SL900 GNSS RTK

SystemGetting Started

Manual Revision

Revision Date	Revision Level	Description
Aug., 2018	1	SL900 GNSS RTK System User Guide

Preface

Introduction

Welcome to the SATLAB SL900 receiver. This introduction describes how touse this product.

Experience Requirement

In order to help you use SATLAB series products better, SATLAB suggests you carefully read the instructions. If you are unfamiliar with the products, please refer to http://www.satlabgps.com.

Tipsfor safe use

Notice: The contents here are special operations, and needyour special attention. Please read them carefully.

Warning: The contents here generally are very important. Wrong operation may damage the machine, lose data, even break the system and endanger your safety.

Exclusions

Before using the product, pleaseread these operating instructions carefully, they will help you to use it better.SATLAB Geosolutionsassumesno responsibility if you fail to operate the product according to theinstructions, or operatewrongly due to misunderstanding theinstructions.

SATLAB is committed to constantly perfecting product functions and performance,

improvingservice quality and reserves the rights to change these operating instructions without notice.

We have checked the contents of the instructions and the software & hardware, without eliminating the possibility of deviation. The pictures in the operating instructions arefor reference only. In case of non-conformity with products, the products shall prevail.

Technology and Service

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

Relevant Information

You can obtain this introduction by:

1. After purchasing SATLAB products, you will find this manual in the instrument container to guide you on operating the instrument.

2. Log onto the SATLAB official website, download the electronic version introduction at the product page.

Advice

If you have any suggestionsfor this product, pleaseemailhttp://www.satlabgps.com. Your feedback information will help us to improvethe product and service.

Contents

CHAPTER

1

Overview

This chapter contains:

- **Foreword**
- **Features**
- **Use and precautions**

1.1 Foreword

A new generation of miniaturized SL900 GNSS RTK system, condensing our ultimate professional pursuit, with enthusiast performance configuration, using magnesium alloy structure, supporting tilt measurement, using Wi-Fi wireless connection, control distance up to 100 meters; built-in transceiver integrated radio, working distance farther. In addition, equipped with a new generation of quad-core full-strength Android handbook, with Satsurv professional measurement software, let you enjoy the comfortable work experience brought by professional quality.

Cautions: This manual does not represent the standard configuration. The contents of the box are adjusted according to different user requirements. The specific configuration is subject to the outbound order at the time of purchase. Before using the machine, it is recommended that you first check the package of the product for damage; please carefully open the package to confirm whether the contents of the box match the delivery order; if you find any loss of the product and its accessories or If it is damaged, please contact your local office or dealer immediately. Please read the instruction manual carefully before carrying, handling and using.

1.2 Features

1. New design, magnesium alloy structure, smaller size, lighter weight and higher quality;

2. Linux operating system, more powerful and more reliable;

3.The transceiver UHF radio enables switchable working modes between base and rover;

4.Built-in 16G built-in storage space, support for inserting an external SD card;

5. Support long-distance Bluetooth and WiFi connection for remote data transmission;

6. Support gravity acceleration sensor (electronic bubble), the accuracy is more guaranteed;

7. Offers tilt survey with a maximum tilt angle of 30 degrees;

8.The new generation controller CHC30, rugged, dexterous and super endurance, accessible in various environments;

9.Based on Android system,developed a customized intelligent measurement software,:Sassurv, with richer graphical performance and improved work efficiency;

10.Multi-function by one key, simple and convenient NFC operation, making your measurement quick and easy;

11. Double format storage of static data (*.GNS / RINEX).

1.3Use and precautions

The SL900 receiver is designed with chemical and impact resistance, but precision instruments require careful use and maintenance.

Notice: The receiver must be within the specified temperature range when used and stored. Detailed requirements, please refer to Chapter 4: *Technical Parameters → Environment*.

In order to ensure the continuous tracking observation of the satellite and the quality of the satellite signal, it is required that the space above the station should be as wide as possible, and there should be no obstacles above the 15° elevation angle; in order to reduce the interference of various electromagnetic waves on the GNSS satellite signal, There should be no strong electromagnetic interference in the range of about 200m around the station, such as TV towers, microwave stations, high-voltage transmission lines; in order to avoid or reduce the occurrence of multi-path effects, the station should be away from the terrain and features that strong reflectors. Such as high-rise buildings, waters, etc.

CHAPTER

2

Product Introduction

This chapter contains:

- Overall appearance

2.1 Overall appearance

The product appearance is divided into three parts, including the upper cover, bottom cover and control panel.

Figure 2-1-1Front

2.1.1Control panel

In the middle of the mainframe is the control panel which contains a power button and three indicator lamps. The only power button can complete all function Settings and three indicator lamps are satellite lamp, power lamp (bi-color lamp of red and green) and status lamp (bi-color lamp of red and green).

Figure 2-1-2 Control Panel

 Satellite Lamp (single green lamp)

 Power Lamp (bi-color lamp of red and green)

 Status Lamp (bi-color lamp of red and green)

Power key functions: power on,power off, mode switching, mode switching confirmation, status inquiry, automatic base station setting, forced shutdown, reset motherboard, etc.

2.1.2 Upper cover

The upper coveris double-color model, and have a U-type anti-wear buffer.

-Anti-wear buffer can effective avoid the instrument from scratches.

- Double-color model makes the structure clear and appearance beautiful

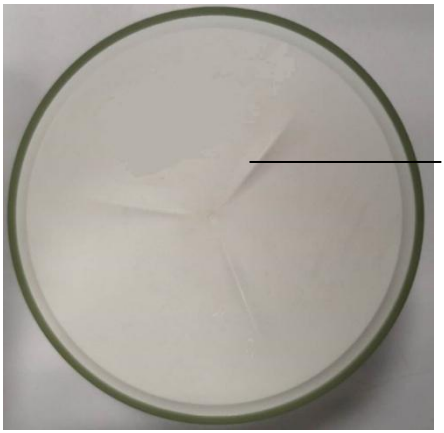
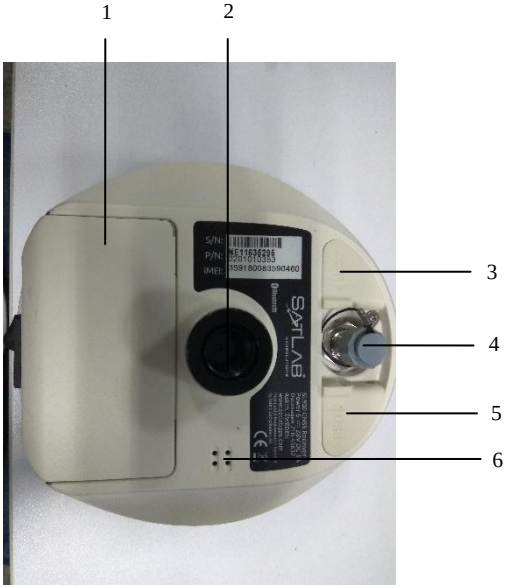


Figure 2-1-3Upper cove

2.1.3Bottom cover



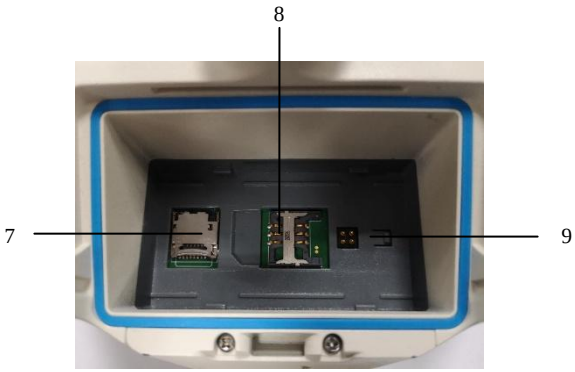


Figure 2-1-4 Bottom Cover

1.Battery compartment cover 2. Connection screw 3. Five-pin socket

4.Antenna 5.USBsocket 6. Speaker

7.SD cardslot 8. Nano SIM card slot 9. Spring contacts

- Connection screw: It is used to fasten the instrument to base or centering rod.

- Battery compartment: Used to place the battery.

- SD card slot: It is used to place SD card, which can store massive static data.

- SIM card slot power seat: When communicating with GSM data, it is used to place SIM card.

- Spring contacts: It is used to connect the lithium battery and host.

- Speaker: Timely operate the instrument and broadcast the status with voice

-Mini-USB socket: connect the hostwith external devices, to upgrade firmware and download static data. It can also be used as the USB to serial port,in special working modes (you need to install the driver).

- GPRS / UHF built-in radio antenna interface: GPRS antenna when using the network, UHF built-in radio antenna when using the radio.

- Five-pin socket: for external data linking and external power supply.

- Connection screw: for fixing the instrumentto the base or a pole.

Notice: 1. If you don't use the five-pin socket and USB interface, please cover the rubber plug to protect from dust and water.

2. When the speaker is flooded, the sound may be silent or hoarse, but it will return to normal after drying.

CHAPTER

3

Basic Operation

This chapter contains:

- **Button & LED**
- **Static survey**
- **Dynamic RTK survey**
- **Firmware upgrade**
- **Tilt survey**
- **Radio channel settings**

3.1 Button & LED

SL900 adopts optimized and simplified design，button operation with control panel is more convenient and concise

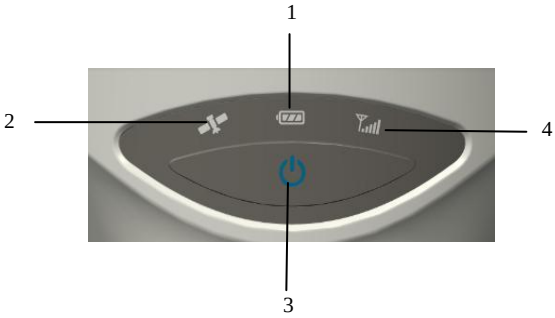


Figure 3-1-1 Button & LED

1-Power key 2-Satellite lamp 3-Power lamp 4-Differential signal lamp

3.1.1 Button function

Table 3-1-1ButtonFunction Description

Function	Description
Power-on	Press the button for 1 second.
Power-off	Press the button for at least 3 seconds.
Auto-set base	In power off status, long press power button for 6s when voice prompts "set base automatically", then release it ; the receiver will automatically set base mode.
Work mode switch	Double click power button enter work mode switch, every double

	click will switch to another work mode
Work mode	Single click to confirm the current work mode
State query	See attached
Reset main board	In power on status, long press power button for more than 6s when voice prompts the second *dingdong*, then release it .
Mandatory power off	In power on status ,long press power button for more than 8 s.

3.1.2Host status query

Table 3-1-2 Key Function Description

Working status	Broadcast content
GSMBase Station	GSMBase Station
UHFBase Station	UHFBase Station, Channel X, Power X
External Base Station	External Base Station
WiFi Base Station	WiFi Base Station
GSMRover	GSMRover
UHF Rover	UHF Rover, Channel X
ExternalRover	ExternalRover
Static	StaticInterval X, Elevation angel X, Existential space surplus X, Satellite number X

3.1.3 LED indicator lamp

Indicators are displayed in different settings; See Appendix 3: Control Panel Indicators.

Table 3-1-3LEDfunction description

Item	Status	Description
Power light (yellow)	Long-term lighting	In normal voltage Battery＞7.6V External power supply＞12.6V
Power lamp (red)	Always on	In normal voltage: 7.1V＜battery＜7.6V 11V＜external power supply＜12.6V
	Slow flash	Low voltage： battery≤7.1V External≤11V
	Fast flash	Power status hints: once to four times of one min
Differential signal lamp （green）	Off	No GSM/WiFi connection
	Always on	GSM/WiFi module connect to server successfully
	Slow flash	GSM/WiFi module connect to internetsuccessfully
	Fast flash	GSM/WiFi module is connecting to internet server
Differential signal lamp (red)	Slow flash	1.Receiving or transmitting data (only receiving data for rover while transmitting for base) 2. collecting static data in static mode
	Off	Communication failure, no data output
Satellite led	Always on	More than 4 satellites tracked successfully

(green)	Slow flash	Lose satellites and try re-track
	Off	1. mother board error resulting in no data output while resetting receiver 2. mother board error resulting in no data output while in static mode
Reset main board or static collecting error(Insufficient storage space)		Anomaly flashof 3 lamps

3.2Static survey

SL900 receiver can be used for static measurement. It is set by double-clicking the power key to enter the mode switching, every double-clicking, switching one mode of operation. In the mode switching process, click the power key to confirm, the red state light flashes every few seconds (according to the set sampling interval) and then collects one. A calendar. The collected static measurement data is stored in the host memory card (when the host memory is less than 2M, it automatically switches to the external SD card). Static data files need to be downloaded to the computer and processed with static post-proceed software.

Notice: Working mode switching: You can also switch through the controller, specific operation please refer to the *Satsurv software instructions→ Equipment→Auxiliary functions→Static collection settings.*

3.2.1 Steps of staticsurvey

1. Set up receiver on a control point, centering and leveling strictly.

2. Measure the height of receiver for three times, on condition that the difference of each measuring is less than 3mm and the final height of the receiver should be the average height. Instrument height should be measured from control point to the upper of measurement bench marker. The radius of the SL900 receiver benchmarkis 0.130m, and the phase center is 0.1018m high.

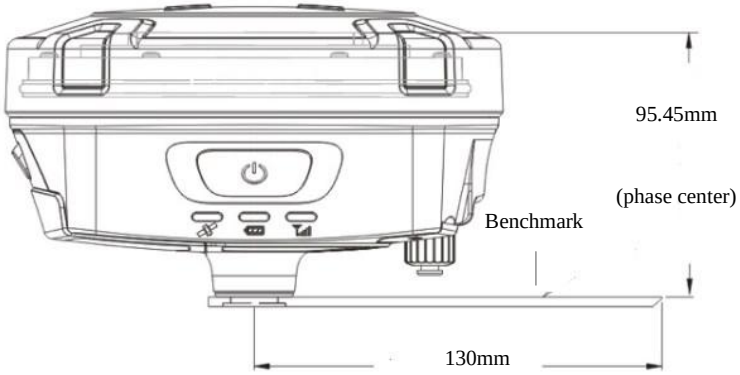


Figure 3-2-1 Benchmark Sketch

3. Record point name, receiver S/N, receiver height, beginning time.

4. Press power button to power on and double click power button to set static collecting mode; then single click power button to confirm it.

5. After the measurement is completed, turn off the machine and record the shutdown time.

6. Download and process data.

Notice: Don't move the tri-brach or change the collecting set while the receiver is collecting data.

3.2.2Static datastorage

The collected GNSS static data is stored in the static drive letter in the 16GB storage of the SL900 receiver. There are three folders: *log*, *gnss* and *rinex*. The log folder stores log information. The data format stored in the *gnss* folder is **.gns*; The data format stored in the *rinex* folder is a standard RINEX format data file. You can connect to your computer using a randomly configured USB cable and use the USB drive to copy static data to your computer.

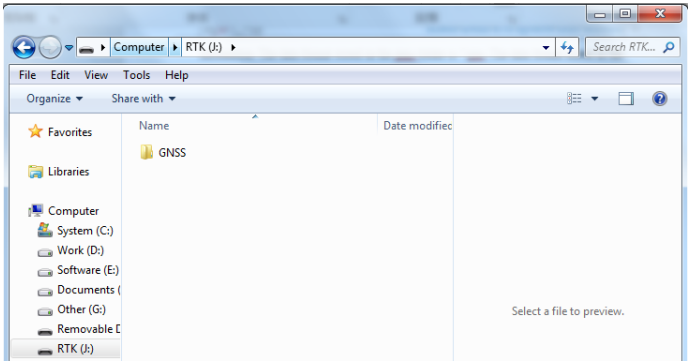


Figure 3-2-2Static Data Storage

Notice: When the storage space inside and outside the receiver is less than 2MB, the data lamp (state red light) flashes and then stops recording , meanwhile the existing data files will not be overwritten.

3.2.3Static data download

SL900 receiver file management using U disk storage, plug-and-play, direct drag-and-drop download, do not need to download the program. SL900 receiver can only download static data by using U disk mode, can not write to the SL900 receiver.

SL900 receiver can download data by U-disk, use Mini USB cable when downloading. Connect the receiver with computer by the Mini USB data cable. After the connection, a *static* code appears in the computer, then copy the collected static files out byopening the disk.

Figure 3-2-3 Static Drive

After downloading, steps of editing the point name and antenna height are:

1. Select *.GNS static files, double click the mouse;

2. Pop up the *Document Edit* dialog box, edit the pointname and input the antenna height, then click *OK*

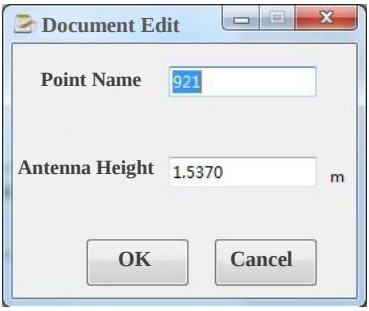


Figure 3-2-4 Edit File

Notice: Static files in removable disks can not be deleted directly, we can use controller software to conduct.

3.3DynamicRTK survey

The dynamic RTK measurement can be based on the propagation mode of the differential signal for the radio mode (internal radio, external radio, external station) and network mode.

1. Erection of instrument

The receiver is mounted on a stable known point or unknown point. In order for the receiver to be able to search for a large number of satellites and high-quality satellites, the base station should generally be selected in the open field of view around, to avoid large buildings and patches within the height of 15 degrees. At the same time, in order to further spread the differential signal, the reference stations should be erected in the higher position.

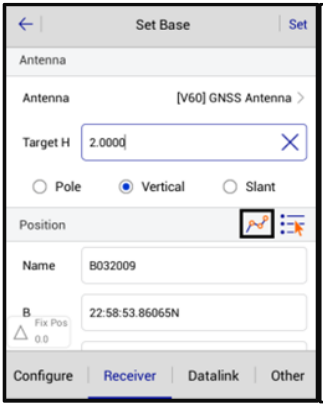
2. Connect the device

Start the Hi-Survey measurement software on the handbook and enter the *Device*interface. Generally, use Bluetooth or Wi-Fi connection.

Figure 3-3-1 Bluetooth Connect Figure 3-3-2 Device Connect

3. Parameter sittings of base

The base station parameters include setting the target height, base station coordinates, working mode and corresponding parameters, message format, elevation angle, and so on. After completing the relevant parameter editing, click the *Settings* button in the upper right corner, and the software prompts *Setup Successful!*



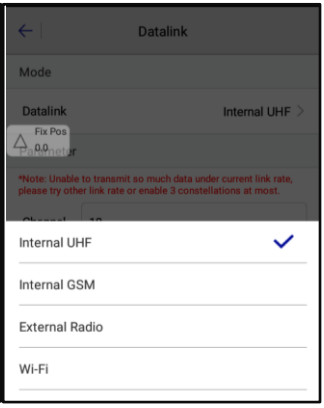


Figure 3-3-3 Receiver SettingsFigure 3-3-4 Choice of Radio

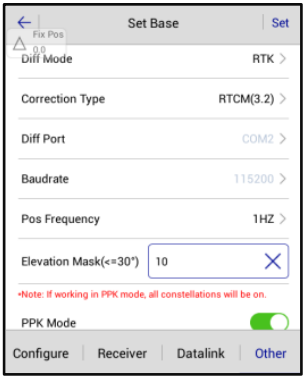


Figure 3-3-5 Other Settings

4. Rover settings

The mobile station receiver is fixed on the telescopic centering pole, and the handbook is fixed on the handbook carrier. The mobile station settings are basically the same as the base station, mainly including the working mode setting, the altitude angle, and the like. The difference is that the mobile station working mode increases the handbook difference.

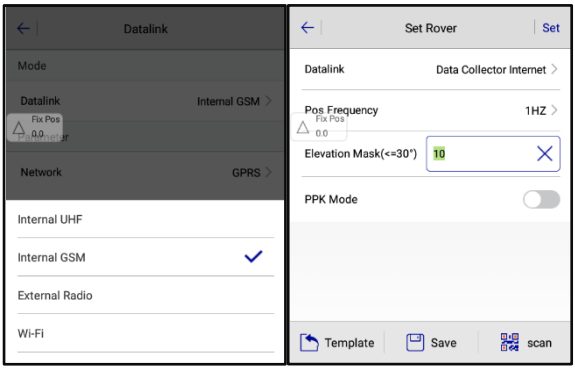


Figure 3-3-6 Choice of Radio Figure 3-3-7Other Settings

3.4 Firmware upgrade

You can Upgrade firmware by USB cable manually.

Steps to upgrading the firmwareby USB cable：

1. Turn on the receiver, connect the receiver and computer with the cable attached. It will show the *update* driveafter clicking thecomputer;

2.Copy the firmware(download from our official website or get it from the technical team) to the *update* drive.Disconnect the computer and receiver, and restart the receiver;

3. There will be different prompt voices of upgrade successes or failures. If it fails, please contactour technical team.

Figure 3-4-1Update drive

3.5Tilt survey

After connecting the host to the Hi-Survey measurement software, perform electronic bubble calibration, orientation sensor calibration, and magnetic calibration on the corresponding interface of the software. In the *Measurement Configuration→Data* interface of the software, open the *Tilt Correction*. The tilt measurement operation can be performed on the host after selecting the correction mode.

3.5.1Tilt calibration

The whole tilt calibration has three steps:

- Orientation sensor calibration;

- Electronic bubble calibration;

- Magnetic calibration.

The order of 1 and 2 steps can be reversed, but must be performed before step 3

.

Notice: 1. The calibration should be done in a low magnetic interference area or an open field. Don't do calibration on the roof or top of a high building.

2. Calibration should be done in external station mode, don't use the internal UHF link to avoid magnetic interference.

3. Don't change battery and power off during all the calibration steps.

Here are the detailed operations below:

1. Orientation sensor calibration

Additional Settings → click *Orientation sensor calibration* to enter calibration interface.

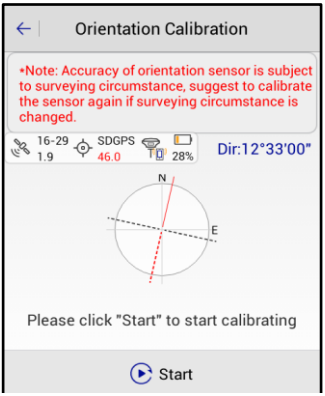


Figure 3-5-1 Start Calibration

Click *Start* to begin calibration, the calibration of the orientation sensor needs to be calibrated according to the demo.

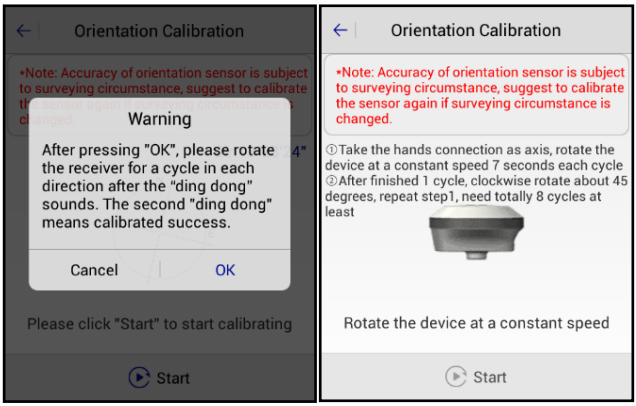


Figure 3-5-2WarningFigure 3-5-3 Rotate The Device

- Rotate at an average speed, approximately 7 seconds for a cycle.

- Clockwise rotate about 45 degrees, repeat step a, you need a total of 8 cycles at least.

- After the calibration is completed in each direction, the second Ding-Dong sound indicates

Success from the device, that means calibration is finished. Conversely, prompting failure - do calibration again.

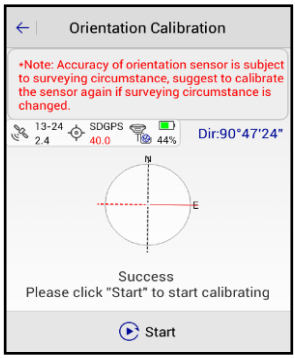


Figure 3-5-4 Calibrated Successfully

2. Electronic bubble calibration

- Connect to the receiver with tilt survey function. In *Additional Settings*, click *Electronic Bubble Calibration* to enter the program.

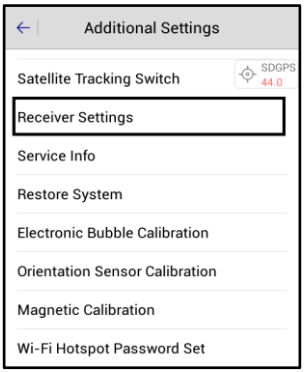


Figure 3-5-5 Receiver Settings

- When the device had been perfectly levelled up, click Start for calibration, then click *OK*.

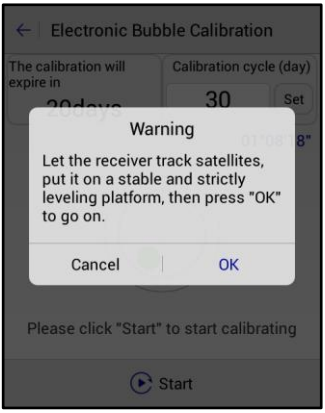


Figure 3-5-6 Warning

- When success is prompted, the electronic bubble and horizontal bubble of base will be centered at the same time.

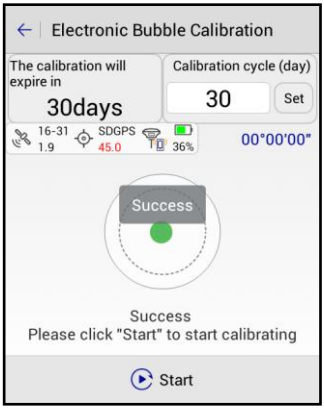


Figure 3-5-7 Calibration Success

- Calibration is finished. Notice: It is recommended to calibrate the device every 30 days, but the calibration cycle can be adjusted.

- Auto collection. When the auto mode is set as Bubble Is centered the software will collect the points automatically when the electronic bubble is centered.

Figure 3-5-8 Auto-collecting

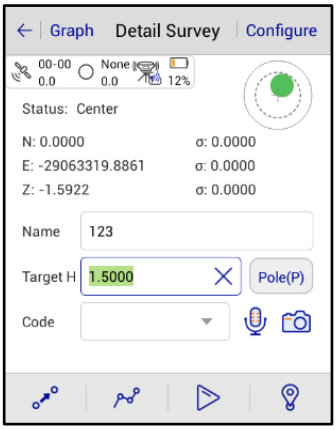


Figure 3-5-9 Detailed survey

Notice: When use the Bubble Is Centered for automatic collection, first set bubble precision. Connect a receiver with tilt measurement function, enter *Main interface* → *Survey* → *Surveying Configure* → *Data* (or: enter *Survey interface* → Click *Configure* at the top right corner→ *Data*), the Bubble Precision can set when tilt Survey is off.

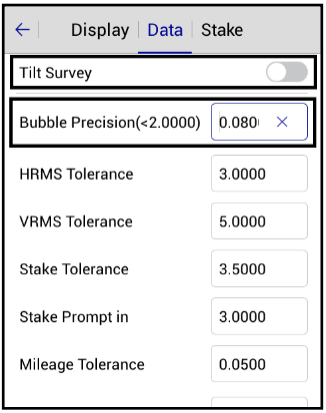


Figure 3-5-10 Tilt Survey And Bubble Precision

3. Magnetic calibration

This step can be done only after the calibration of electronic bubble and orientation.

Additional Settings→ click *Magnetic calibration* to enter calibration interface.

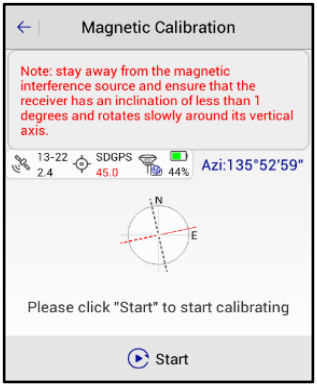


Figure 3-5-11Start Calibration

Click Start to start calibration, magnetic calibration needs calibration in horizontal position.

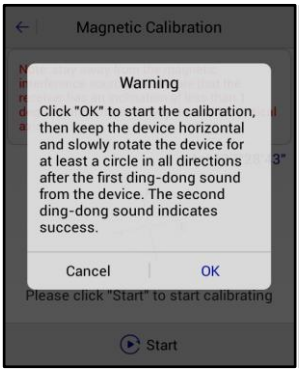


Figure 3-5-12 Warning

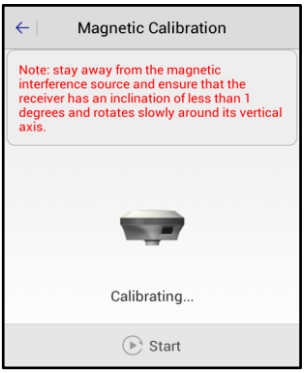


Figure 3-5-13 Calibrating Interface

Keep the device on horizontal and rotate it clockwise a week, slowly and evenly around the vertical axis. Rotation speed is recommended to be less than 20 degrees per second slow uniform rotation and no pause during rotation.

When horizontal calibration is complete, the second *Ding-Dong* sound from the device indicates Success. Conversely, prompting failure - do calibration again.

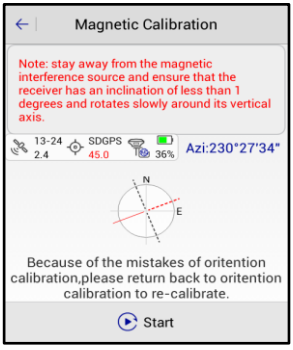


Figure 3-5-14 Mistakes Operation

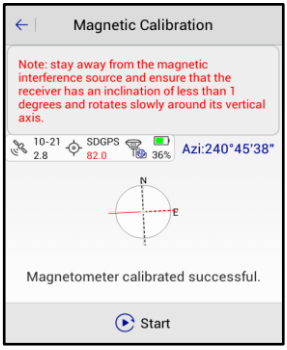


Figure 3-5-15 Calibrated Successfully

3.5.2Calibration verification

In order to make sure accuracy is not strongly interfered with by the environment and procedure, verification is necessary before starting the tilt survey.

Put the device at 30 degree tilt approximately, on the pole, and rotate it slowly clockwise for a week. View the azimuth changes, if the differences between maximum and minimum values is less than 5 degrees, it means the sensors are working well and you can do a tilt survey directly, otherwise module verification will be required.

(Notice: 1. The pole shouldn't be moved; 2. Rotation speed should be 2 degrees per second and it takes about 3 minutes to)

Notice:1. When replacing a new measurement area, or the terrain complex environment of the measurement area changes greatly, module verification is required before measurement.

2. When the new device first uses tilt measurement, it must be calibrated.

3. After the new battery is replaced, the device must be calibrated.

3.5.3Tilt survey procedure

For detailed tilt measurement steps, please refer to the *Hi-Survey Road Software User Manual*.

3.6Radio channel settings

The receiver adopts a built-in transceiver integrated radio unit with a radio frequency of

450MHz-470MHz and provides 116 communication channels for users to choose. User uses the handbook software for channel setting

Notice: Once the base station's transmitting station channel is modified, the mobile station also needs to modify to the corresponding channel, otherwise the differential signal cannot be received. Only the same channel can work properly!

CHAPTER

4

Technical Prameters

This chapter contains:

- Technical parameters

4.1 Technical parameters

Table 4-1-1 Technical Parameters

Configuration		Detailed indicators
GNSS Configuration	Satellite signals tracked simultaneously	System: multi-star system core (OEM729)
		Channels:555
		BeiDou: B1, B2, B3
		GPS: L1C/A, L1C,L2C, L2P, L5
		GLONASS[1]: L1C/A, L2C, L2PL3,L5
		GALILEO[2]: E1, E5a, E5b, E5AltBOC, E6
		SBAS: L1, L5
		QZASS: L1 C/A, L1C, L2C, L5, L6
		IRNSS[3]: L5
		L-Band: up to 5 channels
	Output format	ASCII: NMEA-0183, binary data
	Positioning output	1-100Hz (5Hz with payment)
	Static data format	GNS and RINEX
	Message type	CMR, RTCM2.X, RTCM3.0, RTCM3.2
System Configuration	Operatingsystem	Linux
	Data storage	Built-in 16G memory (SD card supports extended 32G)

	Starting Time	3s
Accuracy and Reliability[4]	RTK Single baseline	Horizontal: 8mm+1ppmRMS
		Vertical: 15mm +1ppm RMS
	Network RTK	Horizontal: 8mm+ 0.5ppmRMS
		Vertical: 15mm + 0.5ppm RMS
	High-precisionstatic	Horizontal: 2.5mm +0.1ppm RMS
		Vertical: 3.5mm + 0.4ppm RMS
	Static and fast static	Horizontal: 2.5mm +0.5ppm RMS
		Vertical: 5mm + 0.5ppm RMS
	DGPS	Horizontal: 25cm RMS
		Vertical: 50cmRMS
	SBAS	Horizontal: 50cmRMS
		Vertical: 85cm RMS
	Initialization time	<10s
	Initialization reliability	>99.99%
Communication	Internal 3G Cellular mobile(Telit:HE910)	UTMS/WCDMA/GPRS/GSM
	WiFi	2.4G, 802.11b/g/n
	Bluetooth	V2.1 + EDR
	Radio	Built-in transceiver integrated radio; (Satel)
		Power: 1W

		Frequency: 403MHz-473MHz(4FSK,GMSK)
		Transmission rate:19.2kbps/9.6kbps adjustable
User Interface	Button	Singlebutton
	LEDLamp	Satellite lamp, signal lamp,power light
Intelligent voice	Voice broadcast	Report the working status of the receiver
	Function self-test	Voice broadcast receiver self-test results
Physical	Internal battery	2×5000mAh lithium-ion rechargeable and removable battery RTK rover(UHF/Cellular) ≥10 hours[5]
	Externalpower	6-28VDCexternalpowerinput (5-pin port) with over-discharge protection
	Dimensions	Φ170mm×95mm
	Weight	≤1.2kg(includes battery)
	Power consumption	4.2W
	Materials	The shell is made of magnesium alloy material
Environment	Water/dustproof	IP67It can resist temporary immersion under 1 meter underwater, completely preventing dust from entering
	Freefall	Designedtosurvivea 2mnaturalfallontoconcrete
	Humidity	95%,condensing
	Operationtemperature	-40℃ ~ 65℃

	Storagetemperature	-40℃ ~ 85℃

Note:

[1] Hardware ready for L3 and L5

[2] E1bc and E6bc support only

[3] Hardware ready for L5

[4]Measurement accuracy and reliability are affected by many factors, including satellite geometry, satellite number, observation time, satellite ephemeris, ionospheric conditions, and multipath.

[5]Batteryworkingtimeisrelatedto work environment, working temperature and battery life.

CHAPTER

5

Accessories and Interfaces

This chapter contains:

- **5-pin socket**
- **Mini USB**
- **Antennainterface**
- **Benchmark**
- **Battery& charger**

This chapter describes the appearance and use of the main interfaces and accessories of the SL900. The following devices do not mean that all users who have purchased the SL900 have these devices. The configuration will vary according to user requirements. The specific configuration is based on the outbound order at the time of purchase.

5.1 Five-pin socket

5.1.1 Five-pin plug

Figure 5-1-1 Five-pin Plug

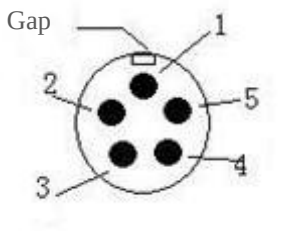


Figure 5-1-2 Description of Five-pin Signal

1.Five-pin data cable: It is also known as COM，which used to connect the host and external radio to transmit differential data.

Table 5-1-1 Description of Five-pin Signal

Five-pin Signal	
1	Ground GND
2	Ground GND
3	Power inlet Vin
4	Data inlet RXD
5	Data exportTXD

2. All the round socketsstart to count the stitches counterclockwise on the front side; the round plugs start to number the stitches counterclockwise with the welding surface.

3. All the above data out (TXD) and in (RXD) signals are described by the receiver. TXD is the receiver data transmission signal line, and RXD is the receiver data reception line.

4. In addition, the serial port DB9 pin connector signal of the computer is: 2 (RXD computer data receiving signal line), 3 (TXD computer data transmitting signal line), 5 (GND signal ground). Referred to as "2 received 3 rounds."

Notice: All of the above are for the host, the front interface of the bottom of the host is shown (the interface soldering surface).

5.1.2 Five-pin data cable

Figure 5-1-3Five-pin Data Cable

1.Five-pin data cable: to connect the host and external radio to transmit differential data.

2. Five-pin plug: A five-pin interface for connecting the receiver to an external radio.

Figure 5-1-4Five-pin Plug

Notice: 1. when connecting various plugs of receiver, it shall align the red point in line joint at the red point in receiver socket, or it will damage the receiver socket and plugs of various lines.

2. When plug out the plug, directly grasp the sliding collar and pull out

the plug with effort. It shall not rotate the plug.

3. After using the cable, it shall place the cable in the place difficult for extrusion, in order to prevent damaging the plug. When installing the difference antenna, it shall rotate the fixed nut in bottom of difference antenna with hand, rather than grasping the upper side to rotate, or the difference antenna will be in bad contact and influence the operating range

5.2 Mini USB

5.2.1 Mini USBinterface

Figure 5-2-1 Mini USB Interface

To connect the host and the computer to upgrade the firmware and download static data.It can also be used as a USB to serial port in a special working mode (requires driver installation).

5.2.2 Mini USB data cable

Figure 5-2-2Mini USB data cable

The Mini USB cable has a standard USB interface on one end and a Mini USB interface on the other end; it is used for connection between the host and external devices for data transmission.

5.3 Antenna interface

5.3.1 Antenna interface

Figure 5-3-1Antenna Interface

5.3.2 Antenna

There isone standard radio antenna and one 4G antenna, you can select the appropriate antenna according to theoperation mode. The UHF radio antenna is used in the internal UHF mode, and the external 4G antenna is used in the internal GSM mode.

Figure 5-3-2Radio antenna(above) and 4G antenna (below)

5.4Benchmark

The benchmark is used to measure the height of the instrument.

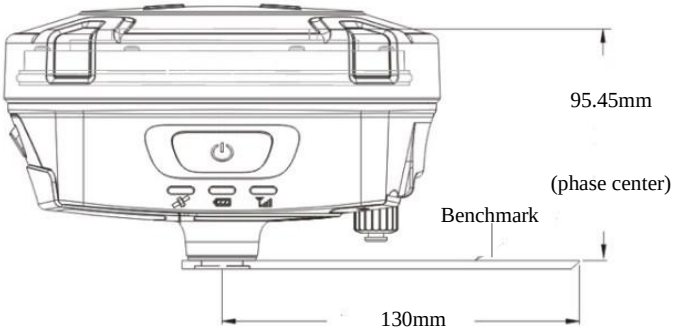


Figure 5-4-1Benchmark

5.5Battery & charger

5.5.1 Battery installation and unload

1. Installation

Lightly press the battery cover and press down, and the battery cover can be lifted up.

Figure 5-5-1Battery Cover

Put the  on the bottom of the battery marked with *Open* to the battery compartment, and put  into the battery rack.

Figure 5-5-2Battery Bay

Install the battery by gently pressing and pushing it toward the end marked *Close*.

Figure 5-5-3 Installed Battery

2. Unload

Gently press and push in the direction marked *Open*, pour out the battery and complete the battery unloading.

5.5.2 Battery and charger model

Table 5-5-1Battery and charger model

Name	Model
Lithium-ion battery	BL-5000
Battery charger	CL-8410

5.5.3 Power supply mode

Table 5-5-2Power Supply Mode

Power Supply	Power supply mode	Lithium battery 5-pin socket external power supply
	Power supply range	6V min and 28V max

You canalso connect the receiver to an external power source through 5-pin socket.

External voltage range for GSM operation mode and UHF rover station is DC 6-28V and the currentshall be more than 3000mA.If there is external power supply, the receiver will choose the highervoltage between the lithium and external power supplies. When an external power supply is required, the specified dedicated power supply must be used.

Notice: 1. Service time of lithium battery will decrease with the reduction of temperature and increase of charging and discharging times. Generally, one new 5000 mAh lithium battery can be used for 10 hours for static data collection, or 8 hours as GPRS Rover, or 7 hours

as 2W internal transceiver transmitting station.

2. In order to extend the life of the battery, please charge the battery as soon as possible within 24 hours after the battery is exhausted, otherwise the battery life will be shortened.

3. If the battery is not used for a long time, in order to prolong its service time, please charge the battery once per month.

5.5.4 Cautions for charging

BL-5000 lithium battery must be charged by CL-8410/CL-4400 lithium battery charger. Charging time is about 7 hours.CL-8410 chargers is designed with charging lamps, whichbecomes red during the charging period, and becomes green after charging. Then continue chargingfor 1-1.5 hours until the electric quantity of battery is in full state.

Figure 5-5-4 Charger

5.5.5 Operation of charging

1. Put the  on the bottom of the battery marked with *Open* to the battery compartment, and put  into the battery rack.

2. Install the battery by gently pressing and pushing it toward the end marked *Close*.

3. When the power is connected, the *charge indicator* is displayed in red to start charging.

Figure 5-5-5 Charging

Notice: 1. only use battery and charger configured by manufacturer, and do not throw them into the fire or use the metallic short-circuit electrode.

2. In case of heating, deformation, liquid leakage, smell emission or other anomaly phenomenon during the use, charging or storage period of the battery, please stop using and replace it with new one.

3. If the service time of the battery is shortened obviously, please stop using the battery. It indicates that the battery has been aged; please replace it with new one.