

# SL800 GNSS RTK System User Manual



User Manual Revision

SatLab SL800 GNSS Receiver

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## Introduction

The SatLab SL800 is a first generation SatLab Network GNSS receiver. This manual will explain how to install and operate the receiver.

## Recommendation

For you to make better use of the SatLab SL800 receiver, SatLab recommends that you read this manual carefully. If you still need further information please visit SatLab's official website: [www.satlabgps.com](http://www.satlabgps.com)

## Safety Tips



Note: The Note contents is for the general operation of the receiver which requires special attention, please read carefully.



Warning: The warning content will generally provide very important information. If the receiver is not operated in accordance with the warnings, it could cause damage, loss of data, or even endanger your personal safety.

## Limitation of Liability

Before use, please be sure to read the instruction manual, which will help you make better use of this product. If you do not follow instructions when operating the receiver, or fail to understand the requirements of the specification and the proper use of this product, any resulting loss or damages resulting from the misuse are limited to the terms of SatLab's International Warranty 'Limitation of Liability' clause.

SatLab is committed to continuous improvement of product functionality and performance, and accordingly reserves the right to make changes to the product and contents of this manual without prior notice.

We have reviewed the contents of this publication in conjunction with the hardware and software to ensure consistency, however, this does not exclude the possibility of errors. The User's Guide is for reference only, if it deviates from the actual product then the actual product version prevails.

## Related Information

For more information on the SatLab SL800 series GNSS receiver please visit [www.satlabgps.com](http://www.satlabgps.com) 'Resources and Support'.

## Your suggestions

If you have any suggestions and comments relating to the SatLab SL800 GNSS receiver, please contact us through email at [info@satlabgps.com](mailto:info@satlabgps.com)

Your feedback on the quality of our products will be greatly appreciated.

## Chapter 1

### Product Introduction

**This section describes:**

- Introduction
- Product Features
- Precautions

## Introduction

SL800 is a small intelligent RTK receiver built with a compact design and rugged magnesium alloy enclosure. It supports multi-constellation, multi-frequency GNSS technology, dual-mode long-distance Bluetooth and NFC for fast and efficient connectivity. The receiver provides reliable and accurate measurement capability, ensuring the user a perfect customer experience.

## SL800 Features

- A new generation of small intelligent RTK receiver, equipped with a new and efficient intelligent real-time GNSS platform;
- Latest multi-constellation, triple frequency GNSS technology;
- Ultra-miniaturized zero-phase antenna;
- Built-in 4.0 standard long distance dual-mode Bluetooth, backward compatible with Bluetooth 2.1 standard;
- Built-in 8GB high-capacity data storage;
- Compatible with any industrial grade Handheld controller or Tablet PC;
- NFC (Near Field Communication) flash pairing connection;
- New small body, magnesium alloy structure.

## Precautions

- (1) The product shall be operated and stored within the specified ambient temperature range.
- (2) Do not place the receiver in a humid, corrosive environment.
- (3) To ensure the signal quality of the satellites tracked, the SL800 should be operated where possible clear of obstacles and with clear sky vision.
- (4) Avoid where possible environments with strong electromagnetic interference, such as TV towers, microwave stations, high voltage transmission lines and other equipment.
- (5) In order to avoid or reduce the occurrence of multi-path, the receiver should be operated away from electromagnetic 'reflective' features such as high-rise buildings, water surfaces etc.

## Chapter 2

### Product operating instructions

**This section describes:**

- Receiver appearance
- Power key function
- LED function
- Battery installation
- Working mode settings
- Handbook differential data chain
- Static measurement
- Static data download
- Firmware upgrade
- NFC function

## Receiver appearance

SL800 consists of three parts: the antenna cover, the lower housing and the control panel.



Figure 2-1 Receiver appearance

The Control panel contains a power button and three LED lights, respectively; satellite indicator LED, power LED (red and green), communication status LED (red and green).

1 - Power button 2 - Power LED 3 - Satellite LED 4 - Signal LED



Figure 2-2 Control Panel



The bottom of the receiver has a 5 pin lemo interface, USB interface and protective plugs. The 5 pin lemo interface is used for the connection of the receiver with an external data link and/or an external power supply. The USB interface is for external equipment connection, firmware upgrade, static data download, and for charging the receiver battery.

If not being used, please cover the 5 pin lemo and USB connectors with the protective plugs in order to maintain waterproof and dustproof status.



Figure 2-3 Receiver Interface

1. 5/8 thread mounting screw    2. Battery compartment    3. 5 pin lemo interface  
4. Mini USB interface    5 - Protection plug

## Power key function

Power key function: power on/off, work mode switch, power query, automatic setting of the base station, and resetting of the motherboard.

Function	Action
Boot	Press power button for 1 second, all lights come on and receiver boots.
Shut Down	Long press power button for 3 seconds, all lights flash twice, release the button to turn off.
Base Station setting	Receiver off, long press power button for 6 seconds, all lights flash twice, release the button, the receiver will automatically set Base Station mode.
Work Mode switch	Double click the power button to enter Working Mode. Each double click will cycle between Static and RTK mode.
Status Inquiry	Click power button, power light flashed red to show power status.
Reset Motherboard	Receiver powered on, press and hold power button for more than 6 seconds, all three lights will flash, release button to reset motherboard

Table 2.1 Power Key Function Details

## LED indicator function

Receiver has three LED lights, respectively; satellite light, power lights (red and green), signal lights (red and greens).

LED Indicator	Description	
Power light (Green)	Solid	Battery fully charged
Power light (Yellow)	Solid	Battery good
Power light (Red)	Solid	Battery > 6% charge
	Flash	Battery <5% charge
	Flash	Battery status indicator: Flashes 1 to 4 times per minute according to power status 1: 0% to 25% 2: 25% to 50% 3: 50% to 75% 4: 75% to 100%
Signal light (Green)	Off	Static Mode
	Solid	RTK Mode
Signal light (Red)	Slow Flash	1, RTK mode: flash at differential data interval 2, Static mode: flash at the sampling interval
	Flash	Static mode: Storage space is less than 10MB
Satellite (Green)	Flash	Acquiring satellites
	Solid	Satellites locked
All three LED's illuminated	Flash	Reset Motherboard, release power button

Table 2.2 Indicator Function Description

## Battery Installation

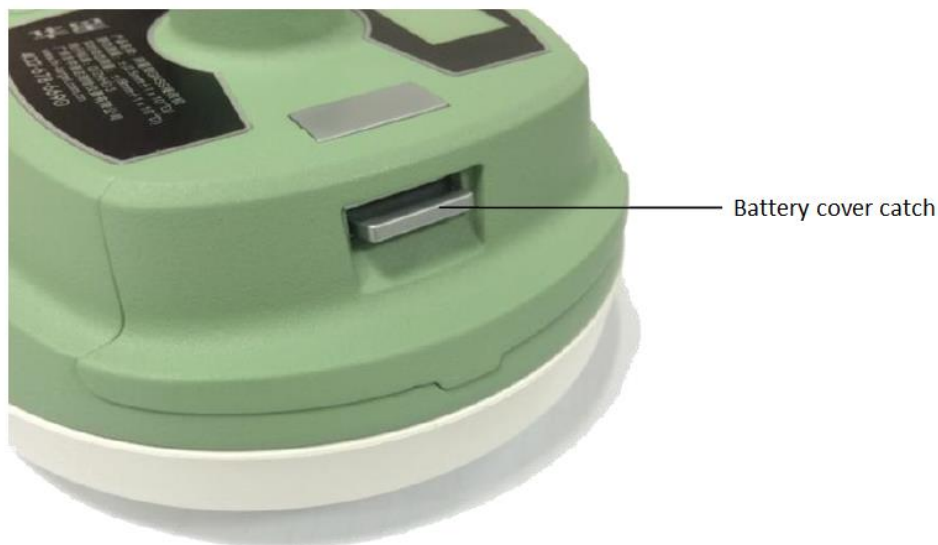


Figure 2-4 Battery compartment

- (1) Press cover catch up to open battery compartment.
- (2) Align the battery electrode with the electrode of the battery compartment and gently push it until it is flush with the battery compartment.
- (3) Reinstall the battery cover to complete the battery installation.

## Working mode setting

Double-click the power button to enter the work mode switch. Each double-click will cycle between static mode and RTK mode. In static mode, the signal green light is off, the signal red light blinks at the sampling interval. In RTK mode, the signal green light is on, the signal red light will flash according to the differential data interval.

You can also set the working mode using SurvCE or FieldGenius software. See Chapter 3.

## Static measurement

- (1) Set up the receiver over the station to be measured with the 'measure plate' fixed to bottom of the receiver.
- (2) Measure the instrument height from the ground point to the upper surface of the measure plate.
- (3) Record the station name, instrument number, instrument high, date and start observation time.
- (4) Power on the receiver and set to static mode. The satellite light flashes to indicate that the receiver is searching and will turn to solid green to indicate satellites are locked. The signal red light will then start flashing according to the set sampling interval.
- (5) Power down the receiver after the measurement is completed and record the shutdown time.
- (6) Download processing data.

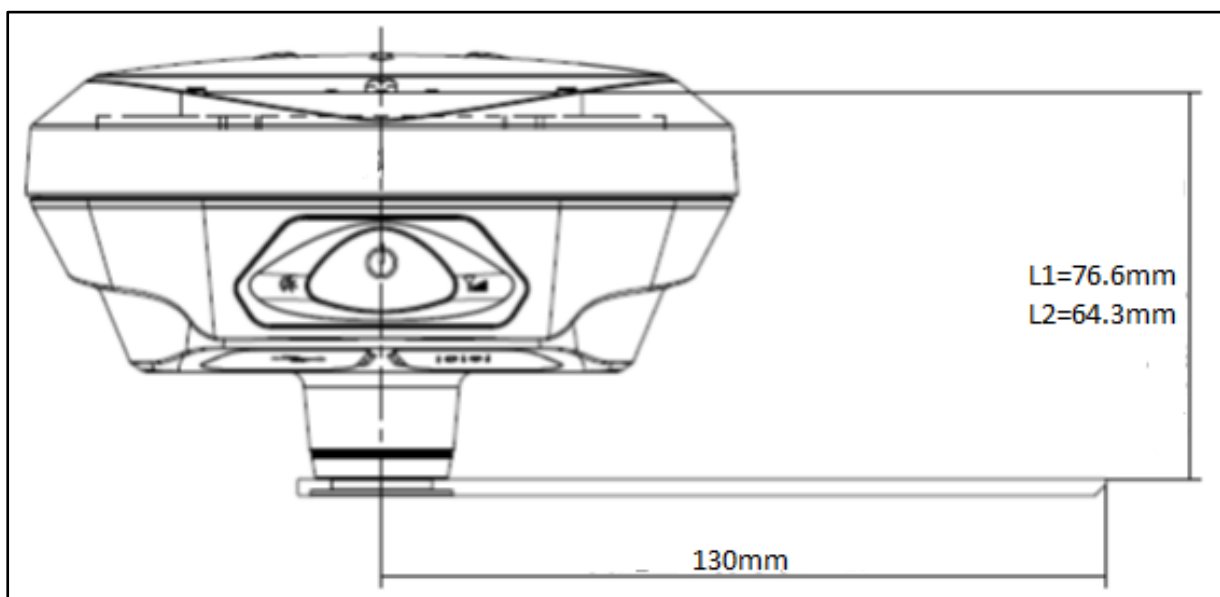


Figure 2-5 ARP offset diagram



Figure 2-6 Height measure plate

When the receiver storage space is less than 10MB, the signal red light flash, and will stop recording data; the existing data files will not be overwritten.

### **Static data download**

Receiver file management uses U disk storage, plug and play, direct drag and drop download. To ensure data security using U disk memory, only static data download is possible and file deletion of the data is not possible. To delete static data, you must use the control software such as SurvCE or FieldGenius.

To download, use a USB data cable to connect the receiver and computer. Open the "static" drive and there are two folders: log and gnss. 'log' folder contains files with log information and the 'gnss' folder contains the static data files.

Download the static file need to modify the name and antenna high, the steps are:

- (1) Select the static file, double-click the mouse;
- (2) pop-up "file editing" dialog box, the name of the modified and high antenna input,

To "update" upgrade disk, remove the U disk, unplug the data cable, restart the receiver to complete the upgrade.

### **NFC function**

Near field communication (NFC) technology applications is a new generation of intelligent connection to control applications and can achieve two functions: instrument connection and software start-up. Touch to automatically connect the device through Bluetooth and start the software. This process simplifies the connection process but needs to be supported by the control application being used.

## Chapter 3

### Operation of SL800 using SurvCE

**This section describes:**

- Running SurvCE
- GPS Rover configuration
- Monitor/Skyplot page



## Quick Start Guide for SurvCE

This section provides a Quick Start guide for operation of the SL800 with SurvCE. The intention is to instruct the user regards connecting to the SL800 and to establish a Network connection to provide correction data. For a detailed description of the use of SurvCE please refer to the Carlson SurvCE User Manual.

### Running SurvCE

Click on the SurvCE icon to open the program. It can be added to the 'Today' screen or the icon displayed as a menu item. If missing from the front screen on your device the icon will appear in the Start Screen.



Figure 3-1 SurvCE Icon in Start Menu



The program will open with option to continue the 'Last Job' or 'Select New/Existing' job. You then have the option to connect to the 'last device' or continue without connection. If this latter option is selected the program will move to the main Menu page.

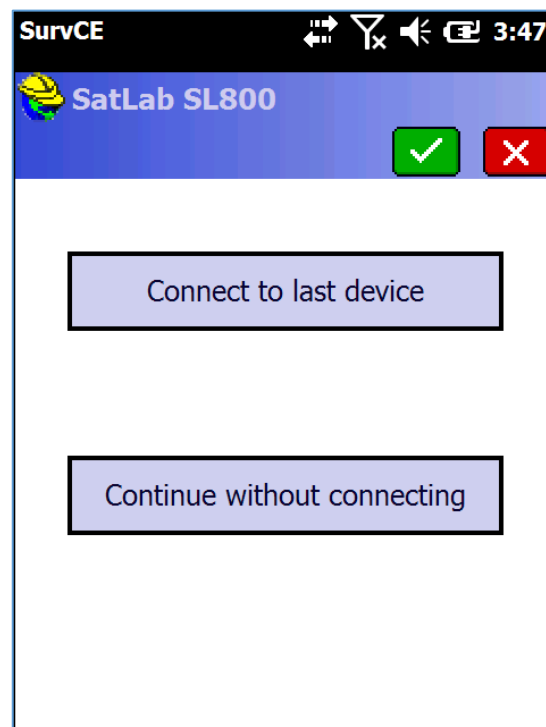
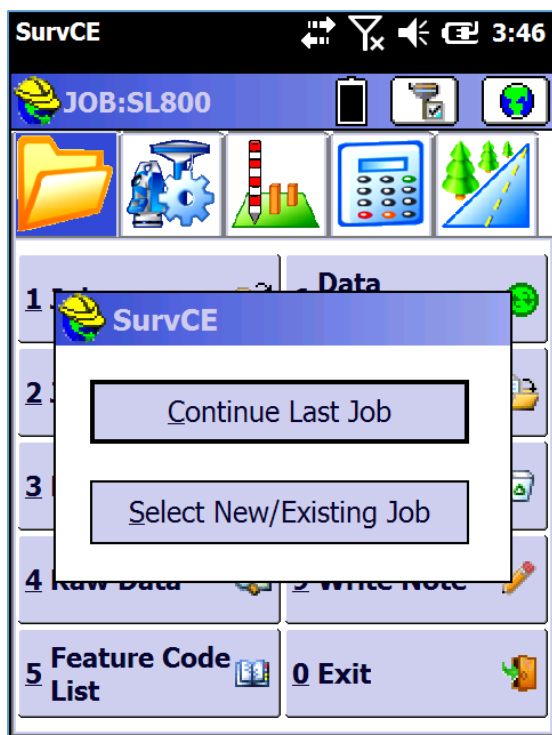


Figure 3-2 Job Selection and Device connection pages



Figure 3-3 SurvCE 'GPS Rover' Menu page

## GPS Rover Configuration Menu

Select 'GPS Rover' to allow configuration of the receiver. In this menu there are four tabs as shown below.

**Current tab** enables selection of Manufacturer and Model of the receiver.

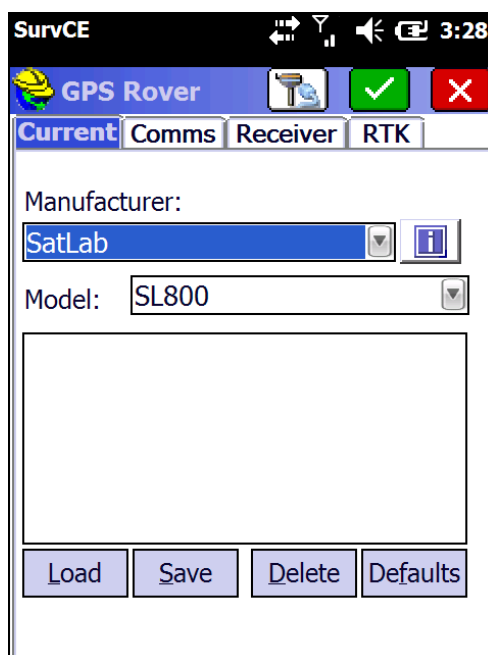


Figure 3-4 Receiver selection tab

**Comms tab** enables Bluetooth connection to the receiver. Click on 'Find Device' then select the corresponding serial number. Next, select 'Device PIN' and type 1234. Click on the Bluetooth icon to connect to the receiver.

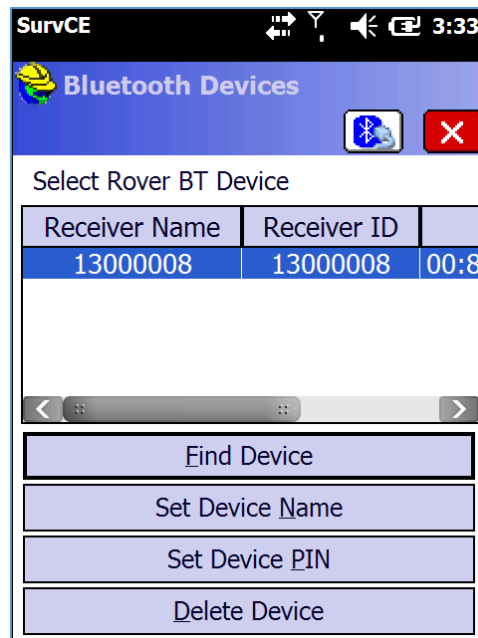


Figure 3-5 Bluetooth connection configuration

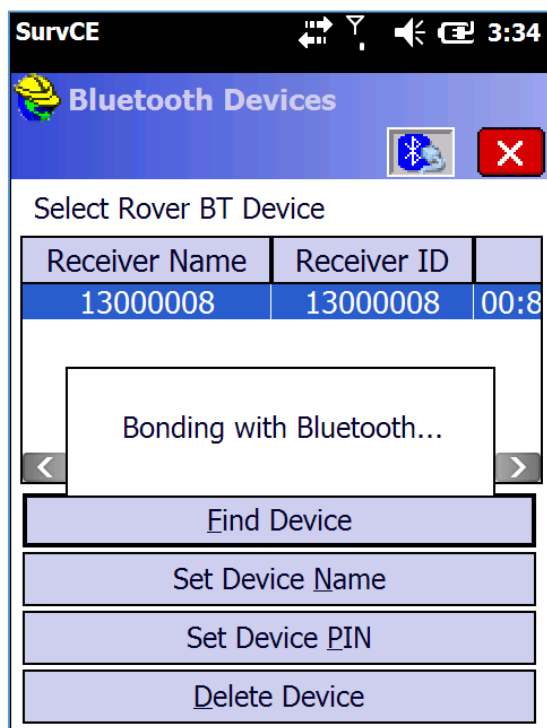


Figure 3-6 Bluetooth connection

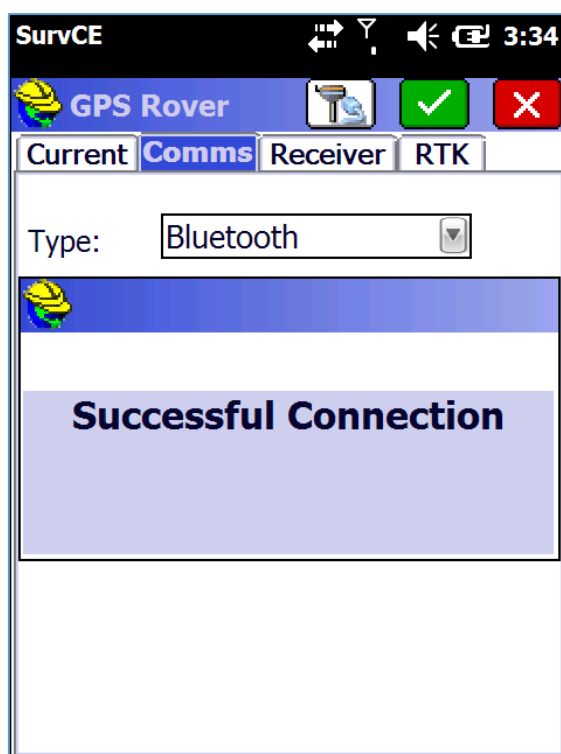


Figure 3-7 Bluetooth connection

**Receiver tab** is used to set the antenna height and will automatically add the offset from ARP (Antenna Reference Point) to the Antenna phase centre.

The screenshot shows the 'SurvCE' application interface. At the top, there's a status bar with icons for signal strength, battery, and time (3:29). Below this is a 'GPS Rover' header with a yellow hard hat icon and a toolbar with a map icon, a green checkmark, and a red X. The 'Receiver' tab is selected, showing settings for the '[SLGSL800]' device. The 'Abs.' offset is 76.7mm. The 'Vertical' radio button is selected. The 'Antenna Height' is set to 0 m. The 'Elevation Mask' is 10 degrees. The 'Position Rate' is 1 Hz. An 'Advanced' button is at the bottom.

[SLGSL800]	Abs. 76.7mm
<input checked="" type="radio"/> Vertical <input type="radio"/> Slant	
Antenna Height: 0 m	
Elevation Mask: 10 °	
Position Rate: 1 Hz	
Advanced	

Figure 3-8 Antenna Height setting page

The **Advanced** button enables the configuration of NMEA output via the serial port and also configure satellite constellations.

**RTK tab** enables configuration to connect to a Network to stream correction data. The only 'Device' option for the SL800 is 'Data Collector Internet' as the data link is provided via the controller GSM modem or WiFi link.

Network connection options are NTRIP and intRTK. Configuration of the Network login parameters is performed by clicking on the hammer and spanner icon. Refer to your Network administrator for login parameters, User names and Passwords.

The screenshot shows the 'RTK' tab in the SurvCE GPS Rover application. The interface includes a status bar at the top with the title 'SurvCE', signal strength indicators, a speaker icon, and the time '3:30'. Below the status bar is a blue header bar with a yellow hard hat icon, the text 'GPS Rover', and three buttons: a hammer and spanner icon, a green checkmark, and a red X. The main content area has four tabs: 'Current', 'Comms', 'Receiver', and 'RTK' (which is selected). The 'RTK' tab contains the following settings:

- Device:** A dropdown menu showing 'Data Collector Inter' with a hammer and spanner icon to its right.
- Network:** A dropdown menu showing 'NTRIP' with a hammer and spanner icon to its right.
- Port:** A dropdown menu showing 'Data'.
- SKPOS:** A checkbox labeled 'Use 1021-1027' which is checked, followed by a dropdown menu showing 'SKPOS\_CM\_31' and an information icon (i).
- Message Type:** A dropdown menu showing 'RTCM V3.0'.

Figure 3-9 Network setting page

SurvCE

NTRIP Broadcasters

Name: SKPOS

IP: 195.28.70.16

Port: 2101

User: geomedia1

Pwd: \*\*\*\*\*

Broadcaster Information

Identifier:

Operator:

Position 0.00S 0.00W ,

Misc:

NMEA: Rover position not needed.

Figure 3-10 Example NTRIP connection settings

## Monitor/Skyplot tab

This tab provides status information regards the receiver position and satellite tracking information.



Figure 3-11 SurvCE Monitor/Skyplot Menu page



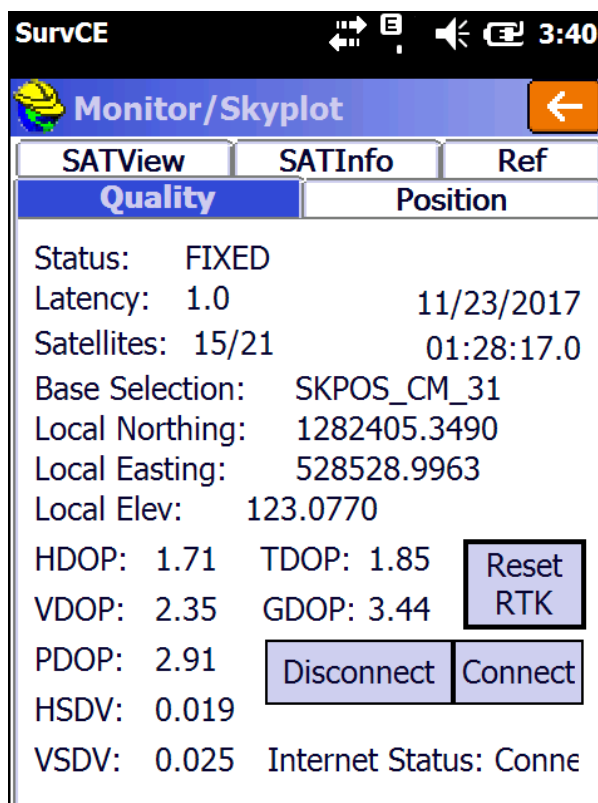


Figure 3-12 Monitor Quality page

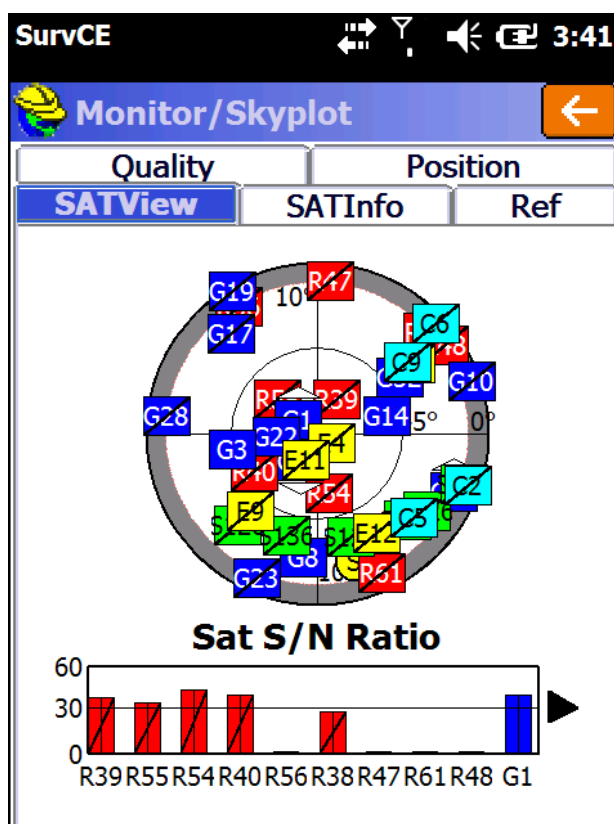


Figure 3-13 Monitor Skyplot page

## Chapter 4

### Technical Specification

**This section describes:**

- GNSS configuration
- System configuration
- Built-in communication
- Control panel
- External interface
- Electrical characteristics
- Physical characteristics
- Environment

## **GNSS Specification**

### **Channel Count**

555 Channels

### **Signal Tracking**

GPS L1 C/A, L1C, L2C, L2P, L5

GLONASS L1 C/A, L2 C/A, L2P, L3, L5

BeiDou B1, B2, B3

Galileo E1, E5 AltBOC, E5a, E5b, E6

NavIC (IRNSS) L5 SBAS L1, L5

QZSS L1 C/A, L1C, L2C, L5, L6

L-Band up to 5 channels

### **Horizontal Position Accuracy (RMS)**

Single Point L1 1.5 m

Single Point L1/L2 1.2 m

NovAtel CORRECT

SBAS 60 cm

DGPS 40 cm

PPP TerraStar-L 40 cm

TerraStar-C 4 cm

RTK 1 cm + 1 ppm

Initialization time < 10 s

Initialization reliability > 99.9%

### **Maximum Data Rate**

Measurements up to 100 Hz

Position up to 100 Hz

### **Time to First Fix**

Cold start < 40 s (typical)

Hot start < 19 s (typical)

### **Signal Reacquisition**

L1 < 0.5 s (typical)

L2 < 1.0 s (typical)

### **System Configuration**

- ◇ Operating system: intelligent real-time system
- ◇ Start time: 1 second
- ◇ Data storage: built-in 8GB memory

### **Built-in communication**

- ◇ NFC near field communication
- ◇ Dual-mode Bluetooth communication

### **Control panel**

- ◇ Panel: Power button
- ◇ Light: three two-color LED lights

### **External interface**

- ◇ 1 USB interface
- ◇ Five-core lemo interface

### **Electrical characteristics**

- ◇ Battery: high-capacity lithium battery 6300mAh / 3.7V, removable, continuous working hours more than 8 hours
- ◇ Voltage: USB interface: DC 4.2-5.5V / 2A; small five-core interface: DC 6-28V / 2A
- ◇ Power consumption: 3.2W

### **Physical characteristics**

- ◇ Size: 127.5mm × 57mm
- ◇ Weight: ≤ 700g (with battery)
- ◇ Material: magnesium alloy material

### **Environmental characteristics**

- ◇ Waterproof and dustproof: IP67; can be anti-2 meters underwater temporary soak, completely prevent dust from entering
- ◇ Drop: 2m drop on concrete
- ◇ Operating temperature: -40 °C ~ 65 °C
- ◇ Storage temperature: -40 °C ~ 75 °C
- ◇ Relative humidity: 100%, anti-condensation

## Chapter 5

### Interface and main accessories

#### **This section describes:**

- Small five-core lemo interface
- Lithium battery
- Adapter
- USB data cable
- Measure reference parts

## Small five-core lemo interface

The five-core lemo connector is used for the connection of the receiver with an external data link and/or an external power supply.

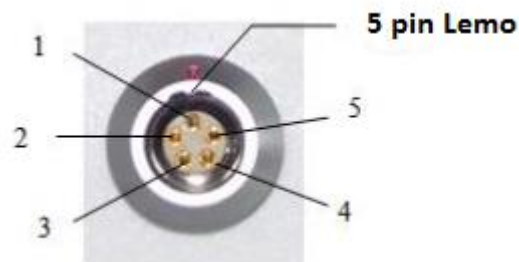


Figure 5-1 small five-core lemo interface

Lemo 5 pin interface Description: facing the bottom of the receiver counter clockwise

- 1 to GND
- 2 to GND
- 3 power into Vin
- 4 data into RXD
- 5 data out TXD



Figure 5-2 Cable connection diagram

Receiver data transmission signal line, RXD for the receiver data receiving line.

3, through the small five-core connection to external data keys, the external power supply, the cable connector on the small five-pin red dot on the small five-core interface on the red dot insertion. If not aligned can not be inserted, and will be small five-core interface and cable plug damage.

4, computer serial DB9 pin connector signal: 2 (RXD computer data receiving signal line), 3 (TXD computer data transmission signal line), 5 (GND signal ground). Referred to as "2 received 3 hair".

### Receiver lithium battery

SL800 has as standard a lithium battery (6300mAh / 3.7V), model BLP-6300S. Technical process and performance is better than nickel-cadmium or nickel-metal hydride batteries as it has no memory effect and when not in use has slow self-discharge function.

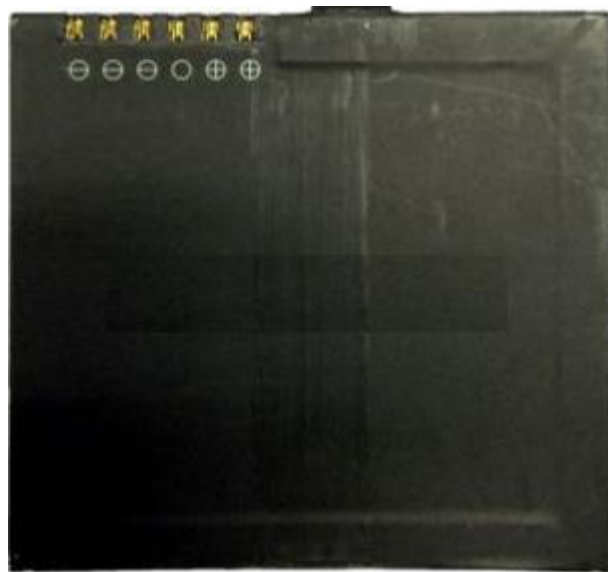


Figure 5-3 lithium battery

#### Warning:

1. Use the standard battery and adapter, do not put the battery into the fire or short-circuit electrode.
2. If while using or charging the battery, it is found that the battery has heat, deformation, leakage, odour or other abnormalities you must stop using and replace with a new battery.
3. in order to extend the battery life, it is recommended for short term storage the battery is stored in a discharged state
4. For long-term storage, it is recommended to charge the battery once a month to extend battery life.



## Power Adapter

Use the standard power adapter (PSAI10R-050Q) for charging. Although the receiver has over-temperature protection, in order to ensure safety, charging should be performed in the 0 °C ~ 40 °C ambient temperature range.



Figure 5-4 Adapter

## USB data cable

Use the USB data cable to connect the computer for the host firmware upgrade and static data download.

Connect the power adapter using the USB cable to charge the host battery.



Figure 5-5 USB data cable

## Height measuring plate

The height measuring plate is used to measure the height of the instrument. Measurement is taken from the ground point to the top surface of the measure plate.

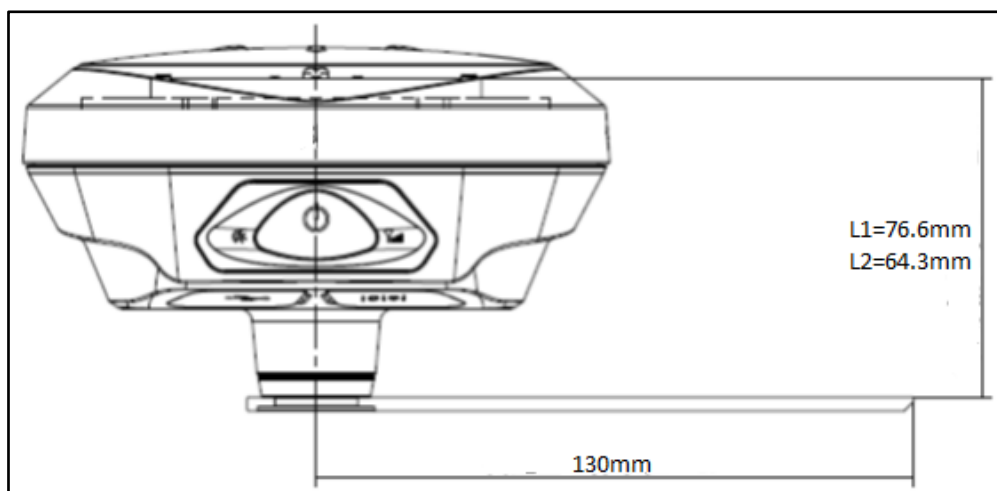


Figure 5-6 Nominal phase centre



Figure 5-7 Height measure plate

### **Schedule 1 - Factory default parameters**

Default System parameters for Mobile station

Working mode RTK

Message Format RTCM (3.2)

Satellite elevation cut-off angle 10

GPS satellite enabled

BDS satellite enabled

GLONASS enabled

Static sampling interval 5 seconds

Static elevation cut-off angle of 10 degrees

### **Schedule 2 Key Parts Information**

Motherboard Novatel OEM729 555 channel

Antenna miniaturized measurement of zero - phase antenna.

Antenna gain 51dB

Data board SLG20150010 [PCBA]