SATLAB
GEOSOLUTIONS

SLX-1 Multi-Application
GNSS Receiver
User Manual

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User Manual Revision

SATLAB SLX-1 GNSS RECEIVER

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1st Nov 2016	1	SLX-1 User Manual (Release V1.1)
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SatLab SLX-1 Multi-Application GNSS Sensor User Guide

Introduction

The SatLab SLX-1 receiver is the first generation of SatLab multi-application GNSS sensors. This manual will explain how to install and operate the receiver.

Recommendation

For you to make better use of the SatLab SLX-1 receiver, SatLab recommends that you read this manual carefully. If you still need further information please visit SatLab's official website: 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

Use SatLab SLX-1 series GNSS receiver internal Web server, [Help] - [Download] to download the electronic version of this manual, or visit www.satlabgps.com 'Resources and Support'.

Your suggestions

If you have any suggestions and comments relating to the SatLab SLX-1 GNSS Sensor, please contact us through email at info@satlabgps.com

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

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Chapter 1

Overview

- **Introduction**
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Introduction

The SatLab SLX-1 GNSS receiver (referred to as "receiver" or "GNSS receiver" in this text) is the latest addition to the SatLab range of GNSS products.

SatLab SLX-1 GNSS receiver is equipped with the world's latest multi-frequency motherboard technology and high-gain antenna for tracking multiple satellite systems; it is built with high-performance microprocessors, flash memory and high-speed large-capacity battery, multiple communication ports, military grade environmental housing, built-in firewall and data encryption; providing high precision and stable multitasking operation for better availability for CORS station operation.

Note: This manual does not represent the standard configuration, the inside information can be adjusted according to different user needs. Before using this receiver, we recommend that you check the product packaging is not damaged; please carefully open the box to confirm whether the items inside the box matches the bill of materials; if you find the product and its accessories have any lost items or damaged parts, immediately contact the local SatLab office or distributor. Please also read the instructions carefully before handling and use.

Features

1. Based on Linux operating system
Based on embedded Linux operating system, it is a true multi-user, multi-tasking, multi-platform operating system. Strong system stability, management capabilities, powerful network operations. Using the embedded microprocessor design; with small size, low power consumption and less heat, the receiver is ideal for long unattended and continuous operation.

2. Supports all available GNSS signal reception
With 220 parallel receiving channels, the receiver tracks GPS, GLONASS, BDS, GALILEO, QZSS and SBAS positioning systems and can maximize the tracking to observe all visible GNSS satellite signals, thereby providing maximum performance for accuracy and real-time measurements.

3. Standard 20Hz data update rate
Supports high data update frequency with data update rate up to 20Hz

4. Multitasking Capability
SatLab SLX-1 has the ability to simultaneously perform multiple tasks. The GNSS receiver can continuously track and record all satellite data while at the same time enable the operator to download the recorded data files, as well as stream or transmit different forms of correction data.

5. Multiple modes of data transfer
By UHF radio, Ethernet, or the built-in 3G / 2G wireless modem, you can use a variety of means of communication with the Internet and wireless networks for data transmission and broadcast differential correction data.

6. Mass data storage, data download, and data streaming
64GB built-in, high-performance storage and can also support up to 1TB of industrial-grade U-disk storage or an external USB storage device. With 64GB the memory can record around one year of one second sampling rate raw data which is available for U disk download, FTP download or remote web page to download; and the receiver also has cycle storage ability.

7. High-precision measurement technology
With high performance precision GNSS measurement techniques and algorithms, direct-milli-metre accuracy with the highest levels of quality assurance is obtained.

8. Excellent compatibility
Real-time compatibility is easily achieved with available output CMR, CMR+, sCMRx, RTCM, RTC-MV3, RTCM32, Binex and other formats of differential data. The receiver is easily integrated into existing CORS networks, but can also output high precision GNSS data in real time for simple single base operation.

9. Network remote access
Remote control of the receiver is easily achieved by logging into the internal web server with any mobile device.

10. Military grade environmental design
Anodized aluminium alloy metal case, built-in firewall, data encryption; gives the receiver pro-tection for both operation and data integrity.

11. Multiple interface options
Equipped with RS232 ports, two USB ports, a Wi-Fi communications interface, a 3G / 2G com-munications interface, an Ethernet interface, an RS485 interface, an external clock interface, a PPS output interface; the receiver will fully satisfy reference station or peripheral data input and output requirements.

12. Wide voltage multi-mode power supply
The built-in large capacity lithium battery, can work for up to 24 hours; two lane external volt-age supply: 7VDC ~ 36VDC; support batteries, solar and wind power and other power supply giving guaranteed 24 hours of continuous operation. If power, for whatever reason is lost, once restored the receiver it will re-boot using the last settings and continue working normally.

Use and Precautions

Although SatLab SLX-1 GNSS receiver is built according to military standard with all-aluminium anodized metal case, it is a sophisticated instrument and needs careful use and maintenance. It is desirable if possible to maintain a dry environment. And in order to improve the stability and prolong the life of the receiver, avoid exposure to extreme environments, such as:

1. Wet
2. Temperature above 75 degrees Celsius
3. Temperatures lower than -40 degrees Celsius
4. Corrosive liquids or gases

Avoid the GNSS antenna being placed near sources of electricity or strong interference signals:
1. Television and computer monitors
2. Generator's
3. Electric motors
4. DC - AC power conversion equipment
5. Power switches

When selecting the GNSS receiver's antenna position, pay attention to the following matters:

The site should be chosen for easy access and should be clear of obstructions. Field of view of around 10 degrees or lower in height should be clear of obstacles to avoid blockage of the GNSS signals, shown in Figure 1-1:
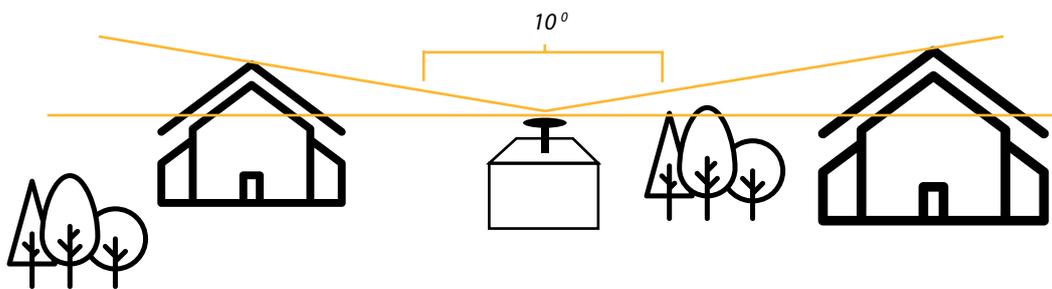

Figure 1-1

1. Site should not have large areas of water or objects that can cause signal reflection, so as to reduce the impact of multipath effects.
2. The site should be located at least 200m away from high-power radio emission sources (such as television, microwave stations, etc.); and at least 50m away from high voltage power lines in order to avoid electromagnetic interference to GNSS signals.
3. Antenna should be mounted so that it is stable and will not move.
4. Ensure there is a reliable and stable power supply and communication network available.
5. Receiver should be installed in a secure environment for the protection of GNSS reference station equipment.
6. Install in a developed area with easy access to check and maintain.

Chapter 2

Introduction to Satlab SLX-1 GNSS Receiver

Introduction
This chapter describes the appearance of the GNSS receiver, key functions, indicators and external ports.

Receiver Appearance
Appearance of the product is divided into three parts, front panel, rear panel and body. Figure 2-1:

Front Panel

Rear Panel

Body

Figure 2-1 Receiver Overall Appearance

Front Panel
The receiver front panel USB port, SIM card slot, TF card slot, keypad, LED, LCD display. Figure 2-2:

Figure 2-2 Front Panel

1- MiniUSB Interface: Write enabled;
2- TF card slot: Installation TF (Micro SD) memory card for expanded storage capacity;
3- SIM card slot: Install the standard SIM card for 3G / 2G wireless network communications;
4- LCD: Display receiver status information and guidance for button operation;
5- Indicator lights: Indicates the receiver tracking status, network status, power status and other information;
6- USB port: Connect the U disk or USB storage device for storing / download data and update firmware;
7- Keypad: Used to query and set the receiver;

Rear Panel
The rear panel includes the antenna connector interfaces, RS232, RS485, Ethernet data input and output interface.

Figure 2-3 Rear Panel

1- DB9 serial port: GNSS data outputs for connecting external devices;
2- **GNSS antenna:** TNC connection for the antenna;
3- Power input: Main power supply input;
4- External clock input: TNC socket for connecting an external clock;
5- Vent: pressure equalisation;
6- External expansion Lemo port: 12VDC power output, RS232 debug port, RS485 / RS422 communication interface;
7- LAN interfaces: LAN cable connection port;
8- 3G Antenna: Connect 3G / GPRS antenna port;
9- Five-pin Lemo socket: Differential data output, host and external data link connection; an auxiliary power supply input;
10- PPS output: SMA receiver PPS second pulse output port;
11- Ground: Lightning ground;

Receiver Body
The body of the receiver is constructed with aluminium alloy metal body shell, and anodic oxidation process, shown in Figure 2-4:

Figure 2-4 Receiver Side

Key Features

Receiver control panel has four buttons: power button, left, right, and function keys; key operation and function description, is shown in Table 2.1 and Table 2.2:

Table 2.1 Key Description

Operation	Explanation
Click	Key operation is less than 0.5 seconds
Double-click	Double-click the button operation interval of less than 1 second
Press	Key operating more than 6 seconds

Table 2.2 Key Functions

Button	Key Name	Function Description	Status
⏻	Power button	Double-click : Off / On LCD Click: Power , OK, modify the parameter Long press: off	See LCD Status
◀	Left	Click: move left	
▶	Right	Click: right or down	
Fn	Function keys	Click: Cancel or switch interface	
Fn ⏻	Key combination	Reset: Hold down the 'Fn key' , and then click the power button. Satellite light will start flashing	

LED Lights

Receiver control panel has four LEDs: Satellite light, Recording light, Network light and Power / Alarm light (network light is monochromatic green light, other red and green light), as shown in Table 2.3 and Table 2.4:

Table 2.3 LED Flash Description

Status	Description
'Slow flash'	Flashing interval around 1 second
'Fast flash'	Flashing interval around 0.5 seconds

Table 2.4 Status Light Indication

Lights	Function and Meaning
Satellite Light	Green ON : Satellites Locked Flashing : Acquiring satellites
Recording Light	Green Slow Flash : Recording interval ≥1 seconds Fast Flash : Recording interval <1 second OFF : Stop recording
Network Light	Green Off : No network cable connected On : Connected network cable Blinking : Data exchange
Power / warning lights	Red Flash : Alarm Steady yellow : External power Green light : Battery powered

⚠ **Note:** *Double-click the power button to turn on the LCD.*

LCD

LCD status and settings display contains two parts;

Status Display

Status display shows the receiver satellite search, network connections, setting status information; specifically shown in Figure 2-5:

Figure 2-5 Status Information 1

1- Alarm status 2- Operation status 3- Satellite status 4-Power status 5-Wi-Fi status 6-3G Network status 7-IP address 8-network status 9-Web server port number (default 80)

1- Alarm status: Symbol ◇ '!' indicates alarm ◈
2- Operating status: Search, REF, Auto, DGPS, Float, Fix Ref
3- Satellite status: Number of satellites currently tracked 32-00
4- Power Supply / Battery Power: External power supply LCD ⚡ , battery-powered LCD ▯
5- Wi-Fi Status: Closed Wi-Fi LCD 📶 , turn on Wi-Fi LCD 📶
6- 3G network Status: Closed 3G module LCD 📶, 3G module turns LCD 📶 , 3G connected to the public network LCD 📶
7- 3G network transmission status: 3G LCD no data transmission ⇄ , data transmission LCD ⇄

Figure 2-6 Status Information 2
(Data Transmission State)
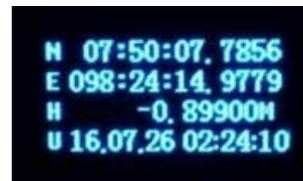
Figure 2-7 Status Information 3
(Coordinate Information)

Figure 2-8 Status Information 4
(Satellite Information)

Figure 2-9 Status Information 5
(Receiver Status Information)

Figure 2-10 Status Information 6
(Memory Power Information)

Figure 2-11 Status Information 7
(IP, Network information)

Figure 2-12 Status Information 8
(position status information)

Function Display
Using the Function screen, you can set data recording, networking, data download, U disk firmware upgrade using the front panel buttons; 2-11, 2-12 screens specifically, as shown below:

Figure 2-13 Setup Menu

Figure 2-14 System Settings

External Ports

External ports on front and rear panels as shown in Table 2.5:

Table 2.5 External Ports Description

Panel	Port Name	Panel Indicators	Physical Interface	Use	NOTES
Front	Mini USB port	/	Mini USB (female)	/	/
	USB port	/	USB-A (female)	Data storage / download and update the firmware	Available U disk and USB removable storage
	TF / SIM card slot		TF / SIM card slot	TF card : store data SIM card : 3G / 2G wireless network communication	/
Rear	GNSS antenna	GNSS ANT	TNC	GNSS antenna connection	/
	External clock input	OSC	TNC	Connect an external atomic clock	/
	3G antenna	3G ANT	SMA	Connection 3G / GPRS antenna	/
	PPS output	PPS	SMA	PPS second pulse output	/
	DB9 serial port	COM1	DB9	GNSS sensor data output and external device	Standard three-wire serial interface
	LAN Interface	LAN	RJ45	LAN Cable Access	Support 10M / 100M;
	External expansion	EXT Port	Fourteen core (LEMO)	RS485: GNSS sensor data output and external access ; RS232: debug serial port ; EX12: 12VDC output; PW_RST: hardware reset; EVT: external event input (reserved);	Hardware reset : 4 ~ 13VDC input level , rising close , falling open
	Power input	PW1	Two core (LEMO)	Main power supply input	/
	Five core socket	PW2 COM2	Fifth core	Auxiliary power supply input; Differential data output	/
	Ground	GND	/	Ground lightning Interface	Ground Lightning

Warning:
1. The main and auxiliary power supply input voltage supports 7 ~ 36VDC, DO NOT exceed this range.

2. When using the hardware reset function or built-in battery, the receiver supply voltage must be in the range 11 ~ 36VDC;

3. RS485 interface is compatible with full-duplex and half-duplex, the pin is defined as follows: 485A Pin7, 485B Pin3, 485Y Pin6, 485Z Pin4, GND Pin5;
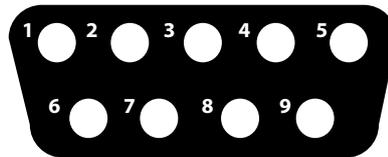
Half-duplex: A, B and external devices A, B connection (Y, Z, GND may not be even);

Full duplex: A, B and external devices Y, Z connection Y, Z and external devices A, B connection (GND may not be even)

Chapter 3

Web Management Overview

Introduction
Users can access the built-in Web management server from anywhere, using a web browser to log into SatLab SLX-1 GNSS receiver, and download observation data, view the operational status, modify the system configuration, perform receiver system upgrades, format or restart operations, and complete remote control. This section describes the Web management server;

User Login
Depending on how the network connection is set up, the SLX-1 Web server can be accessed via a local IP address or through an external web address. Once accessed, the SLX-1 login page will be loaded and the user can then login to the system.

User Groups Profile
For the convenience of management, all users are divided into the following three groups:

Guest: User name 'guest' and password 'guest' to enter the system to browse and view the status but with limited access and no editing rights.

Ordinary User: Requires a username and password (setup by the Administrator), you can view the receiver status, change some parameters, and browse, download, and delete data files.

Administrator: There is only one Administrator account and login requires user name and password. The user name is set to default 'admin' and cannot be edited and the default password is also 'admin' but this is editable in User Management/Users page. It is recommended this password is changed from the default to ensure the system management is secure. 'admin' is the most advanced operating authority, and can add, delete users and modify other users passwords.

Table 3.1 User groups operating authority table

Login Status	'guest'	'ordinary user'	'administrator'
View device status	o	o	o
View location information and satellite status	o	o	o
View data transfer status	o	o	o
Edit the receiver configuration	x	o	o
Set Reference coordinates and parameters	x	o	o
Set file recording parameters	x	o	o
Download and delete data files	x	o	o
Control and change data transfer settings	x	o	o
Change the current login account password	x	o	o
Add 'user' accounts	x	x	o
Delete 'user' accounts	x	x	o
Reset the motherboard	x	x	o
Reboot the receiver	x	x	o
Upgrade system firmware	x	x	o

User Login

After entering SatLab SLX-1 Series Web server page, login page appears first, shown in Figure 3-1:
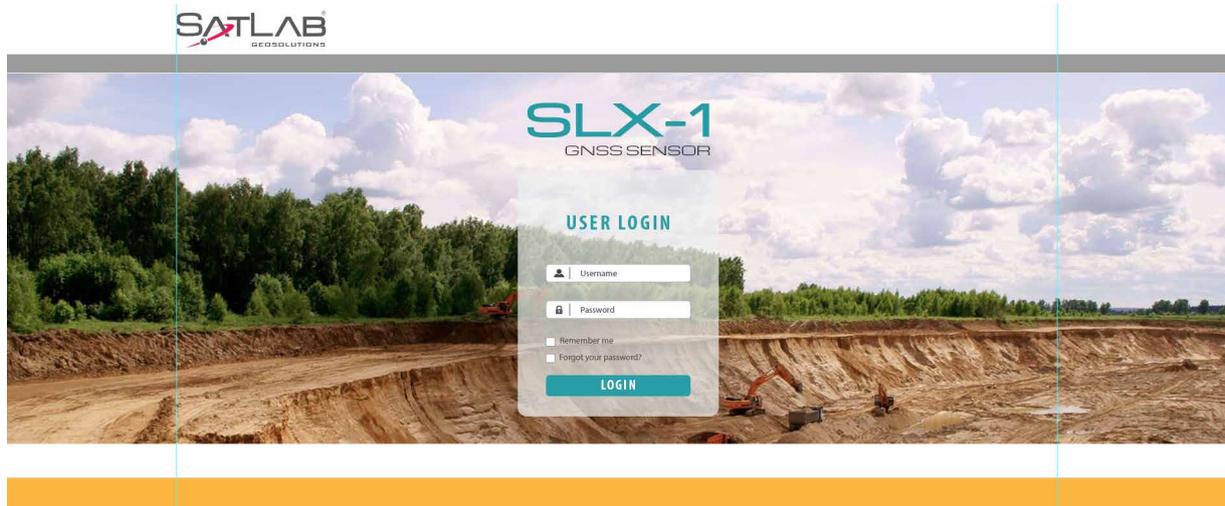

Figure 3-1 User Login Web Page

! **Note:** SatLab SLX-1 Series Web server supports PC, server, tablet PC, mobile phones and other devices, but access please use IE 9 + / Firefox 11 + / Chrome 20+ browser

Enter a correct user name and password and click [Login], and you will be logged into the system. A default guest login is available using login 'guest' and password 'guest', but with only basic browsing permissions and you cannot change the receiver parameters or download, delete data or log files.

In the initial case, the User Account Management only has the default 'admin' account with administrator privileges. Default user named "**admin**", and password "**admin**" (both without the quotes). You can use this account to add multiple users with general user privileges to the User Account data base.

! **Note:** There is only one Administrator account, and the user name cannot be edited, but you can change the password. We recommend that you edit the administrator password as soon as possible to ensure the security of the receiver. If you forget the administrator password, please contact our technical support staff. If you forget your user password, please contact your administrator to reset your password.

Home Screen

Figure 3-2A Base Mode – Home Screen

Home screen contains the GNSS receiver status window and short cut links to, Receiver Settings, Data Recording, Comms Settings, File Management, Receiver Information, Satellite Information and Help which gives a direct link to the SatLab web page. Figure 3-2A & B.

Figure 3-2B Rover Mode – Home Screen

System Information
System information page includes sub-menus for Receiver information (status), Satellite information (Skyplot and text) and Location information (displays position and map of station location).

Receiver Information
Shows the current hardware status included: Receiver information, Motherboard information, Storage device (3 locations), Power information, Network information. Figure 3-3:
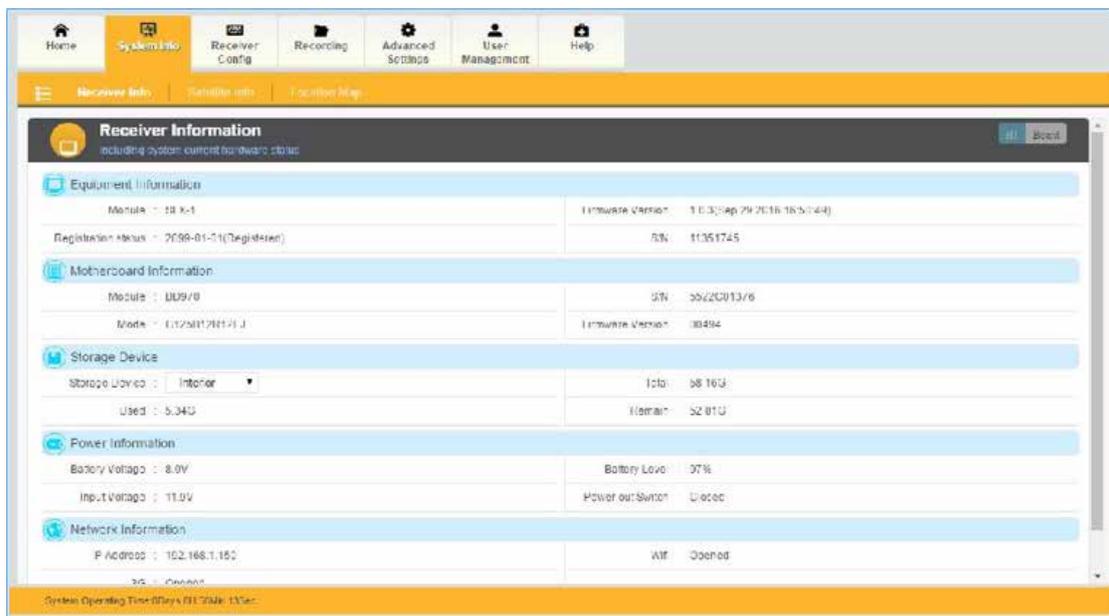
Figure 3-3 Receiver Information

Storage devices, click [Storage Device] - [interior] and you can then select internal, U disk, TF card, to query that status of the selected storage device.

Location for data storage is set in [Recording]-[File Management]-[Storage Management]

Figure 3-4 Storage Device Selection

Satellite Information
Satellite Information module shows the current tracking status in both Sky View and Satellite Info sheet for all in view satellites, with the text display including satellite number, elevation, azimuth, and SNR for each frequency tracked. See Figure 3-5:
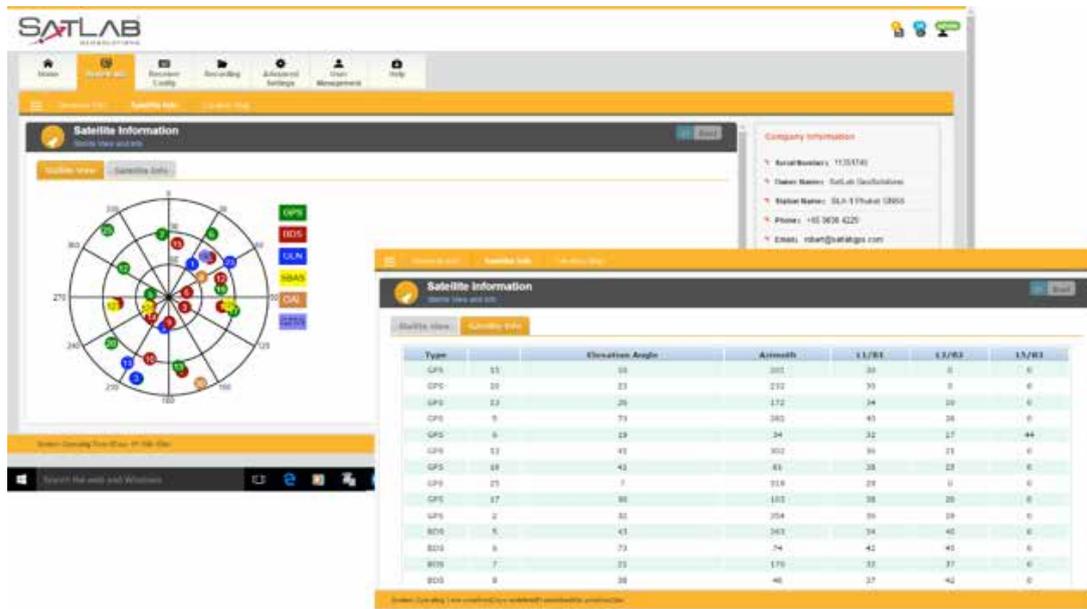
Figure 3-5 satellite information

Location Information

Location information module shows the current LLH location of the GNSS receiver, and displays the location on a map (default to satellite images show but other views are available) Figure 3-6:

In Map view you can zoom and pan as well as selecting other Map views from the menu.
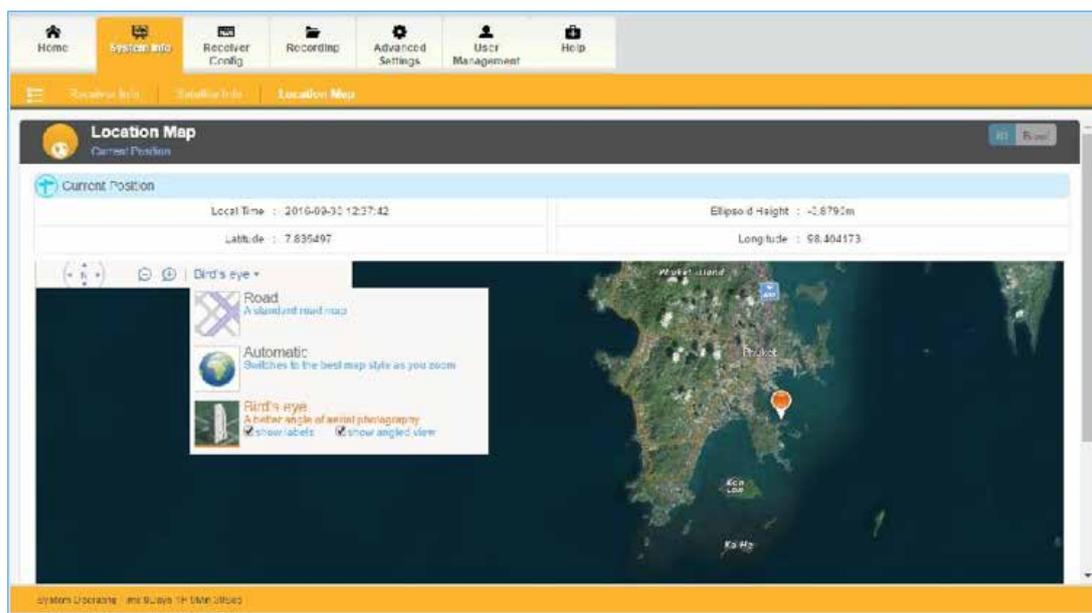
Figure 3-6 Location Map

Receiver Configuration

Receiver Config module comprising: Receiver Settings, Comms Settings, Satellite Settings and Serial Port Settings.

Receiver Settings
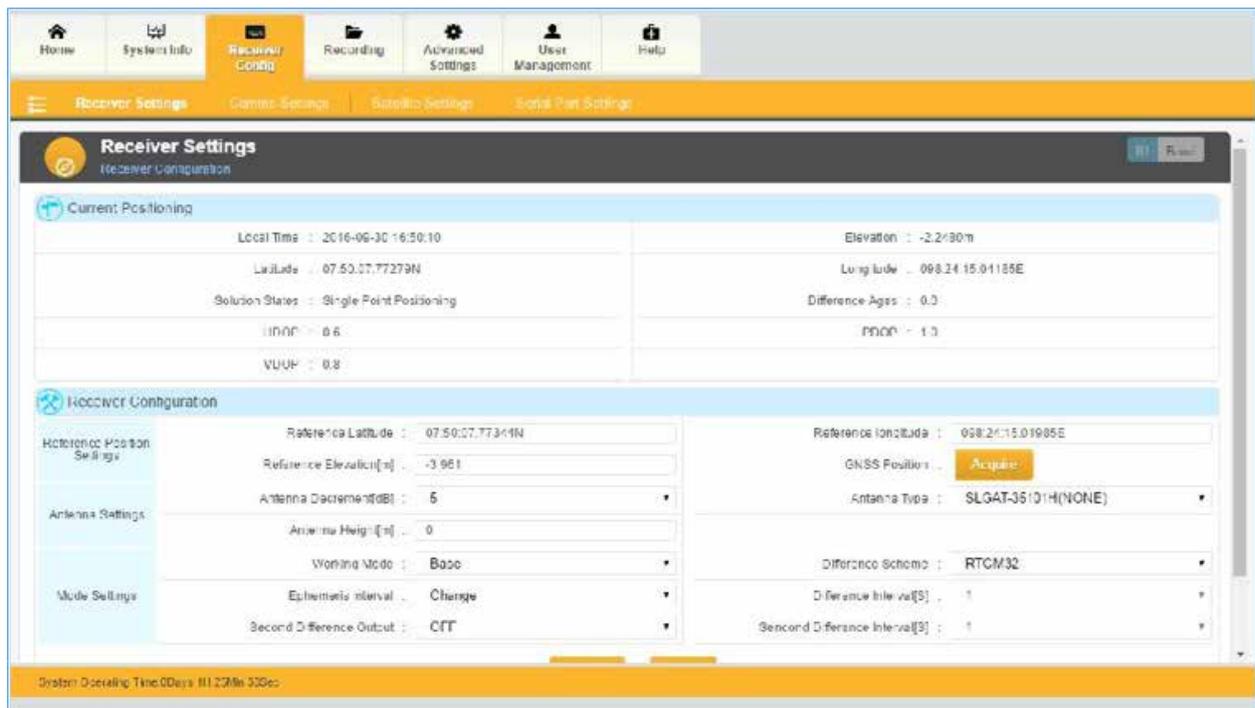
Figure 3-7A Base Settings
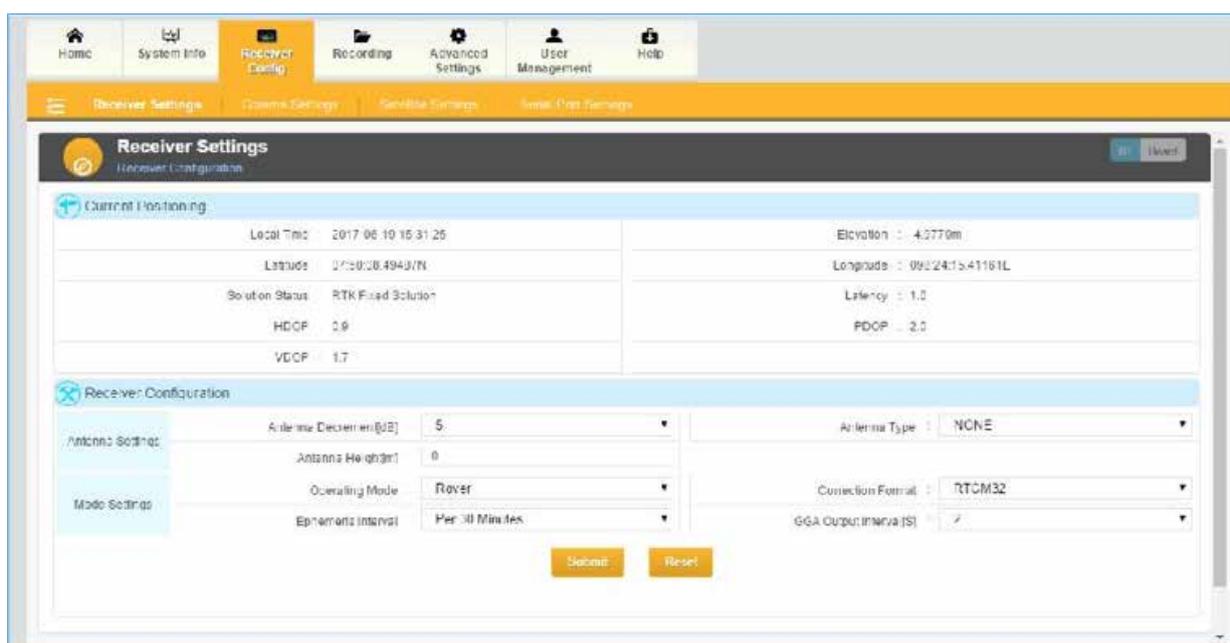
Figure 3-7B Rover Settings

This page has two sections being 'Current Position' and 'Receiver Configuration'. Either screen can be minimised by clicking on the heading icon (top left) for each section.

'Current Position' displays local time and date, the current measured position LLH, solution status (Auto, DGPS, Float, Fix), Correction Latency (Mobile operation only), HDOP, PDOP, VDOP

'Receiver Config' allows the operator to enter parameters for either Base or Mobile operation. Details of setting up the receiver for Base station operation are provided in Chapter 4. Receiver configuration for Rover operations is provided in Chapter 5.

Receiver Config
Working Mode : Base
The Base Configuration allows user to input the settings that works best for their application. Input required is Reference Position (WGS84 LLH) Difference scheme (correction message format), Difference interval (defaultto 1 second and not configurable), ephemeris output interval (recommend 'Change'), and if required you can set a second differential massage output. As shown in Figure 3-8:
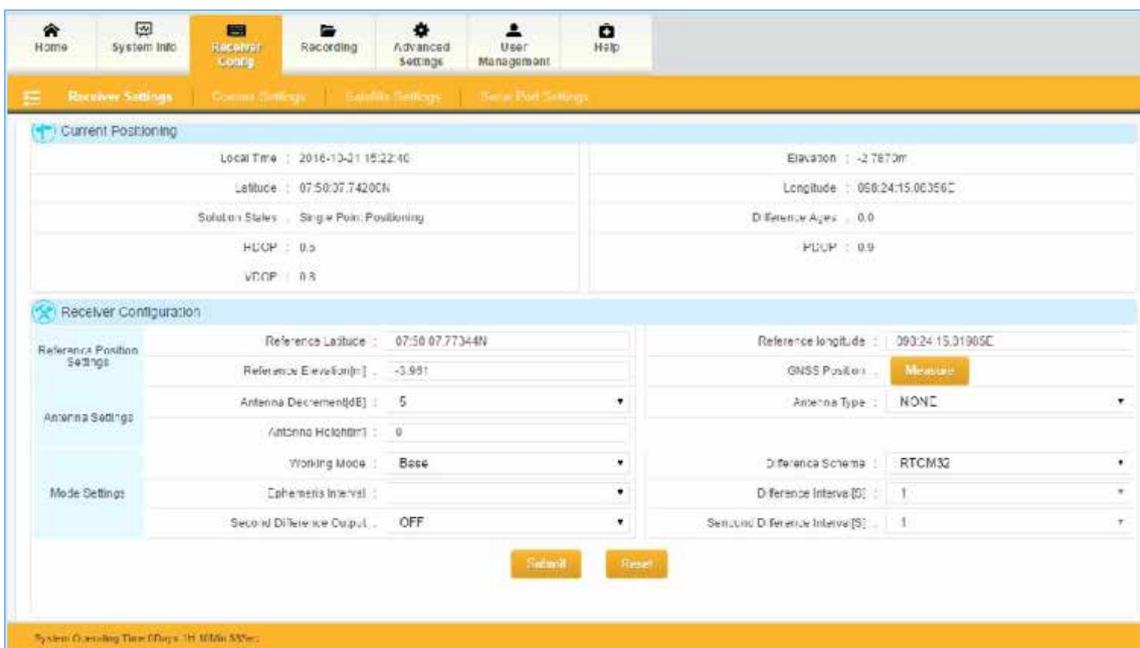
Figure 3-8 Receiver Setting – Base mode

Antenna Decrement dB Setting
The 'Antenna Decrement' setting is used to optimise the antenna gain at point of reception in the GNSS receiver when a high gain antenna is being used.

Antenna attenuation: the receiver attenuation can be set at between 5dB to 20dB, select the appropriate attenuation value based motherboard model and antenna models; calculated as follows:

Select the appropriate attenuation values according to the motherboard model and antenna models; calculated as follows:

"Antenna decrement setting (dB)" = Antenna gain - Motherboard reception gain - Cable Gain

For example: a receiving board optimum is 28dB gain, and the antenna used has a gain of 50dB. The cable length is 30 m using (3dB / 10m attenuation), cable attenuation 9dB; so the receiver gain attenuation value set = 50-28-9, namely 13dB

Working Mode : Rover

Rover setup allows the operator to configure the receiver for mobile operations. Settings include Antenna type and Height, Difference scheme (correction message type), ephemeris update interval and GGA output interval in order to provide positioning information to third party applications.
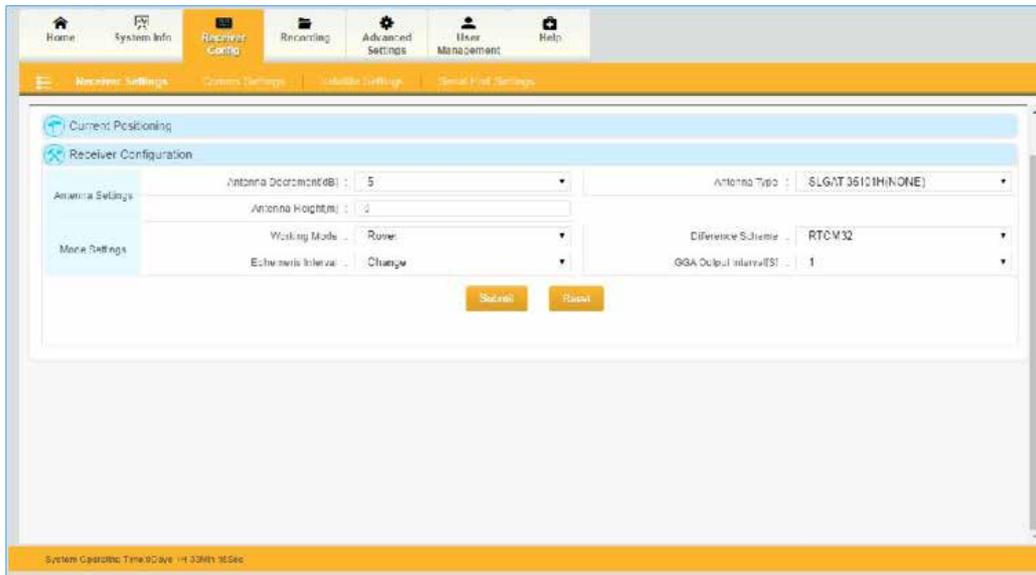
Network transmission Status Figure 3-10

Comms Settings
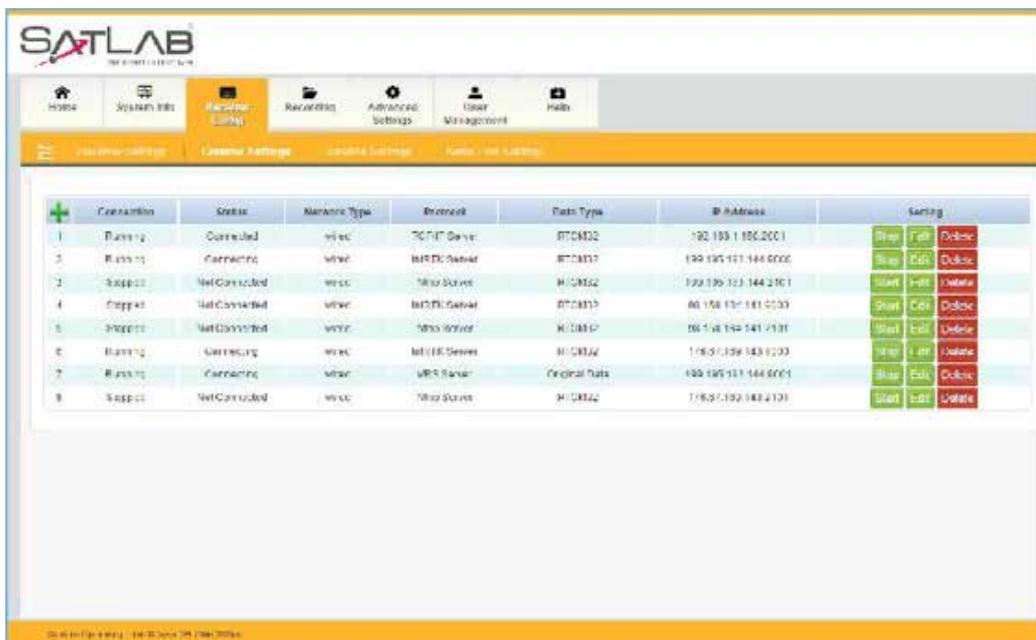
Network transmission Status Figure 3-10

This page allows the user to View network transmission status, Add and Delete network transmissions, Enabled / Disabled and Edit the transmission configuration. When the receiver is configured as 'Base' you have access to 'Server' settings and when configured in 'Rover' mode you have access to 'Client' settings. Both Server and Client connections can operate simultaneously.

To Add a new connection click on the [+] top left and you will get the 'Network Transmission Settings' page to appear. Depending on the 'Transmission Protocol' selected, the setup page will present with the information relevant to that selection. Available settings for the SLX-1 in Base mode are:

1. TCP/IP Server
2. intRTK Server
3. NTRIP Server
4. VRS Server
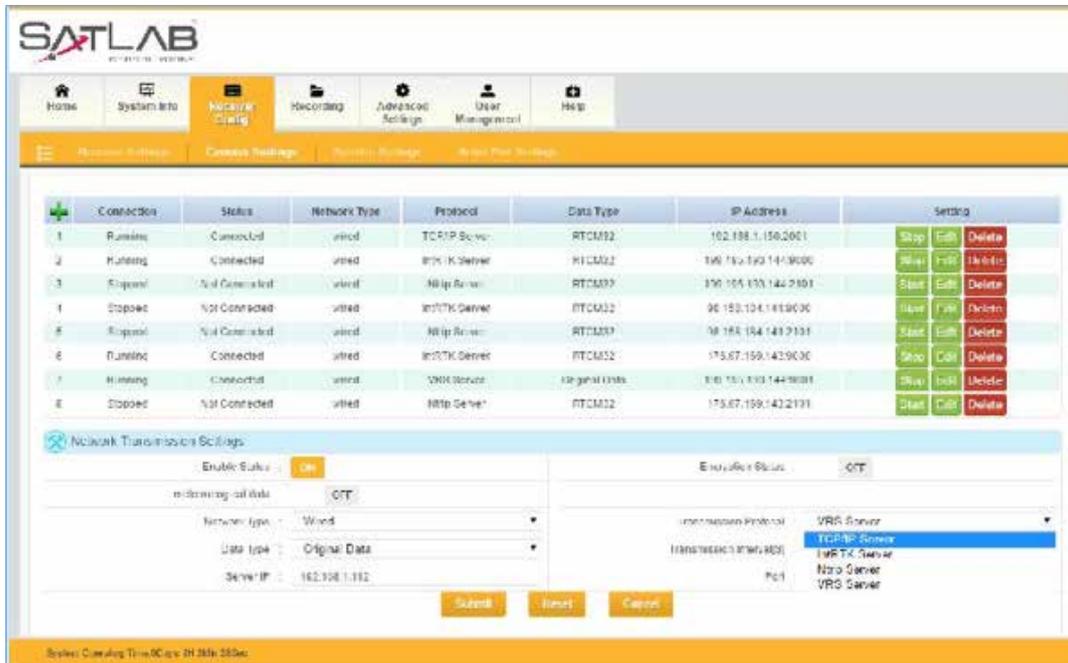
Network transmission Protocol list Figure 3-11

Data Type
For all 'Server' configurations you can choose the transmission data type from a drop down list. Data Type is defined when you setup the 'Correction Format' under [Receiver Config] menu. The other four messages are default and can be selected as needed. Serial data types will be dependent on third party serial inputs through either the RS232 or RS485 ports.
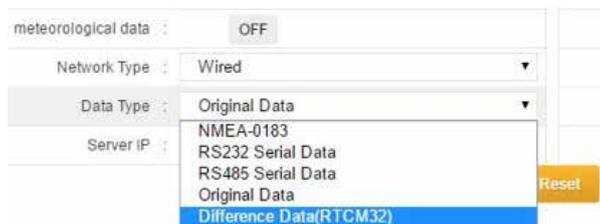
Network transmission Data Selection Figure 3-12

Network Type

Transmission options are Wired (Ethernet connection), WiFi or GSM (2G/3G). Select the required service from the drop down box shown in Figure 3-13

Network transmission Network Type Figure 3-13

TCP/IP Settings

This serviced is provided by direct output from the SLX-1 receiver which acts as the server so the IP address used is that set in the receiver. If using the 'Wired' service the selected port will need to be mapped in the router to enable external access.

Network transmission TCP/IP Server Figure 3-14

IntRTK Settings

intRTK is a proprietary service provided by SatLab and is specific to SatLab equipment. SatLab has three servers strategically located in Germany, USA and Singapore and these accommodate the Caster that is specific to the Cloud operation of both the intRTK and NTRIP services provided by the SLX-1 GNSS receiver. Each of these three servers is available to our customers on a 24/7 free of charge for the intRTK service and location has little effect on operational performance so they provide triple redundancy in the rare case that one of the servers is non-operational.

For more details on intRTK and access to the SatLab servers please contact SatLab Geosolutions AB or your local distributor.

Network transmission intRTK Server Figure 3-15

To use the intRTK service you will first need to obtain a User ID (Country specific 7 digit number) and a Station ID (Receiver specific 3 digit number in range 0-255). Your local distributor will provide these to you on request.

1. Station ID must enter all three digits e.g. Station ID '2' must be entered as '002'
2. Server IP and Port is specific to the server location (EU, USA or APAC) and is available from your distributor.
3. Select Data Type (Difference Data is set from [Receiver Config] setup menu) then press [Submit]. If the connection is successful 'Status' will change to 'Connected' and the transmission is then avail able to use.
4. For intRTK operation on the Rover please refer to your SatLab receiver operations manual.

NTRIP Settings (Single Base)
Ntrip service as provided by the SLX-1 also utilises SatLab's server service and setup is similarto intRTK as described above. IP and Port information for the servers Ntrip operation is available from your distributor. Note: User name and password access to the server is required for Ntrip operation.

NTRIP corrections generated by the SLX-1 are compatible with all NTRIP capable receivers.

Network transmission NTRIP Server Figure 3-16

VRS Settings
VRS service as provided by the SLX-1 utilises SatLab's VRS Caster service and a dedicated 'Node' must be allocated to enable connection of the SLX-1 to the Caster. This service provides either Single Base or VRS Network NTRIP functionality. For VRS operations there needs to be a minimum of three CORS in the network. For information relating to connection to the service or Rover operations using the NTRIP corrections from the service, please contact Satlab or your local distributor.

Network transmission VRS Server Figure 3-17

[Start/Stop] [Edit] [Delete] Transmissions

Network transmission Status [Start/Stop][Edit][Delete] Figure 3-18

Once the Network transmission is setup you have the ability to Start/Stop, Edit or Delete the transmission by simply clicking the appropriate button on the right of the page.

[Start/Stop] turns the transmission on or off but all settings are maintained.

[Edit] will activate the Network Transmission Settings page and changes can be made as needed to the selected transmission then press [Submit] to save the changes or [Cancel] to exit without saving.

[Delete] will permanently remove the service settings from the Network Transmission page.

Satellite Settings

Satellite system settings allows selection [on/off] of the available satellite constellations and setting of the cut-off
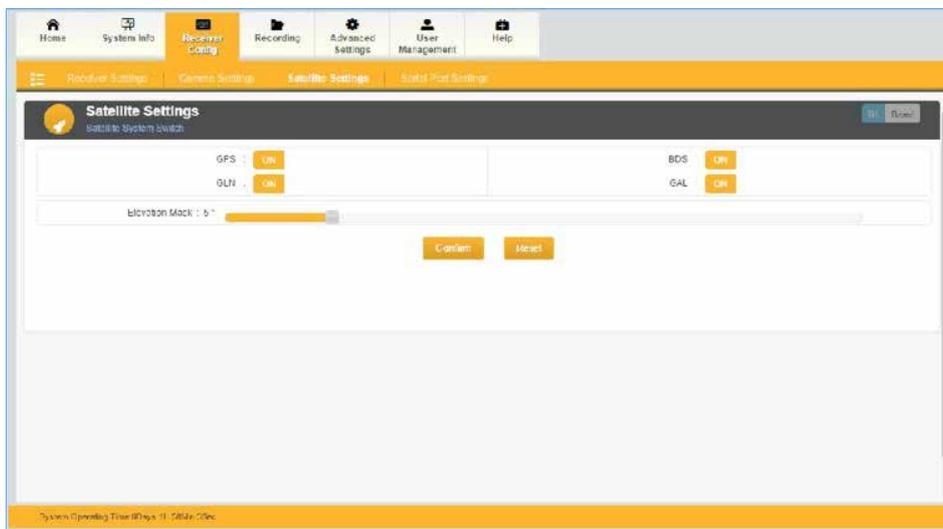
Figure 3-19 Satellite Settings

angle; [OFF] indicates satellite system shut down, [ON] indicates satellite system is turned on. Drag the 'slide' icon left or right to change the cut-off angle (left to reduce the angle of cut-off, drag to right drag to increase the angle of the cut-off). Click OK to submit the set parameters, or click [Reset] to restore the default (without saving). As shown in Figure 3-19:
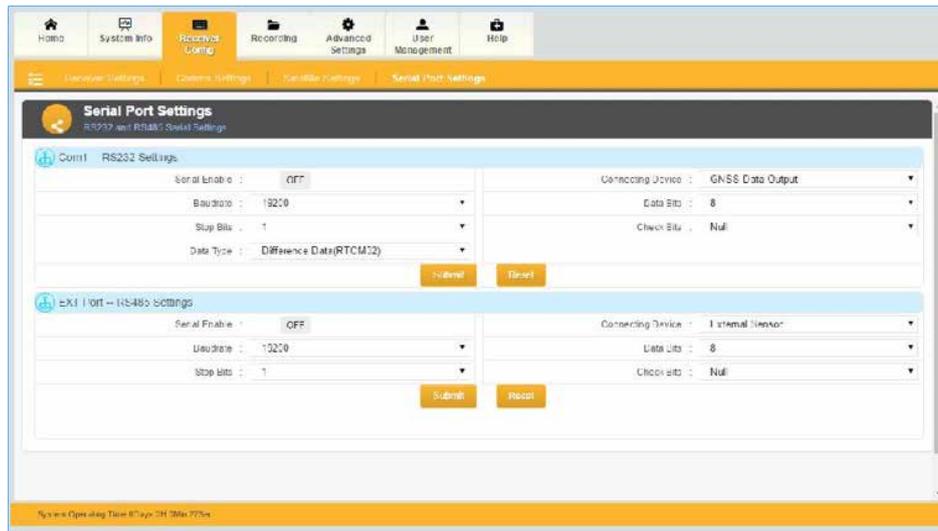
Serial Port Settings

Figure 3-20 serial port settings

This screen allows the operator to set the communication parameters for either the Com1(DB9)RS232 serial port or the RS485 External serial port. GNSS data can be output via Com1 and external sensors (e.g. Met sensors) can access the External port. Serial port baud rate, data bits, stop bits, parity specific settings can be set from this page. Figure 3-20:

Recording

The [Record]-[Record] page allows the user to monitor current Recording sessions and Add new Recording sessions to the list. It also enables the user to Enable/Disable, Edit and Delete the sessions. Figure 3-28:
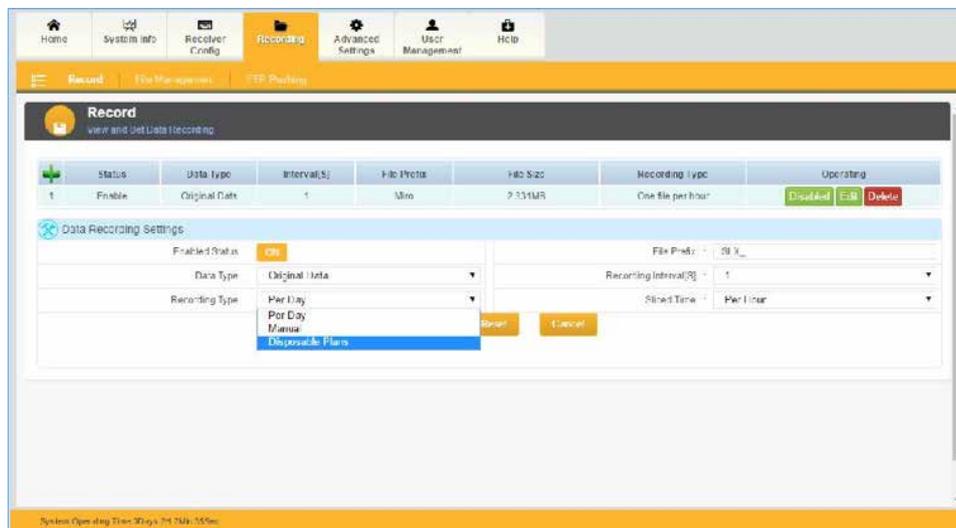

Figure 3-21 Data Record

To Add a Recording session click top left corner [+] and the settings page will appear. Default file Prefix is 'SLX_' but this can be edited as required.

'Data Type' give a drop down menu where you can select between Original Data (Raw data in RT27 format *.GNS), NMEA (general), GGA and RINEX (V3.1).

'Recording Type' gives options for 'Per Day', 'Manual' and 'Disposable Plans'.

Per Day logs on a continuous 24 hour basis but the file length can be controlled by the 'Sliced Time' menu which offers 'Continuous', 'Per Hour' and 'Per 2 Hours'.

Manual allows the operator so start and stop the session using the [Enable/Disable] button.

Disposable Plans lets the operator set the time and date for the start and stop of the session which will then be automatically executed according to the settings.

'Recording Interval' can be selected from a drop down menu with settings from 0.02-60 seconds.

> ⚠️ **Note:** It is possible to set 15+ simultaneous recording sessions with different data types and recording intervals.

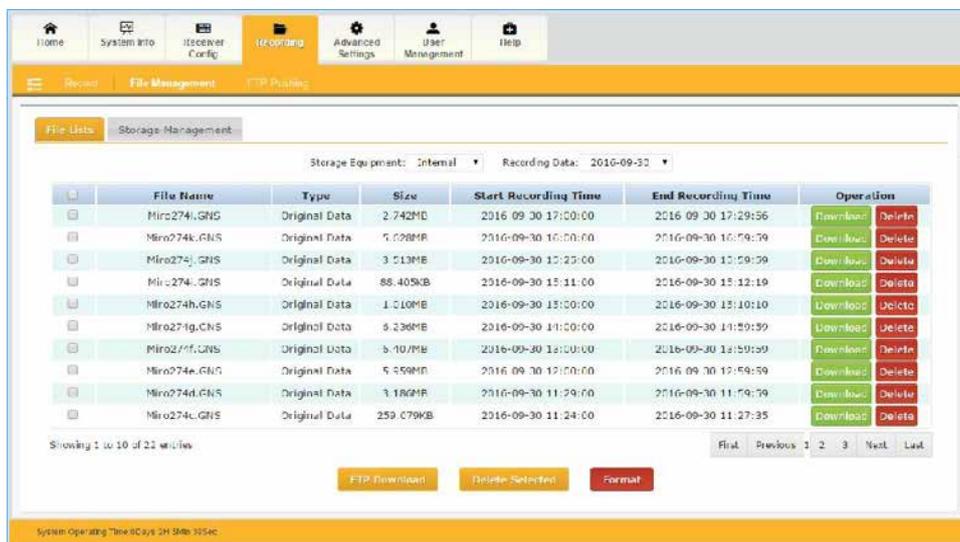**[Disable/Enable]** turns Recording session on or off but all settings are maintained.
[Edit] will activate the Data Recording Settings page and changes can be made as needed to the selected session then press [Submit] to save the changes or [Cancel] to exit without saving.
[Delete] will permanently remove the Recording session from the Record page.

File Management
File management allows the user to view and manage (download/delete) saved Recording sessions on any of the storage devices, including the list of files created by the FTP push function.

File Lists

Figure 3-22 File Lists

File List provides a log files under the different storage devices. Selectable file storage locations are internal receiver memory (64GB), U disk and TF card. Files are displayed by Storage location and Date. Information provided is File name, Data Type, File Size, Start and End recording time.

Users can manually select files to [Download] or [Delete] by clicking on the buttons to the right of the file. The [Format] button allows total deletion of ALL files on the storage medium.

> **!**
> 1. Please do not use a download tool to download , and also no more than three file download ing simul taneously, otherwise it may affect the response time of the device
> 2. The time required to download a file with vary depending on file size and Network speed.
> 3. The data log file cannot be restored after it is deleted so make sure before proceeding.
> 4. Make sure that a file has stopped logging before you Download, Delete or Format the storage device.
> 5. Please minimize the use of the [Format] function to avoid damage to the memory device.

Storage Management

The Storage Management screen allows the user to set the location for recorded files to be stored. It also enables setting for Automatic file cleaning.
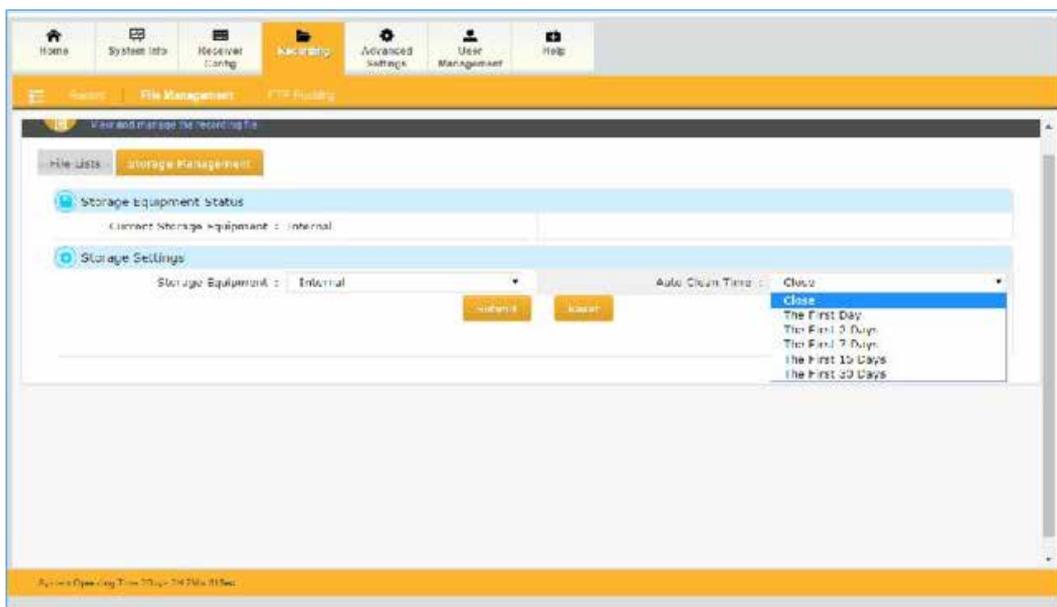

Figure 3-23 File Management

> **!**
> Auto Clean Time settings will be activated once the storage location has reached 90% capacity.

FTP Push

FTP Push allows files to be sent to an EXTERNAL FTP server at a predefined time of the day between 0:00 and 23:59. Set the parameters as shown in Figure 3-31 (for details see [Data Download] in Chapter 4.
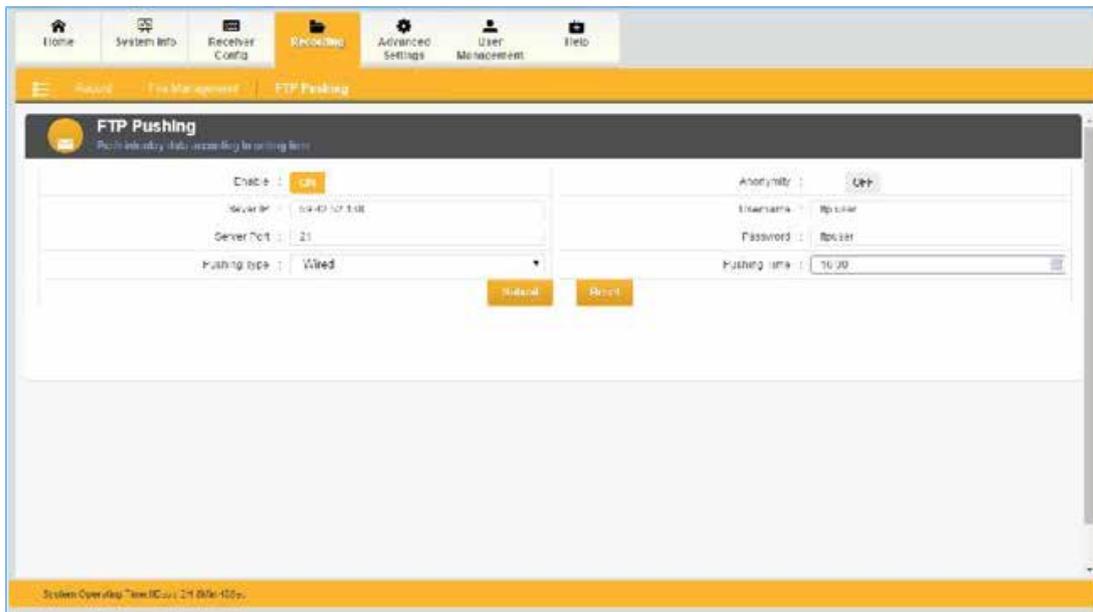
Figure 3-24 FTP Push

Advanced Settings

Advanced page provides advanced command and operations for the equipment, including host settings, motherboard settings, network settings and view the log management functions.

Advanced page is open only to administrators; other users are authorized to view only.

System Settings

System Settings include setting host name and time zone, entering Company name and information, editing Data download password, and provides System Control. As shown in Figure 3-25:
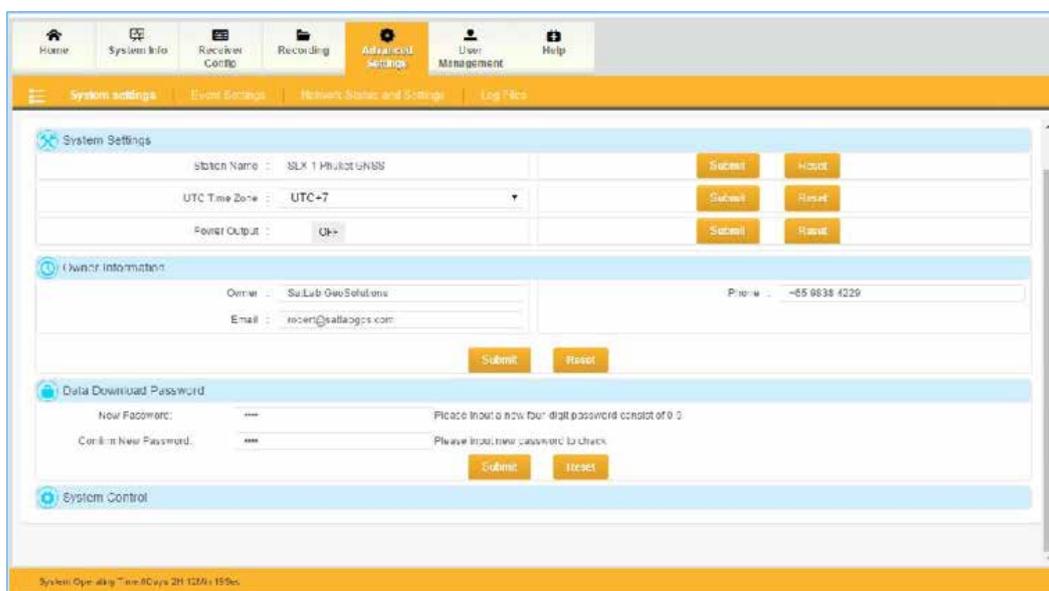

Figure 3-25 Host Settings

Site name: set reference station site name, the default site named "SLX GNSS receiver." When the user changes the Site name, click [Submit] to save the entry.

UTC time zone: From the UTC-12 to UTC + 12 Total 25 time zones, the default is UTC + 8; to modify select the time zone then click [Submit] to save.

Power Output: Power output may be provided to an external device 12VDC, 5W; click the button [ON] [OFF] then click [Submit]. As shown in Figure 3-26

Figure 3-26 System Settings

Owner Information

Enter owner information Name, Email, Phone here and it will be displayed on the Owner panel top right from the Web pages and is combined with the receiver S/N and the Site name set in 'Systems Settings' above.

Figure 3-27 Owner Information

Data Download Password

Data Download password provides local download data confidentiality. The password is used with the LCD and keypad with the [Data download] function by entering the four-digit password. The default password is 1234. To modify, enter the new password and confirm with second entry then click [submit]. Click [Reset] and [submit], then restore the original password. As shown in Figure 3-28
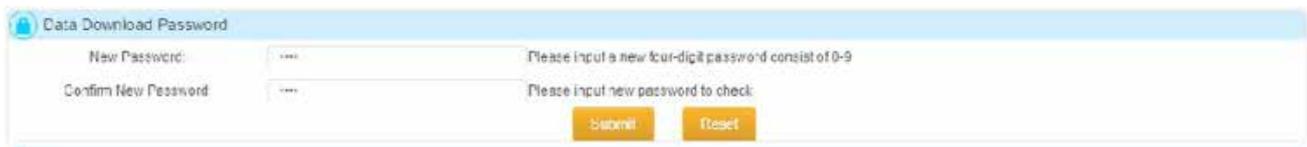

Figure 3-28 data download password changes

System Control

Figure 3-29 System Control

With System Control you can remotely control the receiver via this website. Including: restore factory settings, reboot, reset the board, upgrade firmware, registration and remote control receiver.

Factory Data Reset: click on [Factory Data Reset] pop-up dialog box will appear, and click OK. The receiver with reset back to the factory defaults, and automatically restart. It will delete all the data and settings after the restart, except for the wired network IP address and registration number. Default settings are provided in the Annex.

Reboot: Receiver restart, click [Reboot], pop-up dialog box will appear, select OK. The receiver will restart within 10 seconds, the reboot time is about one minute.

Reset Motherboard: GNSS board is reset to the factory settings. Click [Reset] board, pop-up dialog box will appear, select OK. After a reset all applications restart, and remain unchanged.

Firmware Upgrade: Allows remote upgrade of the firmware on the receiver. Please note that the firmware file name provided e.g. "SatLab SLX-110_Update.bin", cannot be modified. Click [Upgrade Firmware], will start the following screen, click [Browse] to select the file and click [Upload] to, detailed operations, see [Basic Operation] section [Firmware Upgrade]. Shown in Figure 3-30:
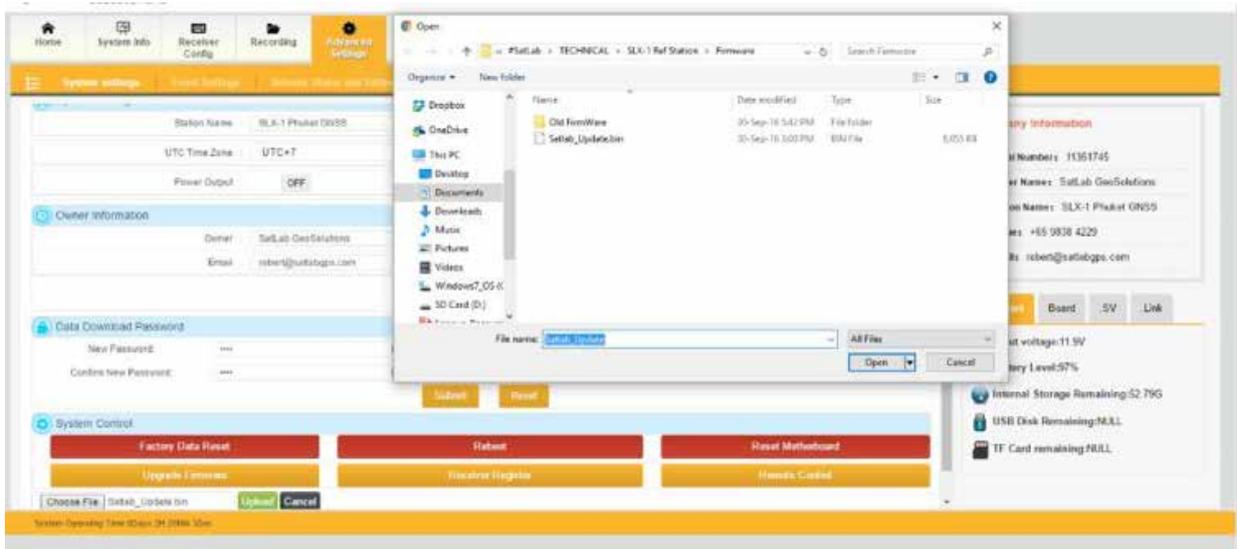

Figure 3-30 Firmware Upgrade

Receiver Registration: Depending on the registration the receiver can be activated for 'life' or until a predefined expiry date. Expiry date can be viewed in [Receiver Info] Equipment Information. If the license expires the date will be highlighted in red; black normal. If the registration code expires, the receiver will cease data transmission and data recording, and it will not display the number of satellites. To resume normal operation a new registration code needs to be entered. For registration details see [Basic Operation] section [Register receivers] in Chapter 4.

Remote Control: After you turn on the remote control, you can remotely control the receiver on the other servers. Click [Remote Control], will start the following screen, shown in Figure 3-31:

Figure 3-31 Remote Control

When you turn on the remote control, it will show the switch as "ON", select the network connection, the remote server IP and port, and click [Submit];

Event Settings

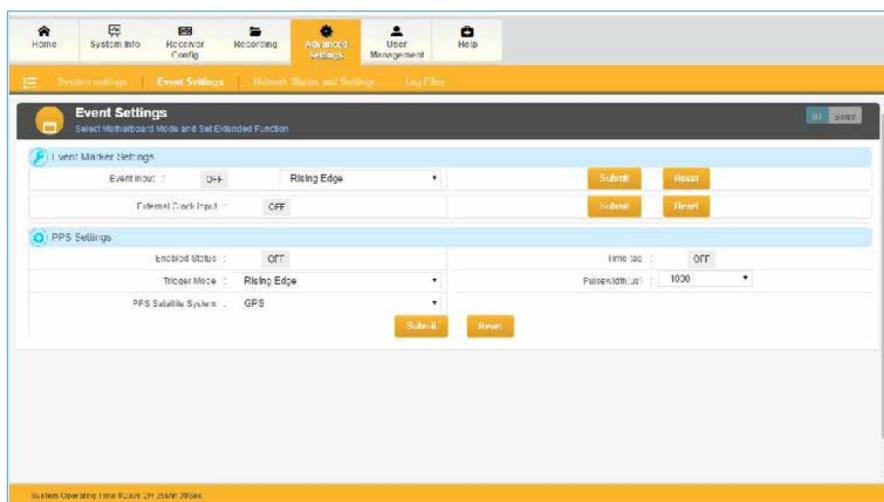Event Settings allows you to set parameters for Event Marker and PPS operation.

Figure 3-32 Event Settings

Network Status and Settings

Network parameters include a wired network, Wi-Fi hotspot, Bluetooth and 2G / 3G network, server port settings and firewall switch settings. As shown in Figure 3-33:
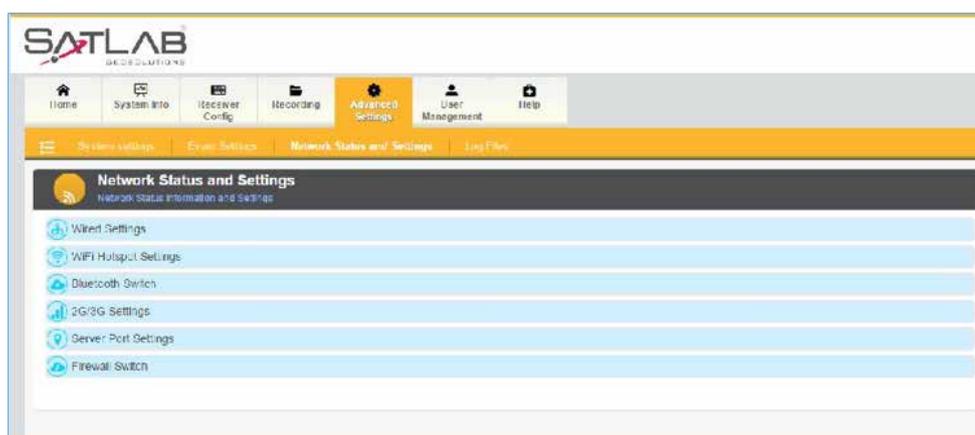

Figure 3-33 Network Settings

Wired network setup: Wired IP acquisition has two modes with DHCP (automatic acquisition) and static IP (manually set). For DHCP mode, select then click on the submit button. For Static you need to set a static IP address, subnet mask, gateway, DNS address. Parameter setting interface shown in Figure 3-34:

Figure 3-34 wired network settings

Wi-Fi hotspot settings: [OFF] to turn off Wi-Fi, [ON] to turn on Wi-Fi; Wi-Fi hotspot can set the following parameters: channel, passwords, and Wi-Fi IP address; Wi-Fi hotspot SSID and password default to the receiver serial number; default IP address is "192.168.9.1".

When Wi-Fi hotspot is available, you can login with a mobile terminal using either the 'default' or receiver IP and then use your Web browser to login to the SLX-1 Web server to access the receiver. Settings Figure 3-35:

Figure 3-35 Wifi hotspot settings

Bluetooth settings: [OFF] to turn off Bluetooth, [ON] to turn on Bluetooth; When set to ON the SLX-1 will output $GPGGA messages as 1Hz via the Bluetooth port.

2G / 3G settings: This can be set to on off for "2G / 3G network". You can set the 2G / 3G network mode (APN and Auto modes). Auto mode will automatically after power on, identify the Network without manual input. In APN mode, you need to manually set the access point, user name and password; shown in Figure 3-36:

Figure 3-36 2G / 3G settings

Server Port Settings: Allows the administrator to set the Web server access port (Default port 80)

Figure 3-37 Server Port Settings

Port 80 is the default http: port so does not need to be specified in the browser when entering the receiver IP address to access the internal web server. If the receive IP address is set to e.g. 192.168.1.150 and the port is changed (e.g. 2000), access to the web server is gained by specifying the IP address as 192.168.1.150:2000

Firewall Switch: Enables Firewall protection to the server if desired.

Figure 3-38 Firewall Switch

Log Files
System log records the user's operational procedures. The log file is in chronological order. System logs include user performs login system, switch the page, change the settings, control data recording and transmission, download, and delete data files, set network parameters, restart and update application records and other operations.

System log management interface allows the user to set the time period at the top of the list of log files. You can then view the system log information within this period. Click Delete to delete all log files query period. As shown in Figure 3-39:
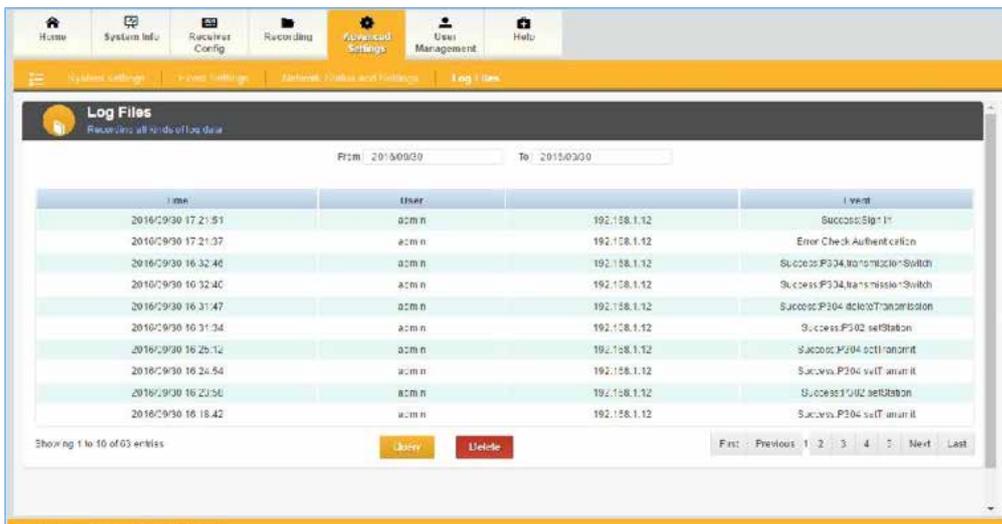

Figure 3-39 Log Management

User Management
User management including password management, and user management.

Password Management
Modify the current user's login password; shown in Figure 3-40:
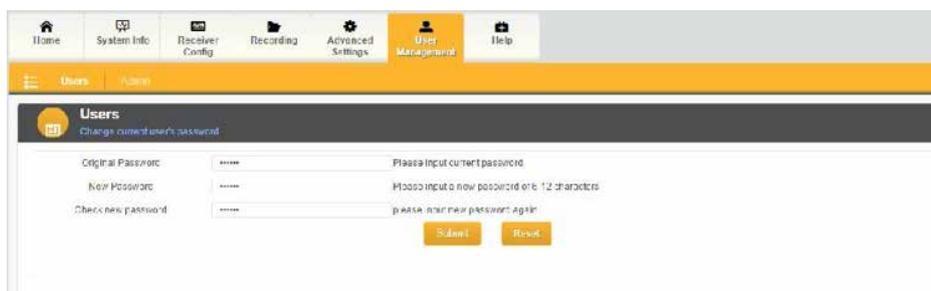

Figure 3-40 Password Management

Users Account Management

Users Account Management is only available to the 'super administrator' (admin) who has the authority to modify, add and delete general users.

Users Account Management allows Adding or Deletion of General Users. Enter the user name and password (user name must be numbers, letters and underscores, and 5 to 16 characters; password must be 6 to 12 characters), click [Submit]

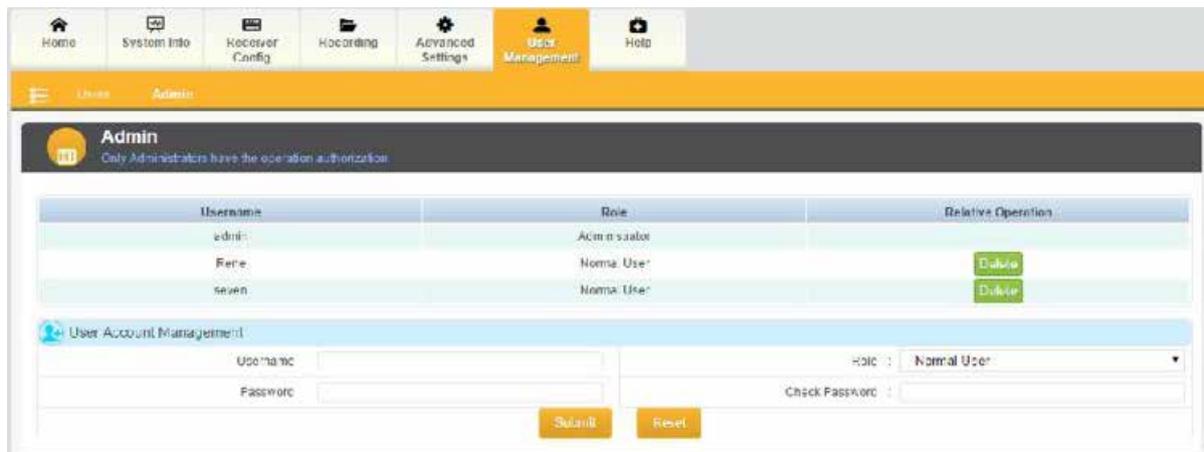**User Delete:** click on the relevant user account the press [Delete] button;

Figure 3-41 users to increase

SLX-1 Multi-Application GNSS Receiver

Chapter 4

Basic Operation

- **Introduction**
- **SIM / TF Card Installation**
- **Internet Connection**
    - LAN Network Connection
- **Wi-Fi Hotspot**
- **2G / 3G Network**
- **LCD and Keypad Operation**

Introduction
This section describes SatLab SLX-1 series GNSS receiver installation and operation.

Architectural Layout
GNSS 'Base' receivers provide ground-based augmentation and CORS operations. The receiver can be connected to meteorological instrument, and can also be operated via 3G/2G GSM connection or by Ethernet using a network cable. Its basic architecture is shown in Figure 4-1:

220 V

UPS

GNSS Antenna

SLX-1 Regerence Station

Router

Figure 4-1 Basic Architectural Layout

SLX-1 Standard Configuration
The SatLab SLX-1 GNSS receiver system consists of:
- SLX-1 GNSS receiver, • 3G / 2G Antenna,
- Power adapter (CL-1233),

Options:
- GNSS Antenna (Geodetic or Choke Ring options)
- 20m Antenna cable TNC-TNC
- Ext Comms adaptor

Figure 4-2 Receiver Connection Diagram

Connector Installation

SLX-1 GNSS receiver has three self-locking sockets, respectively, five-core socket, external expansion, power input.

Per the diagram below, when the cable is connected, ensure that the head of the red dot red dot on the socket is aligned with the mark on the connector, otherwise sockets and cable connectors may be damaged; shown in Figure 4-3:

Figure 4-3 Connector Installation Figure

SIM / TF Card Installation

1-The lower front panel covers the SIM / TF card mounting groove. Rotate the screw clockwise to tighten and counter clockwise to loosen.

2- Installation SIM / TF card: Insert the SIM card with chip side up, TF card chip side down. Directly push into the bevel until you hear a click.

Figure 4-4 Installation of SIM / TF Cards

Internet Connection

Lan Network Connection

The SLX-1 receiver can be directly connected to a LAN using a network cable. When the GNSS receiver is connected to the LAN, you can connect to the internal Web server from 'inside' the LAN by using your Web browser and entering the GNSS receiver 'wired' network IP address (default: 192.168.0.200). This will give you access to enter SatLab SLX-1 Web management system login screen.

> **!** Note: GNSS receiver factory default IP is 192.168.0.200 and will allow immediate access where the LAN segment is 192.168.0.×. If the LAN segment is different from the default 192.168.0. ×; i.e. such as a LAN segment 192.168.1. × or other, then the computer network for the 192.168.0.x network will need to be mapped to gain access to the internal Web server.

Dedicated direct access method is relatively simple, click on the Local Area Connection under the Internet protocol, as shown in [Advanced], in the pop interface directly input the WAN IP address and gateway IP and gateway to the network, as in Figure 4-5.
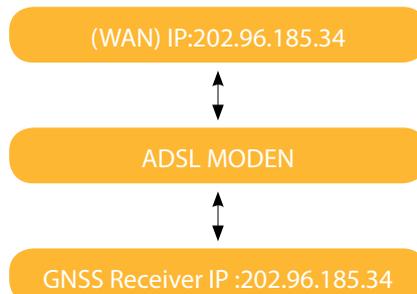

Figure 4-5 Dedicated Connected to the LAN

The following details connection to the SLX-1 internal Web server by mapping the port to an external network IP address. Figure 4-6 shows:
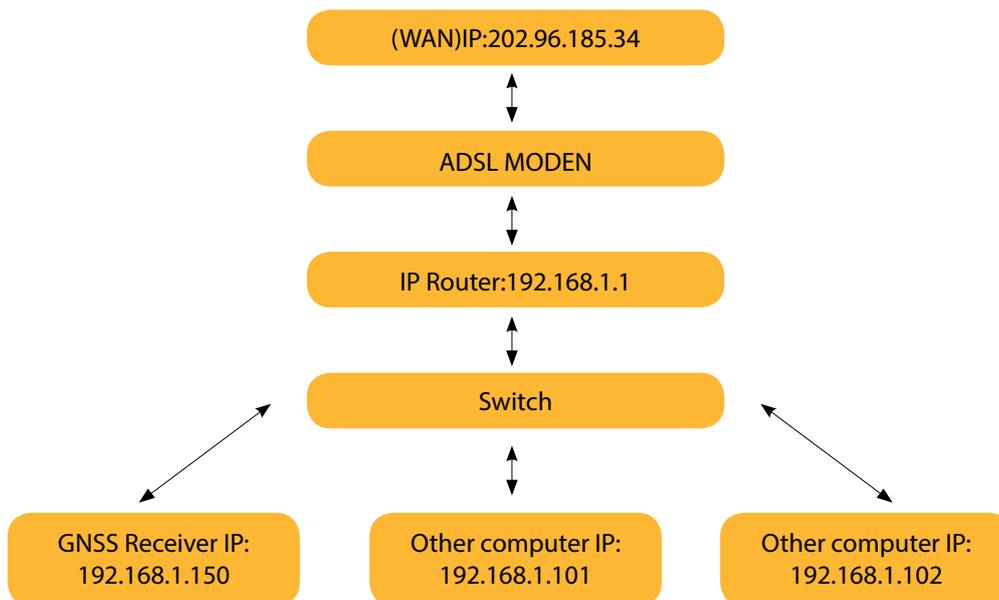

Figure 4-6 Mapping External Network Connected to the LAN

1. Changing the GNSS receiver IP address

You can change the GNSS receiver IP address in two ways: manually set, and automatic;

a. Manual IP settings

First identify the current IP address setting on the GNSS receiver, such as the factory default which is 192.168.0.200 (if you do not know the IP address set on the receiver, double-click "Power button" to open the LCD to view the IP address of the receiver screen). Using a network cable connect your PC and the GNSS receiver. The PC IP and Receiver IP must be in the same network segment, but with different IP address. Access the Web server by entering the receiver IP address e.g. IP 192.168 .0.200 and login to the Web management system. Enter the [Advanced Settings] - [Network Settings] - [Wired Setup] GNSS receiver set the desired IP address, subnet mask, gateway, DNS (DNS may not be provided), and click [Submit]; Figure 4-7:
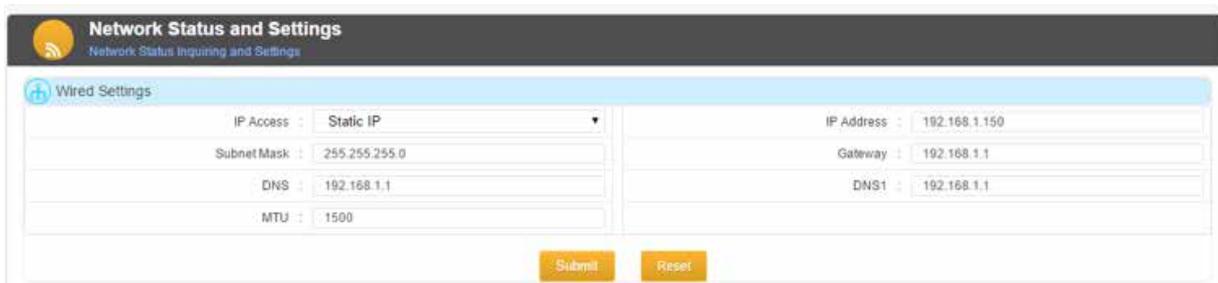

Figure 4-7 Manually Set the IP Address Settings

b. Automatic IP Setting

Double - click the "power button" to open the LCD, click the "Fn key" to enter the menu option, click "right" to select [Network Settings], click the "power button" to enter and select the [Wired Network], click the "power button" to change the receiver wired network mode to [DHCP].

The system will then automatically obtain an IP address with network-related parameters; press the "Fn key" to return to the main screen status display to view the automatically obtain IP address. On your PC use the Web browser and enter the automatically obtain IP address to gain login access to the GNSS receiver Web management system. Enter [Advanced Settings] - [Network Settings] - [Wired Setup]. In the [IP acquisition mode] Select [Static IP], and set the receiver IP address, subnet mask, gateway, DNS (DNS may not be provided), and click the [submit]; Figure 4-8:

Figure 4-8 Automatically Obtain IP Address Settings

2, External network IP mapping
Different brand routers will have different 'port mapping' procedures. Refer to the router manual for model specific instructions. By way of this example we will use IP address 192.168.1.150 for the GNSS receiver.

Open your PC Web browser, enter the following address: http: //192.168.1.1 (router default IP address) the following dialog appears (if you do not enter the router login screen, please consult your network administrator). Figure 4-9:
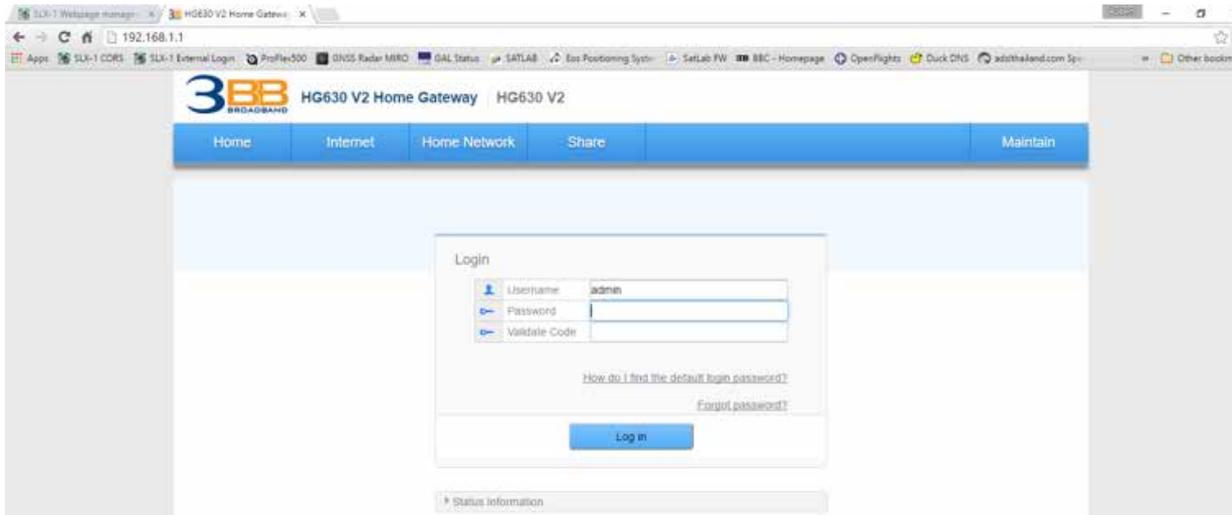

Figure 4-9 Routing Login Screen

Enter your user name and password, general initial default is username: admin, password: admin.

Set up a local area network LAN port in the network settings in, IP address, with IP address set to the GNSS receiver, shown in Figure 4-10:

In order to log into the GNSS receiver Web server from outside the LAN, you need to set up the router to 'map' the external network port and local internal Web server port. The GNSS receiver IP address must be entered in the router, as example: 192.168.1.150 and mapped to the external network. To do this you allocate a port number to the Web server (default 80) but let's say internal Web port is set to 2000. Then the external port is also set to 2000. To access the receiver internal Web server login page, enter the external IP address and port in the IP format 202.96.185.34:2000 (if external port mapping provided is 80, you do not need add the port number).

Figure 4-10 LAN Port Forwarding Settings

Figure 4-11 LAN Port Forwarding Setttings

Wi-Fi Hotspot
Wi-Fi hotspot is mainly used for mobile setup using Wi-Fi browsing to set the GNSS receiver; Wi-Fi hotspot is configured in two ways using either the LCD and button operation to set the WiFi connection to ON / OFF, or the Web management system can be used to set Wi-Fi password, channels, and login IP address;

a. LCD display and key operation: Double-click the "Power button" to open the LCD display, click the "Fn key" to enter the menu option, click "right" to select [Network Settings], click the "Power button" to enter and select [WIFI] click the "Power button" to control Wi-Fi network switch on/off; Figure 4-12:

Figure 4-12 LCD Button Operation Wi-Fi Network On / Off

b. Web Management System: Login Web management system, [Advanced Settings] in - [Network Settings] - [Setup] WiFi hotspot operation is also set; shown in Figure 4-13:

Figure 4-13 Web Management System Wi-Fi Settings

With WiFi set to ON you can access the SLX-1 Web server using your Web Browser and setting the IP to either the WiFi IP setting (default 192.168.9.1) or the receiver internal IP. If the serverport is default 80 then there is no need to enter the port number but if it has been changed in Server Port Settings then the allocated port number must be entered in the address line.

After opening SatLab SLX-1 receiver Wi-Fi hotspot, search the Wi-Fi account (i.e. receiver serial number) on your mobile device, and then enter the password (the default is receiver serial number). Enter the WiFi IP or the GNSS receiver IP address to enter SLX-1 Web management system login screen, shown in Figure 4-14

Use your User name and Password to access the server. Default Administrator login is User 'admin' Password 'admin'. Viewing access can also be gained using Guest login 'guest' guest'.
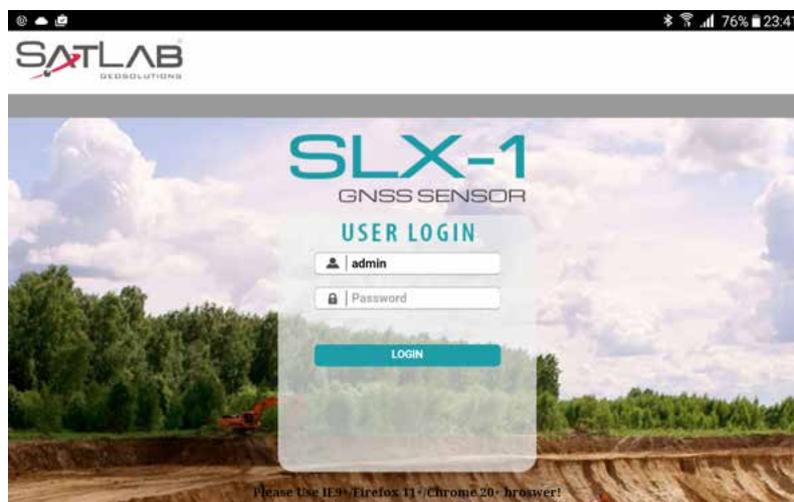
Figure 4-14 The Mobile Device end Home Interface

2G / 3G network
For FTP Push, remote control and network transmission using 2G / 3G network mode, you need to connect the 3G antenna, plug in a SIM card, and setup the correct APN settings in [Advanced Settings] - [Network Settings] - [2G/3G Settings].

Non-APN (Line) phone SIM, select [2G/3G mode setting] in [Auto] and Submit, then the system will automatically dial and connect;

For APN phone SIM, users need to get the APN information from your network operator, together with user name and password (if required), then select [APN]. Fill in access pointname, the user name and password (as shown below), click [submit] the system will automatically dial and connect load data; shown in Figure 4-15:

Figure 4-15 2G / 3G network settings

LCD and Keypad Operation

To control the GNSS receiver through LCD and keypad operation the basic work requirements, and key operation will be described in detail. As shown in Table 4-1:

Table 4-1 LCD and keypad operation

Features	Key Operation	Content	
Open/Close the LCD Screen	Double-click the power button	Each time you open the LCD screen displays status home screen	
Switching status	Click the left or right button	Status display will cycle through the status information screens	
Switching between Status and Setup screen display	Click Fn key	Status and Setup screen will cycle	
Return to the menu / cancel	Click Fn key		
Switching menu	Click the left or right	Menu items from left to right : Data logging, Network settings, Download data, System settings System settings menu item from left to right: Firmware upgrade , Reset the default IP, Reset factory settings, Reset the motherboard	
To enter the System Settings lower menu	Click the power button	Enter the lower System Settings menu: The main menu contains Data records, Network settings , Download data , System settings; System settings menu containing: Firmware upgrade, Reset default IP, Reset factory settings , Reset the motherboard.	
Data records	Click the left / right	Recording Modes	Recording mode : one hour, two hours, one day
	Click the power button	Modify recording mode	
Network Settings	Click left / right	Change Options	Wired network: Manual , DHCP (i.e. manual static , DHCP automatically obtain IP) Wi-Fi, 3G, Bluetooth: On/Off
	Click the power button	Modify the parameter value	

Features	Key Operation	Content
Download Data	Click the power button	Go to Settings , move to the next step and set the parameters
	Click the left / right	Password: Left +1 Right -1 Days: Switching options; among Password / number of days determined handover
USB upgrade	Click the power button	Upgrade Firmware Firmware file should be placed under the root directory of U-disk
Reset default IP Restore factory settings Reset mother board	Click the power button	To restore/reset: Click the "power button" on desired reset icon. When prompt appears, click the "power button" again to confirm. Reset default IP Restore factory settings. Reset the mother board.

The Content column for the Download Data rows also contains: Fast copy to USB storage device. Days downloaded: 1 day, 2 days, 3 days , 7 days, 15 days, 30 days, all

!

1. If no key operation for 60 seconds, the system automatically shuts down the LCD, and turns on indicator lights

2. When the text or icon is surrounded by a square, it indicates the currently selected item and you can then modify or enter the lower menu settings

Chapter 5

Base Mode Operation

- **- Setting up a Base Station**
- **- Comms Settings – Adding Network Transmission**
- **- Recording Data**
    - - Data Download
    - - Web Download
    - - FTP Download
    - - FTP Push

Setting up a Base Station

Login Web management system interface, click on the 'Receiver Settings' via speed link or click on [Receiver Config] - [Receiver Settings]

When the 'working mode' of the GNSS Receiver is set to [Base], you need to enter the relevant operational parameters in the following order:

Reference Position Settings, Antenna Settings, Mode Settings.
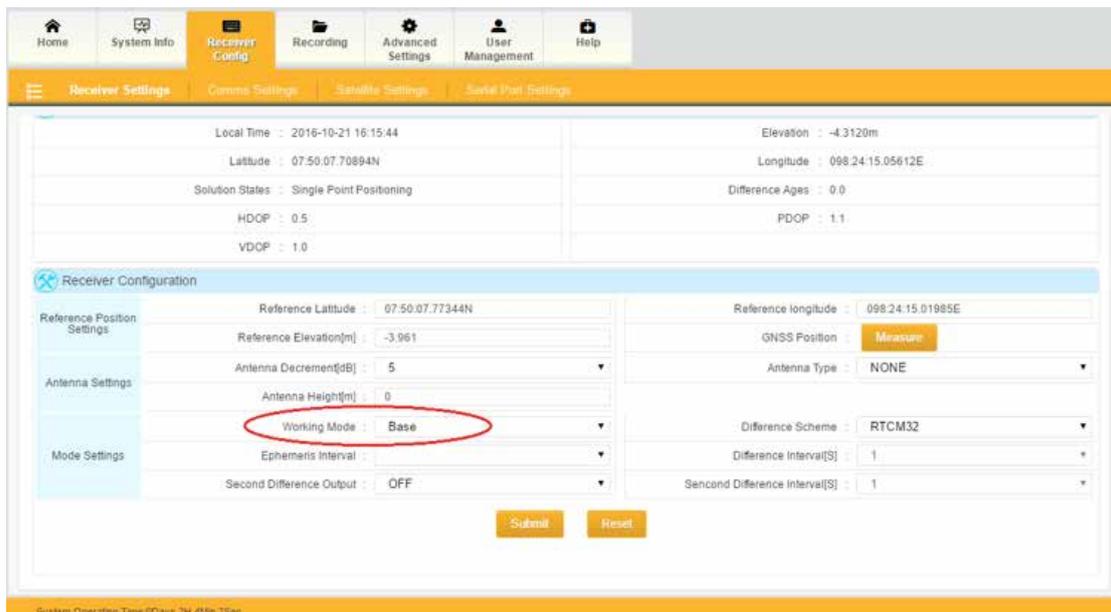
Figure 5-1 Base Setup

This is the Latitude, Longitude, and Ellipsoid Height in WGS84 reference frame of known the 'reference point'. If the position is unknown you can get an approximate position using the 'Measure' button which will take an average of a predefined number of GNSS position measurements.

After entering the position check the entered values against the 'Current Position' values to ensure there are no gross errors in the entry.
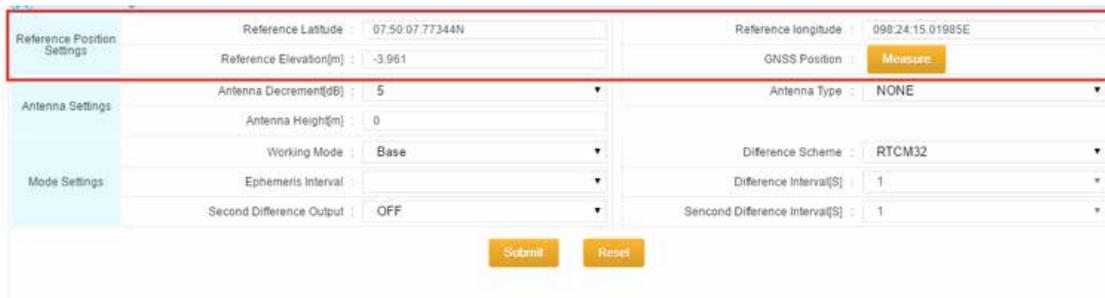
Figure 5-2 Reference Position Settings

Antenna Settings

The Antenna used can be selected from the 'Antenna Type' list and this will automatically apply Antenna offsets.

The 'Antenna Height' is the <u>vertical</u> distance from the reference mark to the Antenna reference point and this combined with the Antenna offset will determine the Antenna phase centre relative to which correction data will be generated.

If you wish to use the position of the Antenna 'phase centre' as the entered LLH for the reference position then Antenna Type should be set to NONE and Antenna Height to zero.

Figure 5-3 Antenna settings

Mode Settings

Mode Settings allow you to select the corrections cheme (s) and relevant data.The available Correction Formats are [Correction Format (OFF, sCMRx, CMR, CMR+, RTCM2.3RTK, RTCM2.4RTK, RTCM2.3RTD, RTCM2.4 RTD, RTCMV3.0, RTCM32, BINEX)

Ephemeris interval is recommended as [change or 30 minutes] but intervals available are every minute, every five minutes, every 15 minutes, and every 30 minutes. Difference interval is by default set to 1 second.

You have the option to select a 'Second Correction Format' scheme with the same formats available as above. *Note however if actively Recording data under the 'Recording' menu, Correction Format output is limited to just one Correction scheme.*

Figure 5-4 Mode Settings

Once all Base parameters have been entered and checked press 'Submit' to save the entry data.

Comms Settings – Adding Network Transmission

Login Web management system interface, click on the [Receiver Config] - [Comms Settings] or click quick link [Comms Settings]

Click on the upper left corner of the button [+], and the pop-up dialog box Network Transmission Settings will appear.
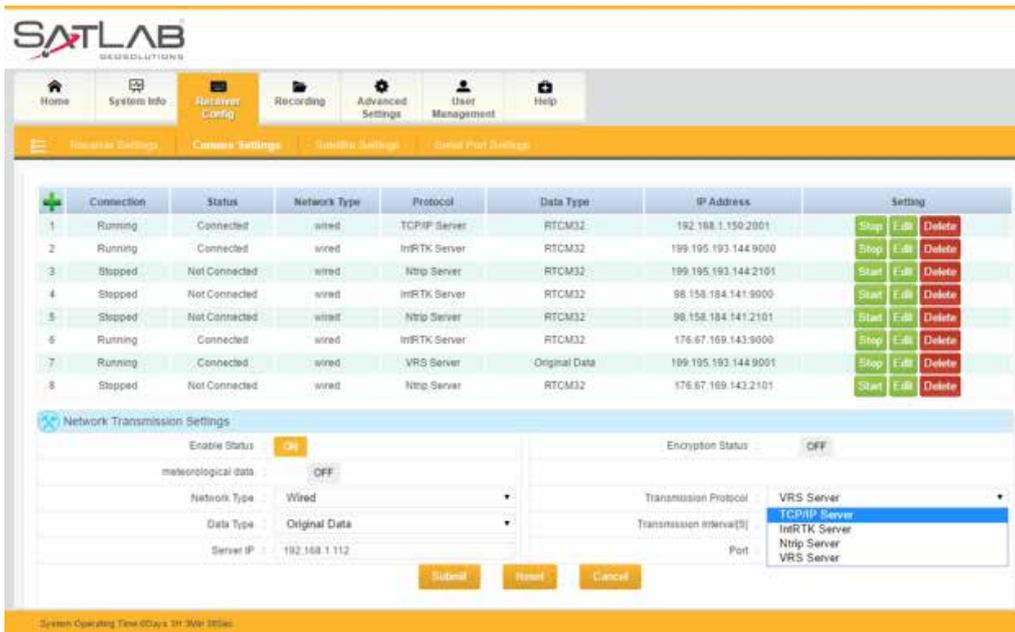

Figure 5-5 Network Transmission Settings

[Enable Status[allocated to [ON], Set [Encryption Status[according to the actual needs , [Network Type] recommended [Wired] (available options are Wired, Wi-Fi, 2G / 3G), [Transmission Protocol] in accordance with the actual needs (available formats are TCP/IP Server, intRTK Server, NTRIP Server, VRS Server) [Data type] set according to the actual needs with choice of (raw data, NMEA-0183, Correction Format data as defined in Base setup, RS232 serial data, RS485 serial data selection), [Transmission interval] which is in seconds is only able to be set for Original Data output and has the option for (0.05, 0.1, 0.2, 0.5, 1, 2,5, 10, 15, 30, 60). The server IP, port, user name and other settings and transmission protocol will depend on the Server method chosen.
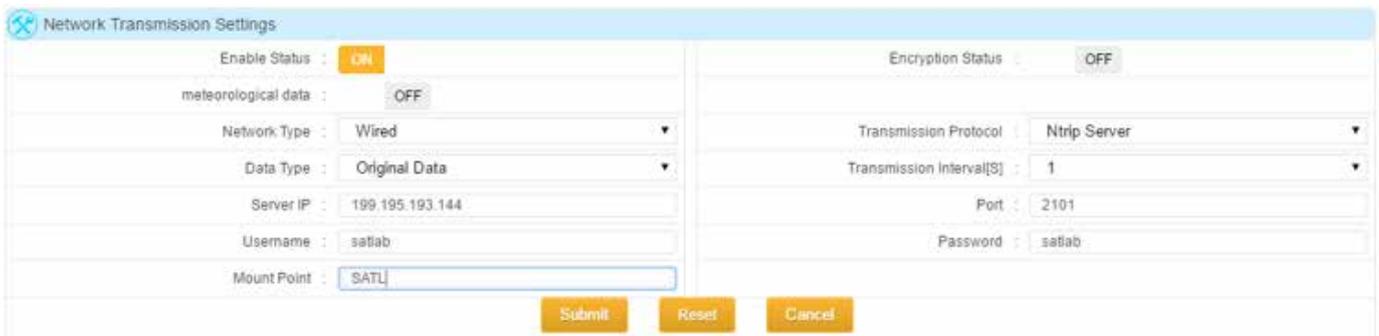

Figure 5-6 Adding a NTRIP Server network transmission

> **!** Four network modes can exist simultaneously, but the transmission to the server IP address cannot be the same.

Recording Data

Login Web management system interface, fast data recording access just click the link 'Record' or click on the [Recording] – [Record]

Click on the upper left corner of the button [+] and the pop-up Settings dialog box will appear. Enable the state allocated to [ON], set the file Prefix (default SLX_), [data type] actual Raw data or Rinex (NMEA options also available), and [Recording interval] in seconds. Available options are (0.05,0.1,0.2,0.5,1,2,5,10,15,30,60), then choose the recording scheme [Recording Type] with options for every day, manual and scheduled time with three recording modes, then click [Submit] to set the options.

Recording schemes in three ways are shown below:
Record Day (24 hours of continuous recording without dividing a data record or a file every hour, or every two hours to record a file)
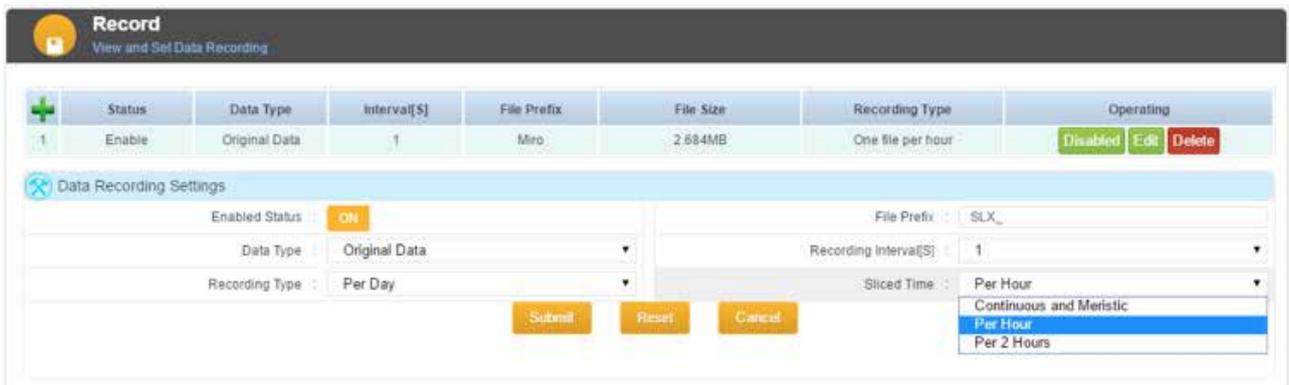

Figure 5-7 Record setting day data

Manual recording (manual control of the data records to enable or disable).

Figure 5-8 Setting manual data recording

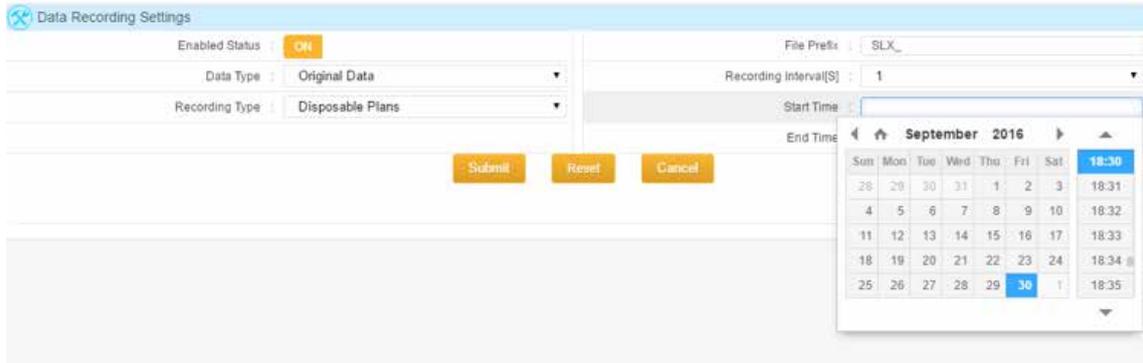Disposable Plans record (according to a set start and end of the period).

Figure 5-9 Record a one-time plan data set

Data Download

There are four ways available to download data i.e. Ordinary download, FTP download, FTP push and U disk download.

Web Download

In the Web management system [Recording] - [File Manager] - [File Lists], select the data storage location and record date; a pop-up list of data will appear enabling you to select the file(s) to download. Click on the right column of 'Operation' [Download] button to download the corresponding data
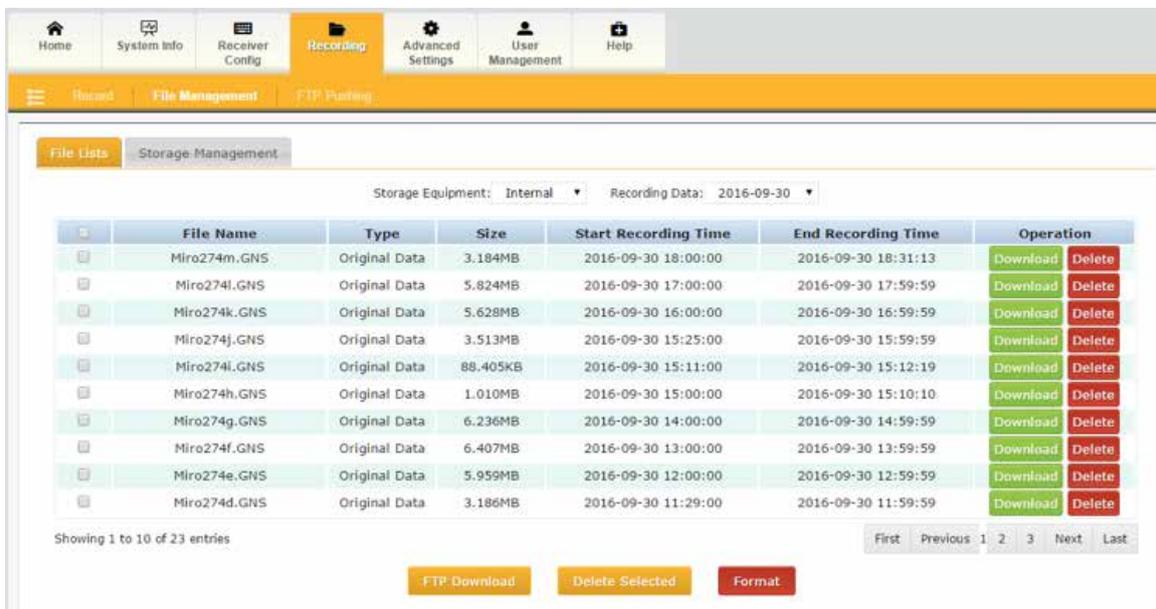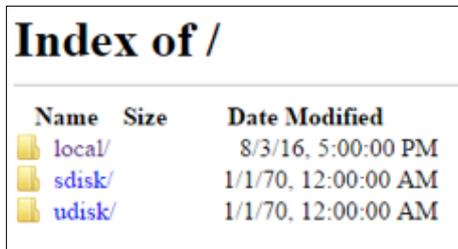

Figure5-10 normal data download

FTP Download

The SLX-1 receiver has a built in FTP Server accessible via the receiver IP address on port 21.
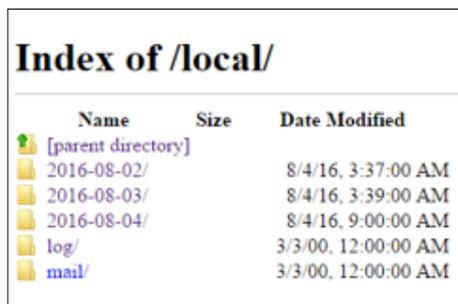
In the Web management system [Recording] - [File Management], click [FTP Download] button to automatically go to the FTP download list; example of HOME directory listing is shown in Figure 5-11:

Figure 5-11 FTP drive directory
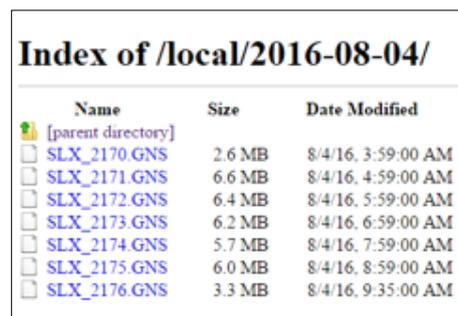
Click the Directory Memory Folder (selected according to drive), and then click the appropriate date folder; shown in Figure 5-12

Figure 5-12 FTP date directory

Click on the file to be downloaded, the Save prompt box pops up, select the folder to download to; click to Save Figure 5-13:

Figure 5-13 FTP download data storage

1- User Login credentials to access the SLX-1 ftp server:
Name: 'satlab'   Password: 'satlab'.

2- If the Web port is changed from default port 80 (see Server Port Settings - page 39) the edited web port number may appear when using FTP Download button. Edit to default port 21 to gain access. e.g. **ftp://192.168.1.150:21**

3- To access the internal SLX-1 ftp server from outside your LAN, port 21 must be forwarded in your router. Refer to your network administrator.

FTP Push

FTP data files can be timed to push to an EXTERNAL ftp server. Set the parameters shown in Figure 5-14:
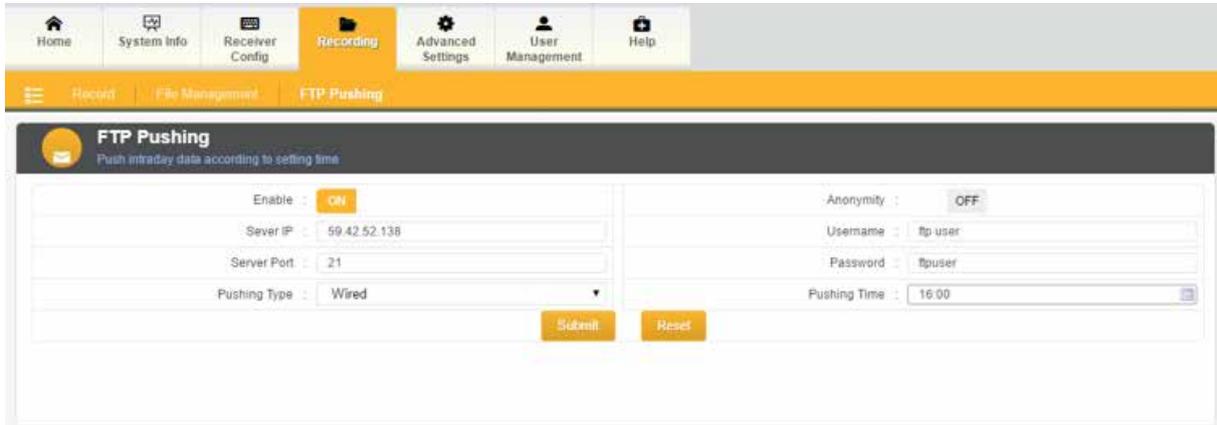
Figure 5-14 FTP Push

Enable the FTP push function and set up either user login or an anonymous user, server IP and port (data is pushed to the nominated FTP server IP and port). Select the push mode (Wired, Wi-Fi or 3G) and push time (according to your need), as shown above.

Push time interface can quickly select the time required. Select the desired time or modify using the pop-up sub-selection box then click "OK"; click [Submit] to complete the FTP push settings.

Figure 5-15 FTP Push time selection

Chapter 6

Rover Mode Operation

- **Introduction**
- **Home Page**
- **Setting Rover Mode**
- **Comms Settings**
    - TCP/IP Client
    - intRTK Client
    - NTRIP Client
- **Serial Port Settings**
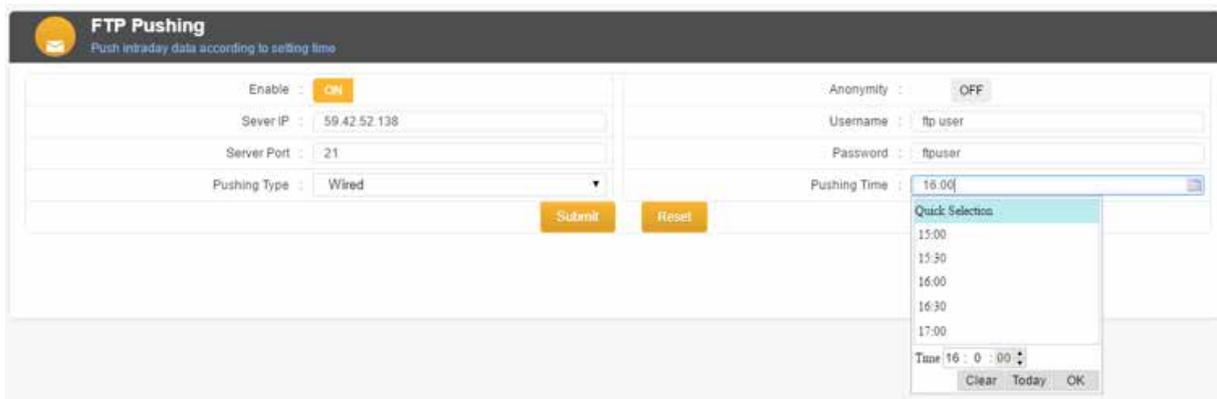
Introduction

In addition to exceptional performance as a CORS station, the SLX-1 is equally capable of operation as a rugged mobile receiver. With Mil-speced housing and a variety of I/O options the receiver can be configured for almost any operation where high-precision mobile positioning is required.

The configuration of the SLX-1 for Mobile operations is controlled using the in-built Web server. This will typically be accessed using a WiFi enabled mobile device using the SLX-1 WiFi Hotspot. Once login is achieved the SLX-1 Home screen will be displayed.
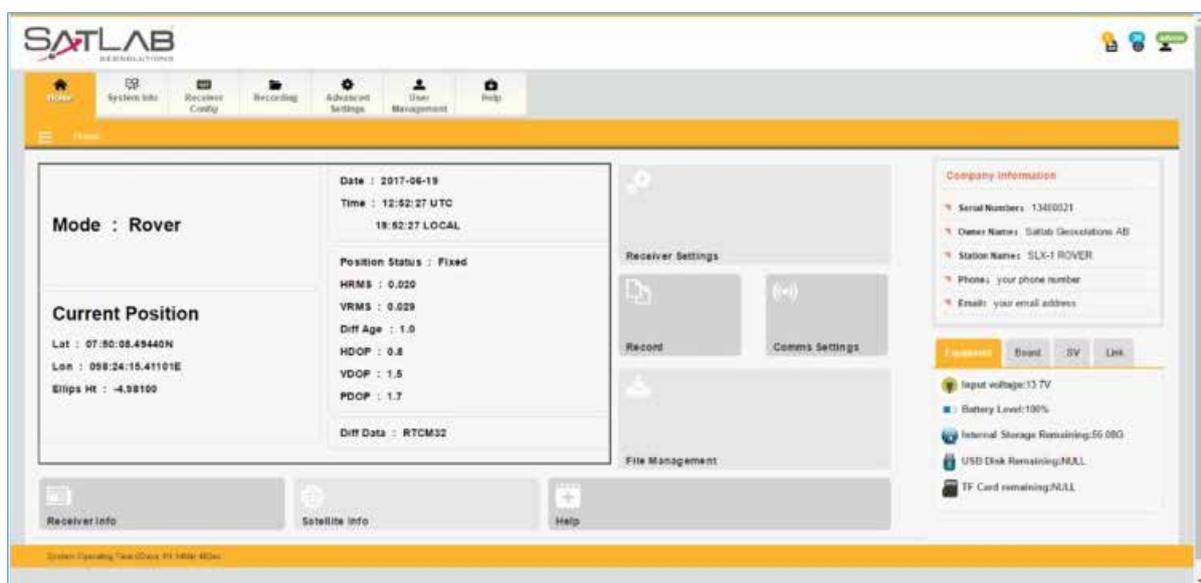
Home Page

Figure 6-1 Rover Home Screen

In Rover mode the Home screen dashboard provides instant feedback regards 'Current Position' together with 'Position Status' and related statistics indicating expected accuracy and data link status.

'Position Status' is also displayed on the LCD screen on the front of the SLX-1 GNSS receiver.

Figure 6-2 Rover LCD Screen

Setting Rover Mode

To set the SLX-1 in Rover mode select [Receiver Config/Receiver Settings] and select 'Operating Mode' as 'Rover' then click [Submit]. The Receiver Settings screen with then change to that shown in Figure 6-3 below.
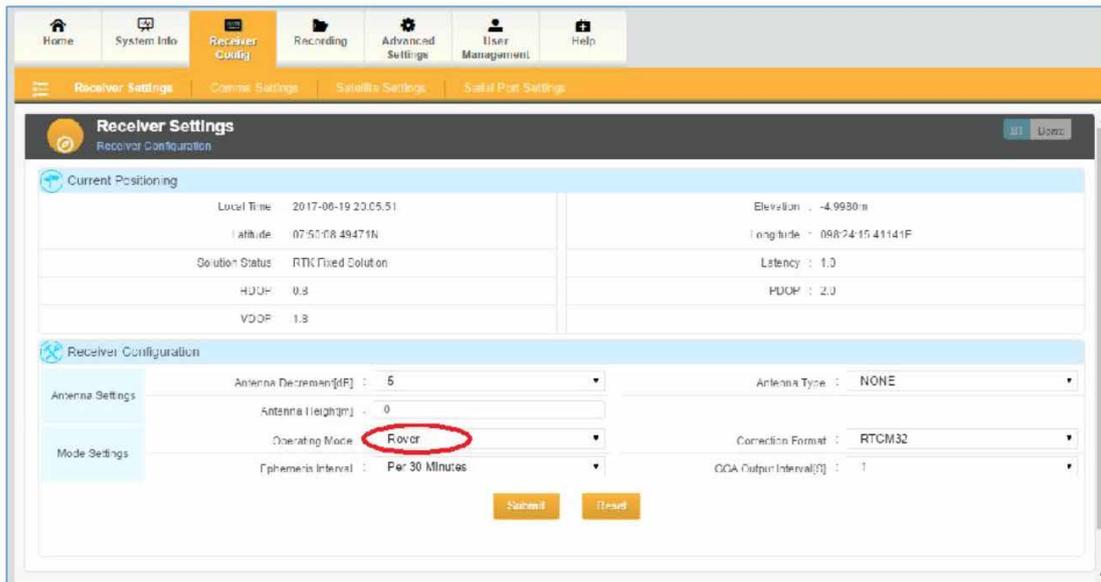
Figure 6-3 Receiver Config – Rover Mode screen

Comms Settings

Correction data to enable the SLX-1 GNSS receiver to operate in high-precision mode is configured using [Receiver Config / Comms Settings]. The SLX-1 supports correction data input using either 'Wired' Ethernet connection or the internal GSM modem via:

  1. TCP/IP Client
  2. intRTK Client (Satlab proprietary)
  3. NTRIP Client

Additionally, correction data can be input via any of the several Serial ports available on the receiver thus enabling the use of an external Radio Rx modem or other telemetry devices.

Note: SLX-1 Comms module currently supports numeric IP addresses only and will not accept Domain name entry. Numeric IP for a Domain can be determined using 'IP Checker' or similar programs.
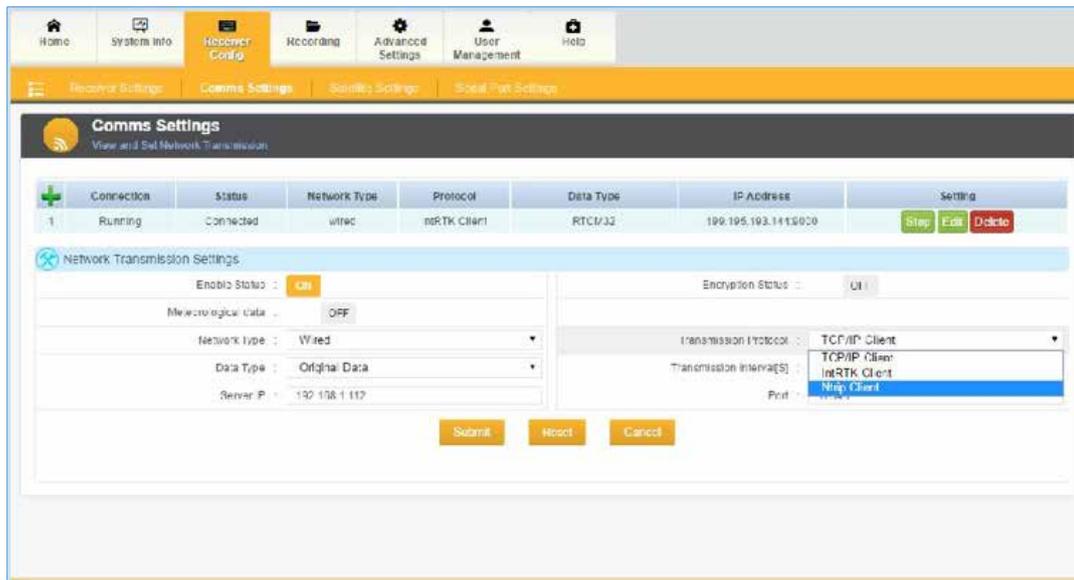
Figure 6-4 Comms Settings screen

TCP/IP Client
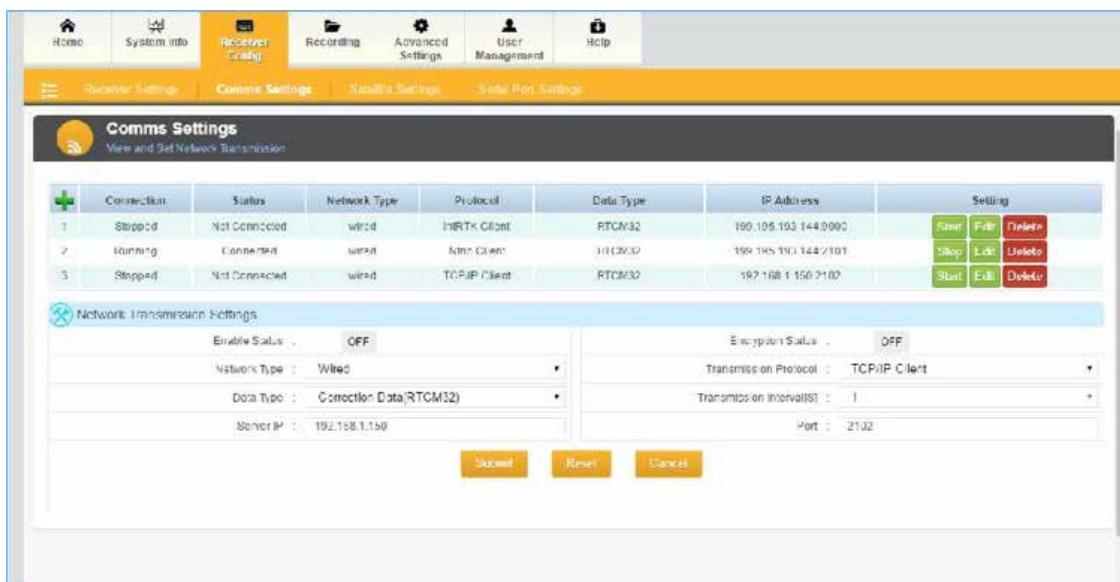
Figure 6-5 Comms Settings – TCP/IP Client

TCP/IP or Direct IP (DIP) is the simplest but least secure form of the correction formats supported by the SLX-1 receiver. Correction data from the Base is forwarded to an IP address and Port and can be received by simply connecting to that same location. There is no User name or Password required.

Select 'Network Type' (Wired or GSM) and enter the numeric IP address and Port the click [Submit].

intRTK Client
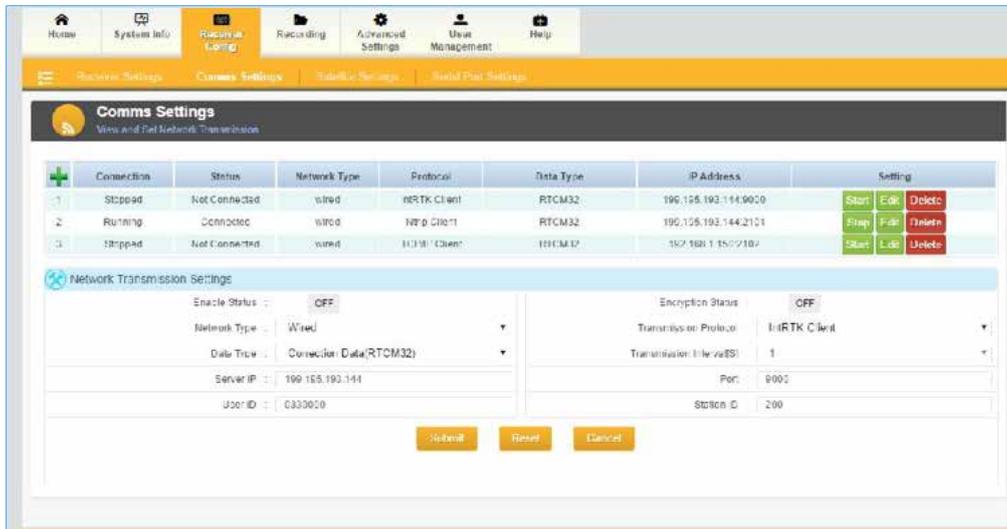
Figure 6-6 Comms Settings – intRTK Client

intRTK is a Satlab proprietary service available on a free of charge basis to Satlab customers. Satlab Geosolutions operates three servers Worldwide to support intRTK. Any of the servers can be used by registered customers and location has no effect on equipment performance.

1. Germany   IP 176.67.169.143   Port 9000
2. Singapore   IP 199.195.193.144   Port 9000
3. USA   IP 98.158.184.141   Port 9000

To use the intRTK Client it is first necessary to have a Satlab Base station connected to the intRTK server and generating correction data. Satlab will issue you with a User ID and Station ID consisting of 7 and 3 digits respectively. The Rover ID used must match the previously entered ID for the connected Base.

Enter 'Network Type (Wired or GSM), Server IP (same IP address as used for Base connection), Port (default 9000), User ID (must enter all 7 digits), Station ID (must enter 3 digits), the click [Submit].

NTRIP Client

Figure 6-7 Comms Settings – NTRIP Client

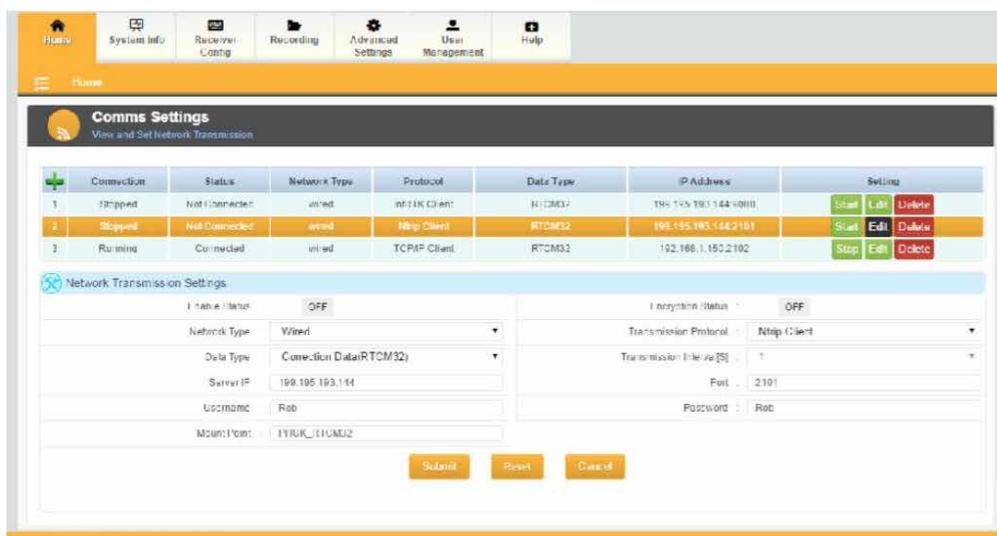The SLX-1 'NTRIP Client' enables the receiver to connect to any CORS Network and supports both Single Base and VRS Network connections.

Select 'Network Type' (Wired or GSM), 'Data Type' (SLX-1 will auto decode the correction data so this setting is not critical), Network Numeric IP and Port, User name and Password, and the required MountPoint.

!   **Note:** The SLX-1 NTRIP module does not currently allow the download of the Network Source Table so the desired MountPoint needs to be entered manually.
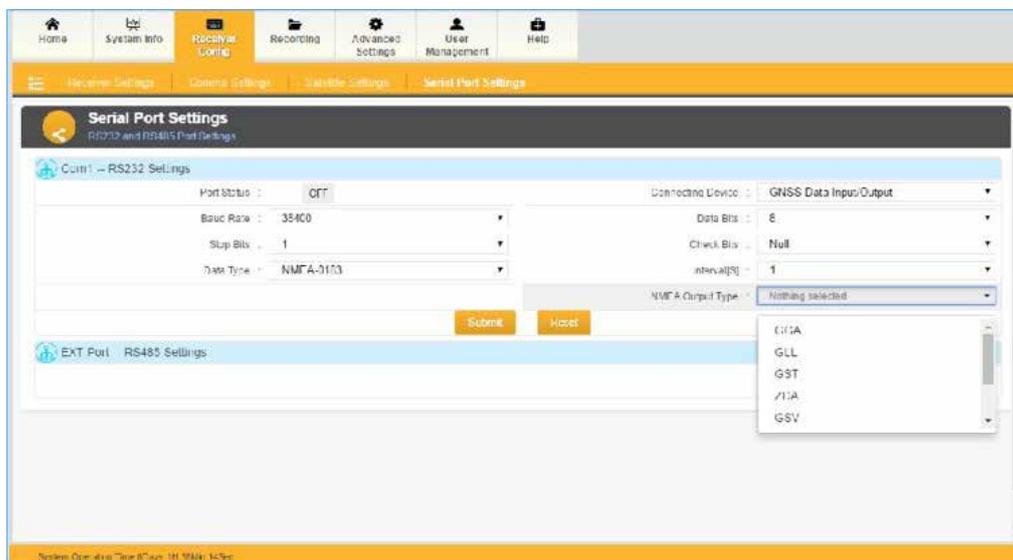
Serial Port Settings

Figure 6-8 Serial Port Settings

The SLX-1 GNSS receiver supports three serial and one Bluetooth port that can be used to send position data to third party Applications.

Com1 (DB9 port) is RS232 and can be configured using [Receiver Config / Serial Port Settings] menu. This menu allows Baud rate settings as well as the selection of the relevant NMEA messages and output rate (1 sec – 600 sec)* to be sent.

Ext Port supports RS485 which enables longer cable runs than standard RS232 but to use this port it needs the SLX-1 'extension box' which is available from your Satlab distributor. As well as providing the RS485 port the 'box' adds capability for Event mark input, 12VDC External power output, Remote power cycle and other functions. Setting the RS485 output configuration and messages is similar to described for Com1 above.

Com2 (5 pin Lemo) is standard RS232 protocol but is set to default 19200 Baud and output is $GPGGA @ 1Hz. These settings cannot be edited*.

Bluetooth Port. When enabled, see [Advanced Settings / Network Status and Settings] the output is $GPGGA @ 1Hz and is not editable.*

* Future firmware developments will add greater utility for control of Com2 and Bluetooth output so this specification is subject to change.

Chapter 7

Advanced Operations

- **USB Download**
- **Firmware Upgrade**
    - Web Page Firmware Upgrade
    - USB Firmware Upgrade
- **Receiver Registration**
- **Fault Diagnosis, Analysis and Troubleshooting**
- **Reset – Default Parameters**
- **SatLab SLX-1 Product technical Specifications**

USB Download
For USB data download, in order to protect the security of data, you need to enter a password (the default password is: 1234). This password can be set on the page [Advanced Settings] - [Data Download Password] to modify data download.

In the LCD screen menu bar, select [Data download], click on the "power button" to enter the password input interface. To enter your password click on the "power button" and the cursor is displayed to underscore the first number entry. You can modify the first entry by click "right" to plus 1 or click the "Left" minus 1. After the first password is set correctly, click the "Power button"to switch to the password entry to the second place, and soon for the operation. When the password is entered click "Power button" and click the [OK] button then click the "power button" to enter the download screen. Click the "power button" to enter the number of days to download selection then click the left / right to change the number of days. Click the "power button" box to switch to [OK] button, then click the "power button" to download.

When using USB to download data, you need to ensure the USB drive is installed correctly, otherwise you will get an error "No U disk". After the download is complete a message will be displayed on the LCD "Download Complete"

Figure 7-1 USB Data Download

Firmware Upgrade
Firmware Upgrade can be done in one of two ways. Upgrade from the Web pages, and U disk upgrade;

Web Page Firmware Upgrade
In the Web management system [Advanced Settings] - [Main Settings] - [System Control], click [Upgrade Firmware] button to expand the dialog box, shown in Figure 7-2:

Figure 7-2 Firmware Upgrade

Click "Choose File", to bring up the file selection dialog box, and then select the upgrade file which has previously been stored in a user defined directory on the PC. Click "Open", as shown in Figure 7-3:
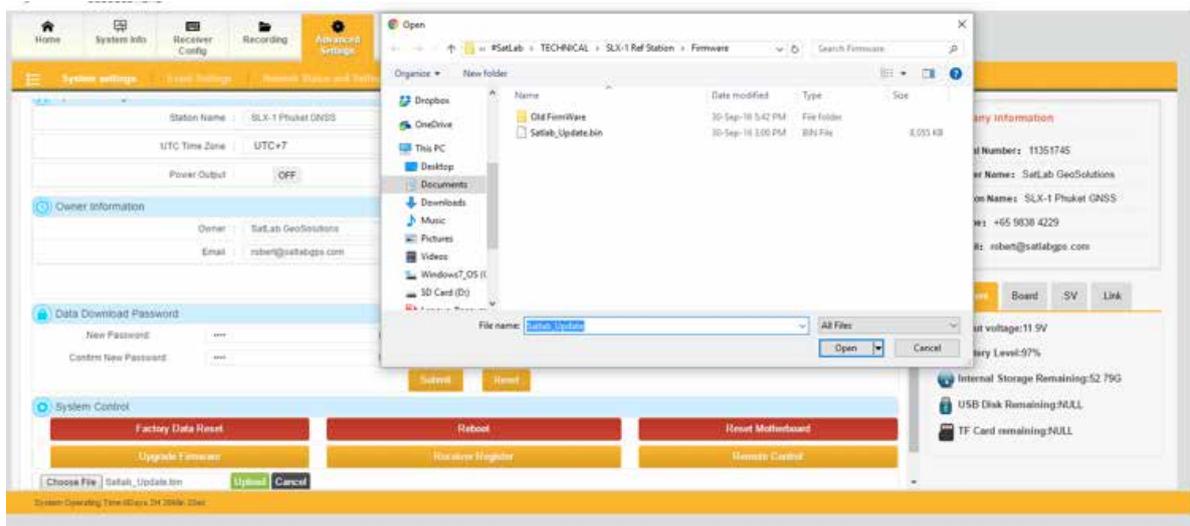
Figure 7-3 Firmware upgrade - file selection

Then click on "Upload" and after a period of time, a browser pop-up "submitted successfully, wait ......" prompt box will appear; wait for about 1 minute to complete receiver firmware upgrades.

> ⚠️ 1. When the firmware update package is released it will have a predefined name e.g. "SatLab_Update.bin" (without the quotes and may vary from example). Please do not change the file name as provided, otherwise it is impossible to upgrade the firmware.
> 2. When doing Web firmware upgrade, do not close the browser, or the upgrade will fail.
> 3. Upload time will depend on your network environment but typical upload time is about 10 seconds.

USB Firmware Upgrade
If you need to upgrade the firmware package you first obtain the upgrade file (e.g. "SatLab SLX-110_Update.bin") and copy to the root directory of your USB drive, then insert the USB in the receiver front panel as shown in Figure 7-4:

Figure 7-4 USB installation diagram

In the LCD screen menu bar [System Settings], select the [Upgrade Firmware], and click the "power button". A pop-up box will appear "Please make sure to insert U disk", then click power button again and wait for the prompt "transmission was successful".

If the prompt "no U disk" appears then return to [upgrade] to select the firmware upgrade interface and try again; wait one minute or so, which represents a successful upgrade receiver reboot;

Figure 7-5 USB upgrade screen

Receiver Registration

In the Web management system [Advanced Settings] - [Main Settings] - [System Control], click [Register] button receiver, will expand the dialog box; shown in Figure 7-6:

Figure 7-6 Receiver Register

Receiver License format is 24 digits, divided into eight groups of 3 digits. After obtaining the registration code enter it into the boxes (registration number ignores input spaces), then after confirmation click [Submit] to register the receiver.

To confirm successful registration check that the Expiration Date has been updated.

Fault Diagnosis, Analysis and Troubleshooting

System starts normally, but SV light is OFF.

1, Check GNSS antenna plug and GNSS external antenna installation is correctly connected and installed.

2, Check if the registration code has expired. For new registration codes please contact SatLab or your distributor to apply for a new registration code, then log onto SatLab SLX-1 Series Web management system and register the receiver.

3. Check the GNSS antenna cable is correctly connected to the SLX-1GNSS receiver and GNSS antenna connections are tight. Tighten if loose, and wait about 30 seconds.

GNSS receiver is working properly, and the browser software open, but the receiver Web interface is not visible.

1, Check the browser connection, and ensure the correct IP address and port are set.

Recording function previously working correctly but now not operating.

1, Check recording sessions correctly programmed; check power supply is sufficient, if using 12V battery power check the battery voltage is not lower than 10.5V.

2, If recording session failed; check if registration has expired, if not overdue check whether the GNSS receiver locks satellites, check if available storage space is sufficient.

Network cable is connected properly, but you can not logon to the SatLab SLX-1 series Web interface.

1, Check whether the computer is set in accordance with the instructions for network settings, wired network settings.

2, The computer side can ping the GNSS receiver, but cannot access; turn off the firewall and antivirus software.

3, Check whether the correct input IP is set. To determine receiver IP setting double-click the power button to view the current IP address.

Reset – Default Parameters

- Reference Station site name SLX GNSS receiver
- UTC time zone UTC + 8
- Antenna attenuation [dB] 5
- Antenna Model SLGAT-35101H
- Antenna height [m] 0
- Operating Mode Rover
- Ephemeris interval every 30 minutes
- Difference Scheme RTCMV3.0
- Satellite systems are all open
- The height of the cut-off angle 10 °
- Data storage internal memory
- 2G / 3G network OFF
- RS232 / RS485 serial port Close
- Server port settings 80
- Firewall Close
- Time Input OFF
- External clock input OFF
- PPS output OFF
- FTP Push Close
- Users deleted with only administrator retained and default password setting
- Auto Clear Time 1 day
- Power output OFF
- Delete all data transmission management networks
- Delete all the data records
- Remove all internal data
- Delete all log management
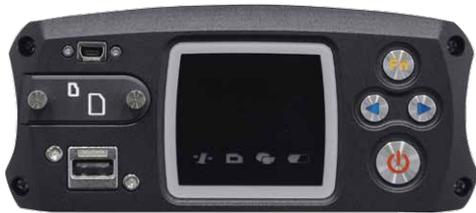
SatLab SLX-1
Product Technical Specifications

Model SatLab SLX-1 GNSS Sensor
Tracking
- GNSS channels: 220
  (optional second GNSS board with additional
  220 channels)
- GPS: L1, L2, L5
- GLONASS: L1, L2
- BDS: B1, B2
- GALILEO: L1BOC, E5A, E5B, E5AltBOC
- SBAS: L1C/A, L5

Accuracy
- RTK horizontal positioning accuracy: ± (8mm + 0.5 ppm)
- RTK vertical accuracy: ± (15mm + 0.5 ppm)
- Static horizontal accuracy: ± (2.5mm + 0.5 ppm)
- Static vertical accuracy: ± (5.0mm + 0.5 ppm)
- Initialization time is typically <10 seconds
- Initialization reliability> 99.9%

I/O Interfaces
- 3 RS232 interface (1 x DB9 Serial output, 2 x Limo for
  configuration and debugging)
- USB interface
- WiFi communication interface
- 3G / 2G communication interface
- RS485 / RS422 interface (optional)
- Ethernet interface
- External clock interface
- 1 PPS output interface

Data Management
- 64GB of internal storage
- External memory support 1TB
- Difference Scheme CMR, CMR+, sCMRx, RTCM2.x,
  RTCM3.0, RTCM3.2
- Interactive Web Content Management System
- LCD, LED, key operating system

Power
- External power supply: 7VDC ~ 36VDC (2-way)
- Built-in Battery: 24h continuous operation
  (configuration dependent)
- Power consumption: ≤ 4W

Environmental
- Dimensions (LxWxH) 22.50cm x 13.80cm x 7.00cm
  (8.86in x 5.43in x 2.76in)
- Weight 2.480 Kg
- Operating temperature -40^{0}C ~ 75^{0}C
- Storage temperature -40^{0}C ~ 80^{0}C
- 100% relative humidity
- Protection class IP67
- Corrosion GJB150.11
- Vibration GJB_1032
- Shock JB / T 9329 30g 3 times / axis
- Collision JB / T 9329 10g 1000 times
- DROP GB-T2423.8 anti 1 meter drop

Standard Configuration Table	
SLX-1 GNSS sensor	1
Power Adapter	1
AC power cord	1
SatLab SLX-1 data cable	1
Straight-through cable	1
SatLab SLX-1 kit packaging carton	1
Warranty card	1

SATLAB
GEOSOLUTIONS