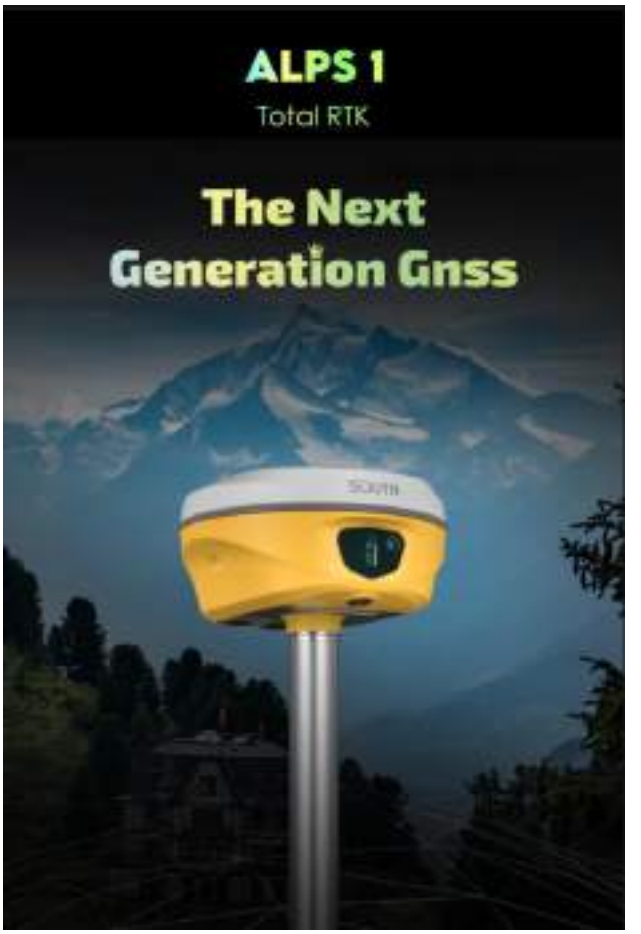

ALPS1

Technician Manual

Content

Chapter 1 Preface

Read this chapter, you will have a brief knowledge of SOUTH Company and ALPS1 measurement system.

§1.1 Introduction

Welcome to SOUTH SURVEYING & MAPPING TECHNOLOGY CO., LTD., which is China's leading manufacturer of surveying equipment including GNSS receivers and Total Stations. To know more about SOUTH, please visit our official website https://www.southinstrument.com//

Our company detailed information as follows:

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Tel: +86-20-23380888 Fax: +86-20-23380800

E-mail: mail@southsurvey.com export@southsurvey.com impexp@southsurvey.com gnss@southsurvey.com

This manual takes the new ALPS1 positioning system for example, to explain how to install, set up and use the RTK system as well as the use of the accessories. We recommend that you read these instructions carefully before using the instrument.

§1.2 Applications

Control Survey: dual-band (dual-frequency) system static measurements can accurately complete the high-precision deformation observation, photo-control point measurement.

Highway Survey: quickly complete the encryption of the control points, road topographic mapping, cross-section measurement, profile measurement with Survstar

CORS Application: provide more stable and convenient data link for field operations. It is seamlessly compatible with all types of domestic CORS applications.

Data acquisition measurement: perfect match South's various measurement software to do quick and easy data acquisition.

***Stakeout shot*:** large-scale point, line, plane lofting.

***Electric Power Measurement*:** power line measurement orientation, ranging, angle calculation.

***Marine application*:** oceanographic research, dredging, piling, inserted row, making the marine operations convenient and easy.

§1.3 Main Features

AR Stakeout

Augmented Reality (AR) stakeout revolutionizes conventional surveying methods by integrating various sensory modalities, including visual and auditory. This approach eliminates the proficiency gap between experienced surveyors and novices by providing real-time visual guidance within authentic environments. Additionally, voice prompts are employed when nearing designated targets. This streamlined process allows surveyors to stake out targets without the need for leveling the pole, relying on visual and auditory guidance for precise stakeout each time.

Laser Survey

Laser survey is an instrument that accurately measures the distance to a target by modulating a certain parameter of the laser. Pulse laser ranging involves emitting a brief pulse or sequence of pulses towards the target during operation, with the photodetector receiving the reflected laser beam from the target. The timer measures the time it takes for the laser beam to travel from emission to reception, allowing for calculation of the distance from the rangefinder to the target. Point acquisition is carried out according to the position of the laser point.

Visual Positioning

ALPS1 visual positioning broadens the scope of RTK applications through the synergistic integration of photogrammetry and RTK positioning technologies. With an 8-megapixel camera, “Fast” IMU and the latest positioning algorithm, ALPS1 is adept at capturing and processing images or videos to derive precise coordinates. Therefore, it excels in surveying targets that pose challenges for traditional methods, including intricate corners beneath roofs, obstructed fields, and bridges spanning rivers. This capability enhances surveying versatility, allowing for the

efficient and accurate surveying and mapping of locations that were previously difficult to access with RTK surveying techniques.

BDPPP: Keep working in remote aeras with no CORS network coverage

ALPS1 can receive B2b signal of BDS GEO satellites(Asian Pacific area), and E6- B signal from GALILEO. After waiting 20 min in open environment, ALPS1can achieve 10-20cm horizontal accuracy and 20-40cm vertical accuracy. If you have specific needs, please contact us.

Color Round Screen

HD 1.14 inches and 135*240 pixel TFT screen color LCD screen with high brightness and low power consumption is more suitable for field work, which is convenient and, efficient to complete mode settings, information browsing, function settings.

Intelligent Platform

New generation of embedded Linux operating system platform improves RTK performance and work efficiency. Its operating efficiency is higher; a unique core processing mechanism which can respond to more than one command at one time; it starts faster and more responsive in real time. While the stability of system is much higher, it can be adapted to the job of longer uninterrupted power.

The “Fast" IMU: More Fast, More Stable and More Accurate

ALPS1 is integrated with a new generation IMU module that it only needs 2-5s of shaking or walking to complete the initialization, and the maximum tilt compensation angle can be 60 degrees. it can ignore magnetic interference while RTK receiver works in such a magnetic environment. This professional IMU module can keep the tilt effect for about 40s if RTK

receiver stays on a point without moving.

Internal Web UI management

Embedded Web UI management platform supports WIFI and USB mode connection. Users can monitor the receiver status and configure it via the internal Web UI management platform.

WiFi

As a feature and technology adopted on ALPS1, it not only can be used as data link to access to internet, but also can be as a hotspot which can be accessed by any other smart devices to configure the receiver.

Advanced UHF module

ALPS1 adopts new and excellent datalink system, which is compatible with current radio protocols in the market, and realizes the random switching of the radio range 410MHZ-470MHZ and the power level as well.

Intelligent Interaction

Support to access the internal web UI manage page of receiver with WiFi and USB connection, monitor host state real-time, configure receiver freely.

Electronic Bubble & Tilt Compensation

Integrated with a new generation IMU module which makes tilt measurement more stable, accurate and fast that without strict leveling the receiver to measure the point at will.

NFC Function

The internal NFC module can make the complicated Bluetooth communication easy and simple.

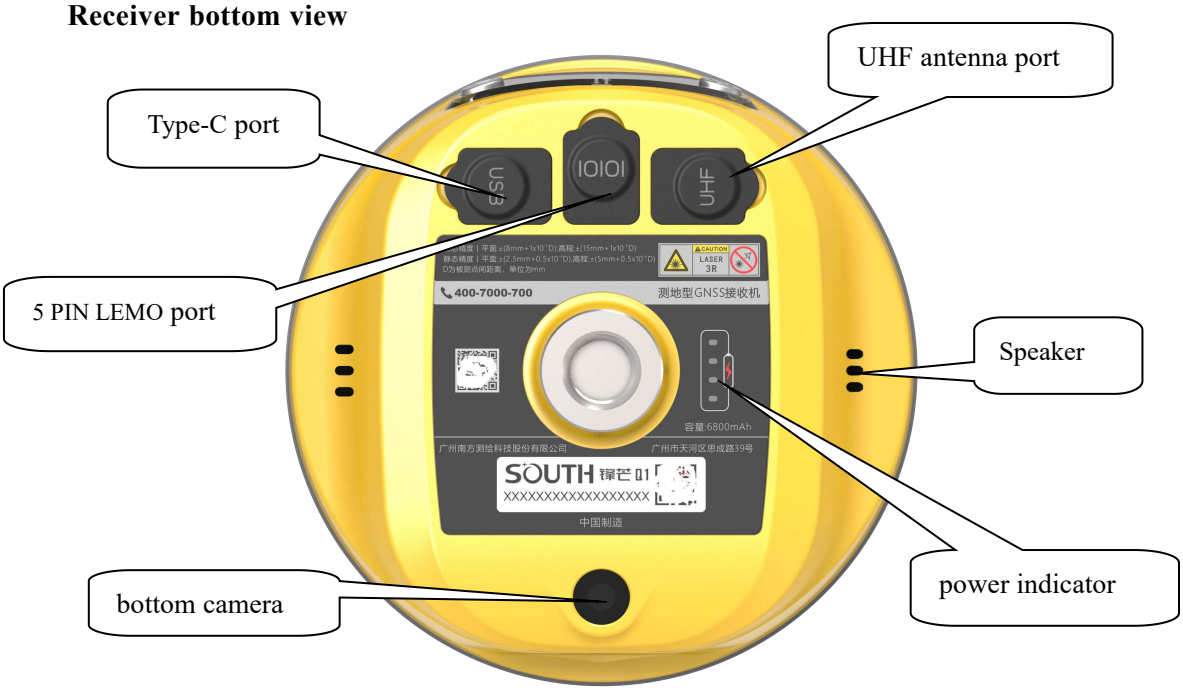
Chapter 2 ALPS1 receiver introduction

§2.1 Receiver components

Receiver front view

Receiver back view

Receiver bottom view



- **Type-C port**: for static data downloading, OTG (for external storage) and charging.
- **5-Pin port**:
  1) As a power port connected with an external power supply device.
  2) As a differential transmission port connected with an external radio.
  3) As a serial port to check data output and debug.
- **Power indicator light**: Displays the current battery, with one bar representing 25% charge.
- **Speaker**: Voice broadcast.
- **UHF antenna port**: Instill UHF antenna.

§2.2 Receiver screen menu

§2.2.1 Main display interface

Ref	Component	Description
	**Power Button**	1) Power on/off 2) Select menu
	**Function Button**	Shift between menus.
	**Data Indicator**	Keep yellow when turn on. Flash green when Fixed solution. Flash red when not Fixed with the correction signal.

§2.2.2 Main menu

After the device is powered on, the current working status is displayed. The status interface consists of ICONS and text.

Main menu: by Function Key right or left, Power Button to **s**hift between menus.

[Receiver information],

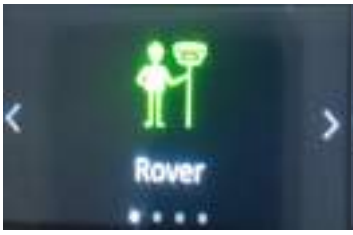
[Work mode],

[Set Datalink],

[System Setup]

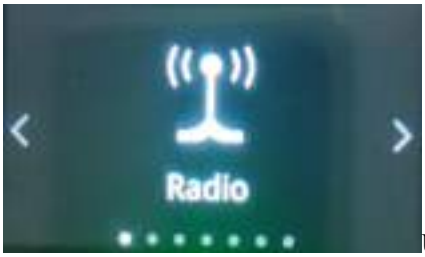
§2.2.3 Work mode

To switch work mode between Rover mode, Base mode and Static mode.



§2.2.4 Set Datalink

To configure datalink and there are 7 datalink modes as below:

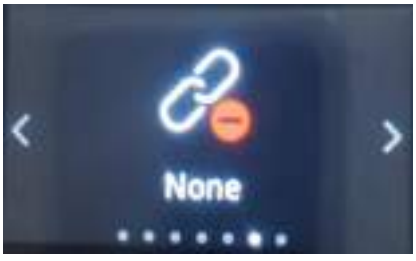


UHF(inbuilt radio) as datalink

External radio as datalink

Bluetooth datalink (also called controller network as datalink)

WIFI datalink



No datalink

§2.2.5 System Setup

Radio Config

Self-check

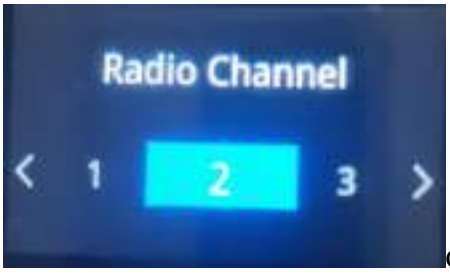
Factory Default

Clean EPH

Reset OEM

Normal

Radio Config



Change the Radio Channel.

Self-check successful

§2.3 Hardware Operation

Power on

After pressing the power button for three seconds, the instrument can be turned on and used normally.

Power off

Press the power button and hold for a while, after 3 beeps and the “Power off” voice prompt at the third beeping, release power button, the instrument will switch off.

Check working mode

Press the power button for once in the state of power-on, the instrument will prompt with voice message about current working mode (for example, “Rover, internal radio mode”).

Self-check

Self-check is an useful operation to simply check the main hardware components if the instrument is abnormal or not working properly.

Press and hold the power button for about 10 seconds and pass over the state of power off and mode selection (do not release the button even the instrument says power off and start to set work mode), then ALPS1 will say “start to self-check”, at this moment, release power button, the instrument will perform self-check automatically for the modules one by one.

The sequence of modules checking is:

OEM board checking

UHF module checking

Sensors checking

WiFi module checking

Bluetooth module checking

EPPROM checking

If all the modules are normal during self-check, the instrument will get into the state of power-on.

Factory reset

Press and hold the power button for about 15 seconds and pass over the foregoing states (power off, mode selection, self-check, USB mode setting), ALPS1 will get into factory reset progress with voice message saying “start to restore factory default”, at this moment, release power button, the instrument is performing the factory reset automatically. After this progress complete, the instrument will restart automatically with the factory default settings.

Charging

Charging state, in the middle of the charging process, the red light will turn green when full. Lamp power display current power, each light on represents 25% power.

In charging

Full charged

Chapter 3 Web UI Management

§3.1 Overview

Because of using the smart embedded Linux operating system and SOUTH intelligent cloud technology, the web UI allows users to configure and monitor the status of ALPS1 in real-time. The accessing way is not only by WiFi connection, but also can be USB mode.

§3.2 Access by WiFi

The WIFI hotspot is default broadcasted by ALPS1, search the WIFI hotspot which named with SOUTH_xxxx using smartphone, tablet or laptop, then establish the WIFI connection, input the **default IP (10.1.1.1)** into broswer, on the login interface, apply “admin” for the username and password.

For example, search the WIFI hotspot broadcasted by a ALPS1 receiver using a laptop PC, choose the WIFI hotspot and click on connect button to establish the connection without password.

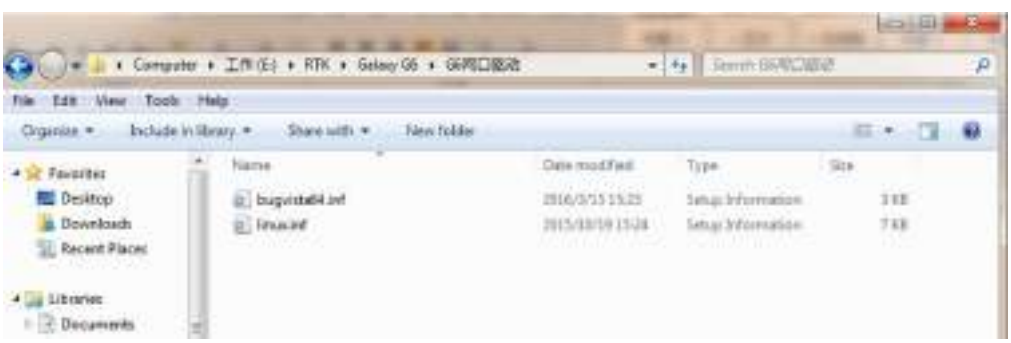
Run IE broswer on computer and input the default IP (**10.1.1.1**) into address bar, after a while, the system login interface is refreshed, then apply **“admin”** for username and password to login.

§3.3 Access by USB

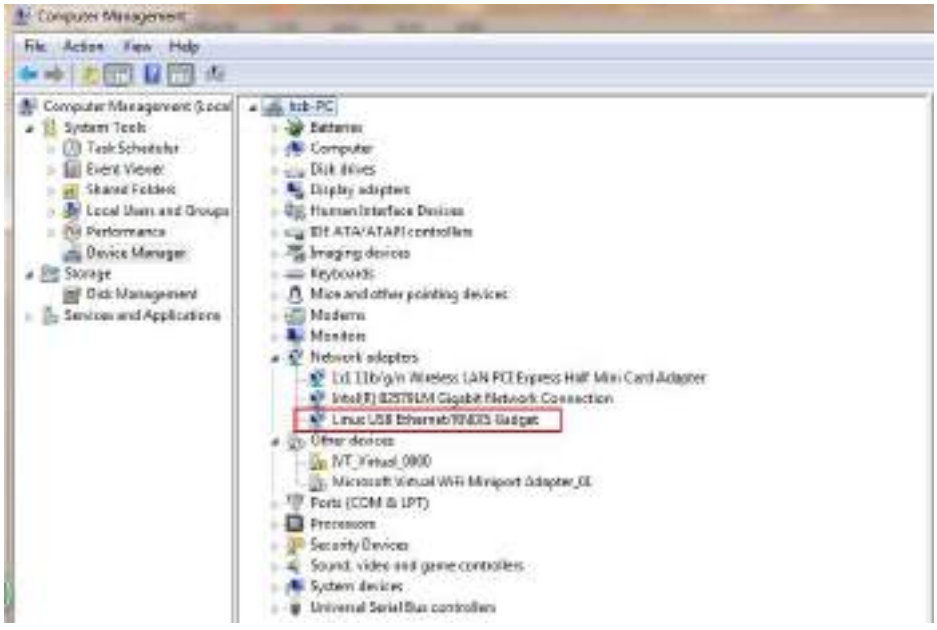
On this mode, the Type-C USB port of ALPS1 must work as an Ethernet port, then internal web UI shall be accessed via USB cable connection with computer.

First of all, a corresponding driver is required to install to the computer, then this function could be activated.

Due to different operating system is installed on computer, the drivers should be applied to a suitable one. The file bugvista64.inf is applied to 64bit operating system, and linux.inf is for 32bit operating system.



Choose the folder which contains the drivers



NOTE: *The driver can be downloaded from official website automatically or please contact with us for more supports.*

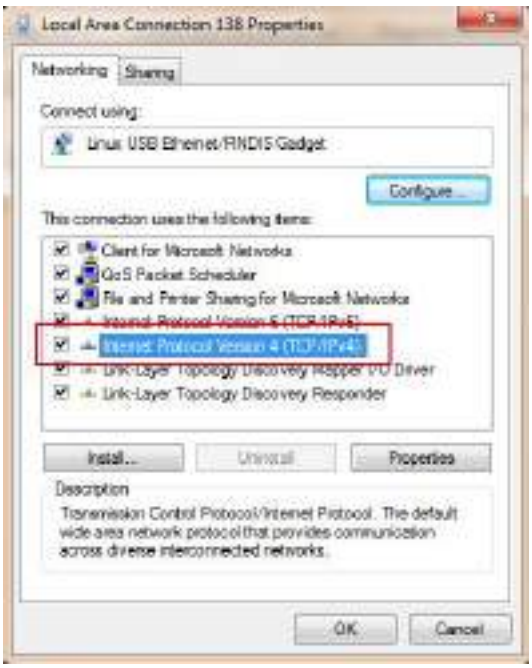
If the driver has been successfully installed, the USB port of ALPS1 will be recognized as **Linux USB Ethernet/RNDIS Gadget**, and a local area connection will generate in **Network**

Connections on the computer. For example, Local Area Connection 138 generates after connectingALPS1 receiver to computer via USB network interface.

However, sometimes the computer cannot detect the receiver by USB network interface because there is something wrong with acquiring IP automatically, therefore, we need to do something to avoid such problem, that is to set a fixed LAN IP for the connection:

Right click on the local area connection which newly generates, choose properties to call out the local area connection properties window.

Then double click on Internet Protocol Version 4 (TCP/IPv4) option or click on properties button to call out Internet Protocol Version 4 (TCP/IPv4) properties window, set the fixed LAN IP address as shown in following, then click OK button and confirm the settings, return to the IE browser and use the IP address 192.168.155.155 to access the internal web UI.



Run IE broswer on computer and input the default IP (**192.168.155.155**) into address bar, after a while, the system login interface is refreshed, then apply **"admin"** for username and password to login.

§3.4 Web UI main interface

After login the Web UI management of ALPS1 by WIFI or USB connection, the main interface appears with displaying configuration items and positioning. As shown at following figures.

In the Web UI home page, the configuration items are listed at left side. And the positioning information including coordinates information and satellites are displayed at right side

Ref	Component	Description
	Status	Positioning information, satellite tracking and the others will be displayed in this page
	Configuration	It contains registration for receiver, base configuration, antenna configuration, satellite configuration, receiver configuration and system configuration.
	Satellite Information	Display and control the satellites are used or not
	Data Record	Configure the parameters for static mode and raw data download
	Data Transfer	Contains NTRIP configuration, TCP/IP configuration and data transferring with PC
	Network Config	Contains network parameters configuration, WIFI configuration and the other functions

	Radio Config	Configure the parameters and frequency for radio modem
	Firmware Update	It is used to upgrade the firmware for receiver and each modem
	Track Manage	Record track file while doing measurement
	Coordinate System	Setup a local coordinate system forALPS1
	Online Service	Upload data onto a server in real-time
	User Management	Add and manage the Web UI users
	System Log	System and data log

§3.4.1 Status

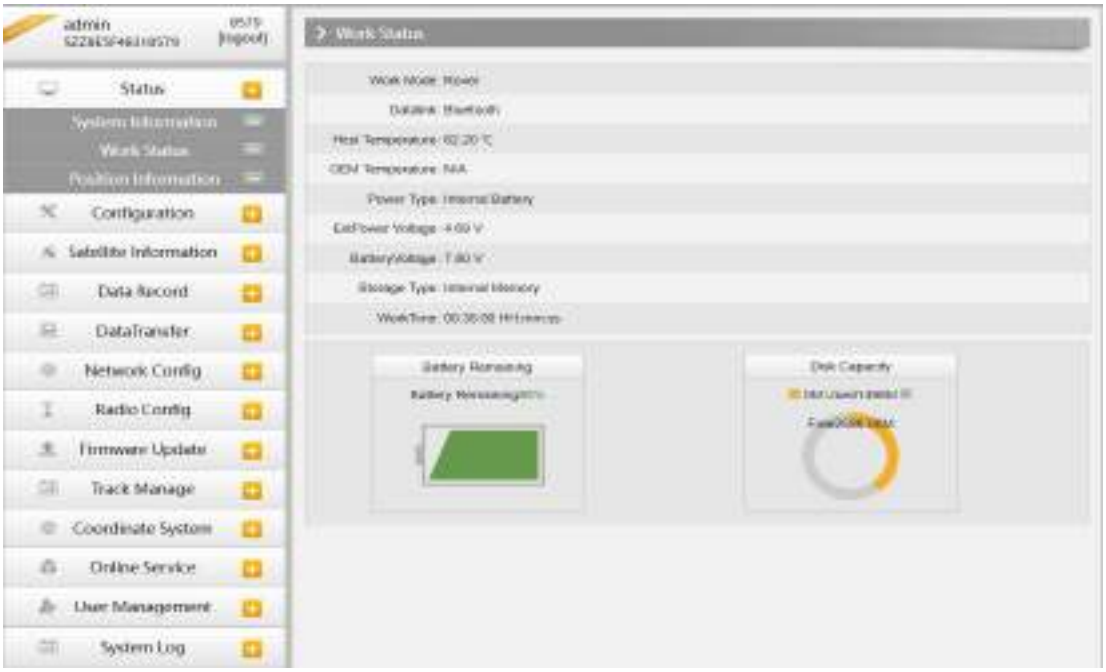
System Information, Work Status and Position Information are listed under Status menu.

System Information

In this page, all the information of ALPS1 is diplayed such as serial number, hardware ID, MAC address, firmware version and so on.

Work Status

The physical state of ALPS1 such as working mode, datalink, host temperature, remaining power and the free memory is obtained from this page



Position Information

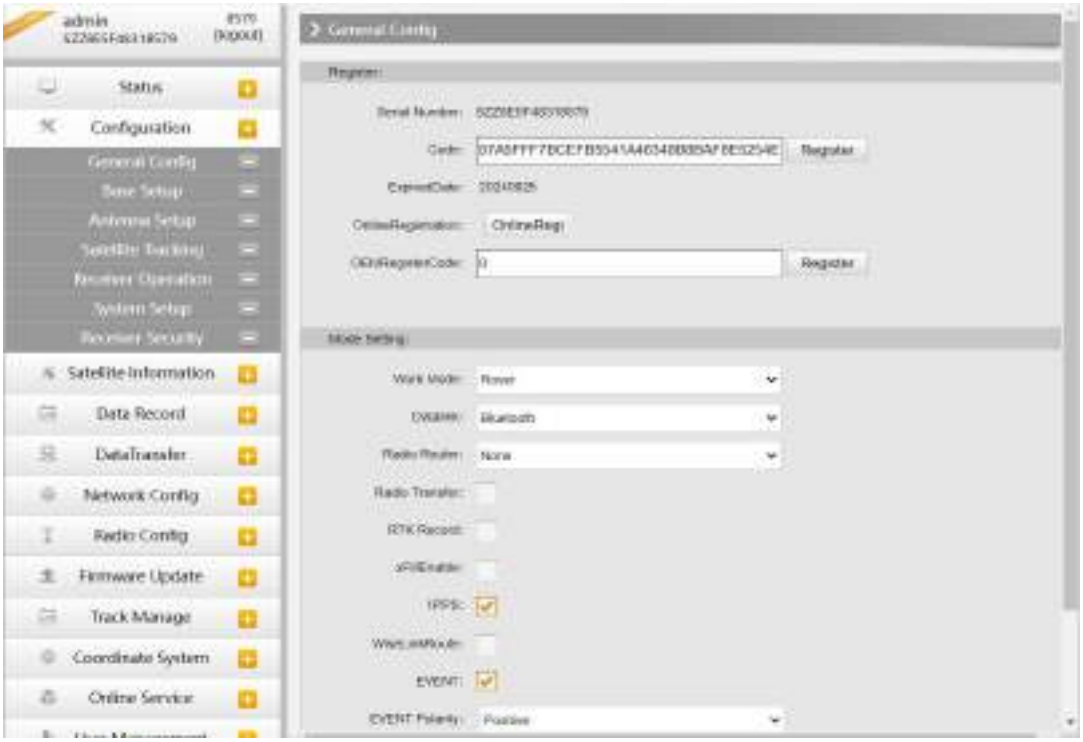
In this page, users can be clear at a glance on current position information and satellite information

§3.4.2 Configuration

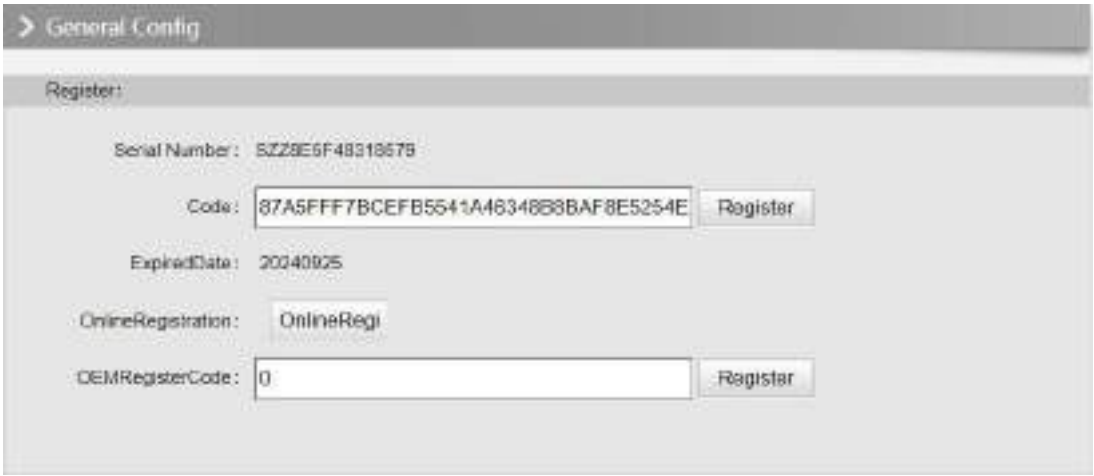
General Config, Base Setup, Antenna Setup, Satellite Tracking, Receiver Operate and Default Language are contained under Configuration menu. Users are able to configure all kinds of parameters for ALPS1 under Configuration menu, and all the settings are immediate effect after saving.

General Config

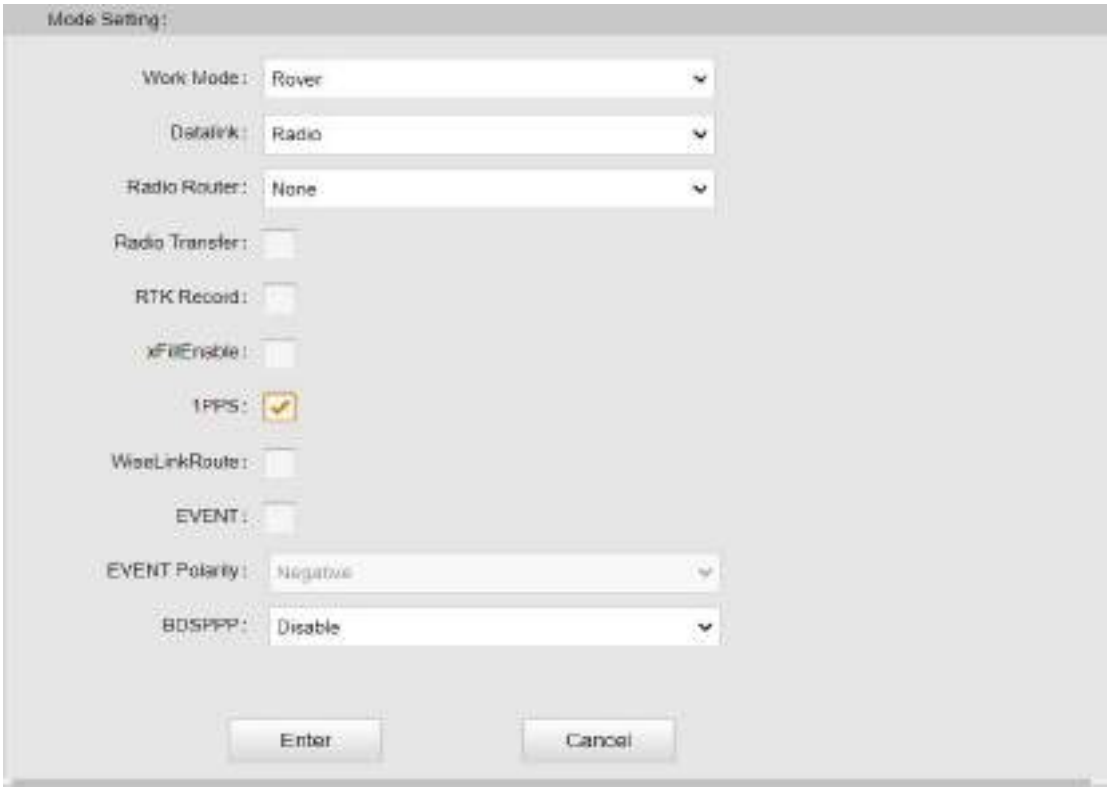
The registration for receiver working mode setting can be completed in this general configuration page.



If the code of ALPS1 has expired or is going to be run out, please provide the serial number of your ALPS1 for us to apply for another available code, then input the code into the blank or register the receiver online.



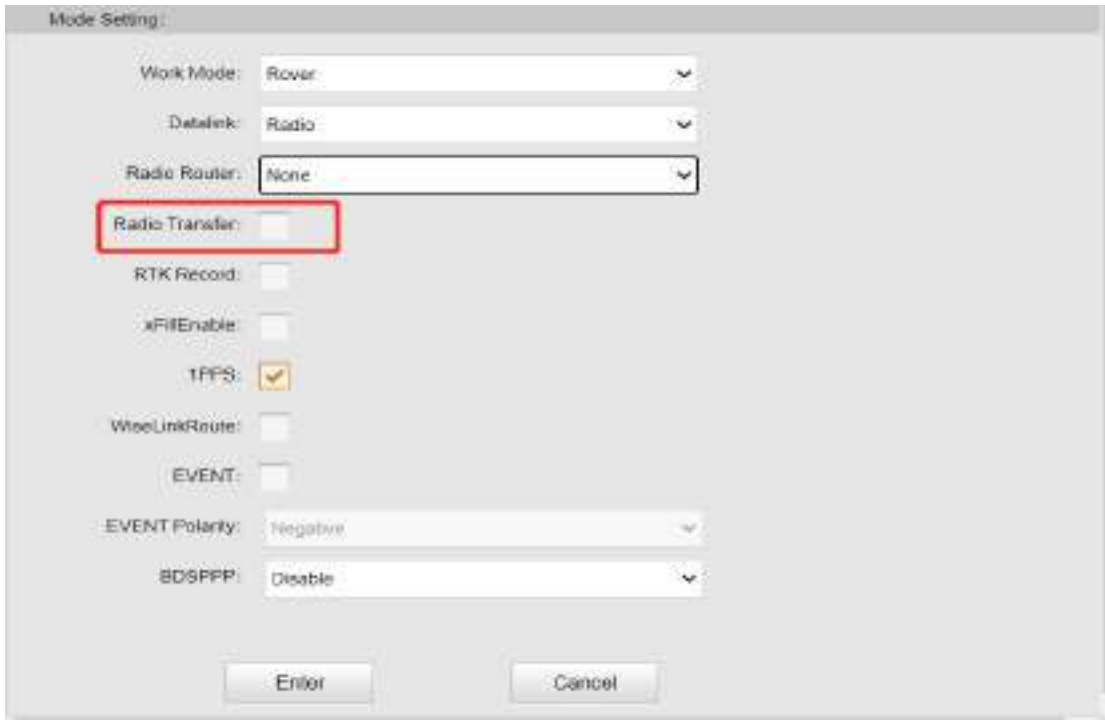
ALPS1 allows users to setup the working mode and datalink from this Web UI that only need the mobile phone or tablet PC is able to connect the wifi hotspot of ALPS1.



Work Mode: There are Rover, Base and Static contained in this dropdown list

Datalink: Pull down the list, there will be all kinds of options for datalink, such as radio, Network, External, Bluetooth, WIFI.

RadioTransfer: This is the function that ALPS1 is able to transfer the correction from Base station to the other rovers with the internal UHF, definitely,ALPS1 can work as a radio transfer (radio repeater).



Operation:

1, check the box of “RadioTransfer” on “General Config” dialog for Base station.

2, open the same function for Rover in critical status (when the Rover is close to working distance of Base internal UHF).

3, configure the datalink of the other rovers into internal UHF mode, then make sure the channel, protocol and frequency point are same as "Repeater" rover.

Note: please take in mind that the "Repeater" rover should keep away from Base station to avoid signal interference.

RTK Record: This is used to enable raw data recording in base mode or rover mode for post-processing

xFillEnable: the "Fixed-keep" function, to allow ALPS1 keep the centimiter-level accuracy when the correction is missing

1 PPS: This option is for the 1 pulse per second output

WiseLinkRoute: receivers first priority to use internet transmit and receive corrections (a internet server is needed), if lost the internet signals, then receivers will use radio transmit and receive corrections

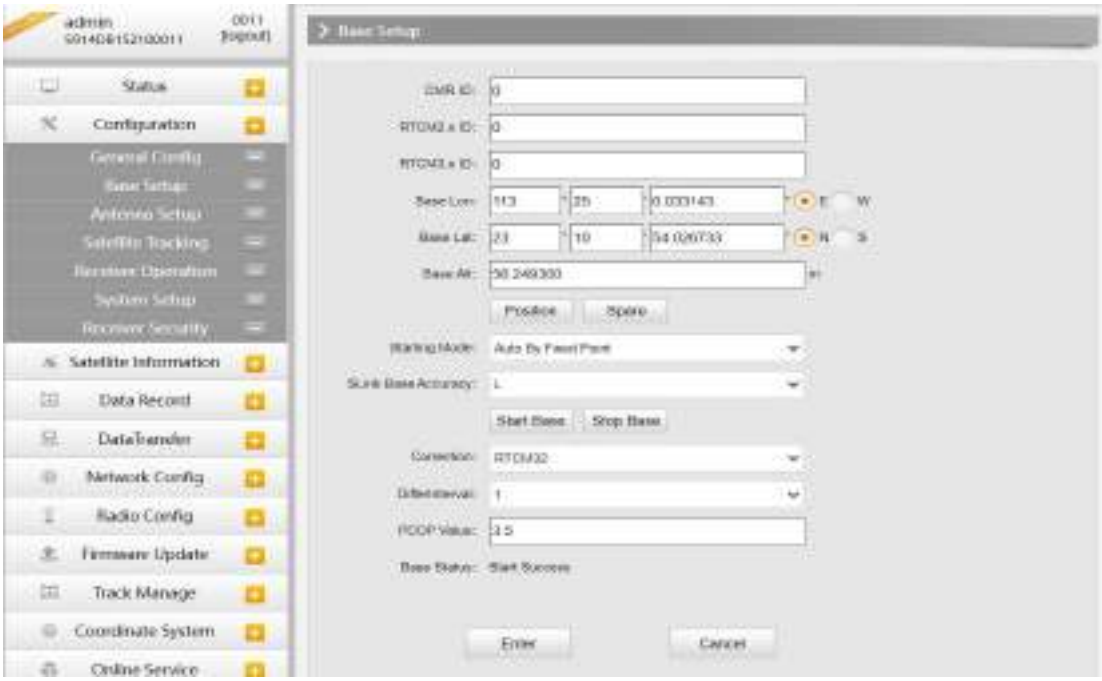
EVENT: This option is for the EVENT marker input

EVENT Polarity: EVENT input method.

BDSPPP: Disable BDSPPP function, Dynamic PPP(rover) and Static PPP(static).

Base Setup

When ALPS1 works as a base, the basic configuration for base can be setup in this page. Users can input the correct coordinates or capture a current position for the base. Also users can define what kind of correction format is transmitted.



CMR ID/RTCM2.X ID/RTCM3.X ID: Users can specify the ID for transmitting correction.

Position: Click this button to capture the coordinates for current position

Spare: This is used to the repeat station

Base Start Mode: Here contains 3 methods to start the Base, manually start base, automatically start base by fixed point, automatically start base by current point.

SLink Base Accuracy: Here contains 3 methods to make sure the Base accuracy, L, M, H. Choose different methods according to different needs.

Correction: Here contains the global general used correction formats including RTD,RTCM23, RTCM30, RTCM32, CMR and SCMRx

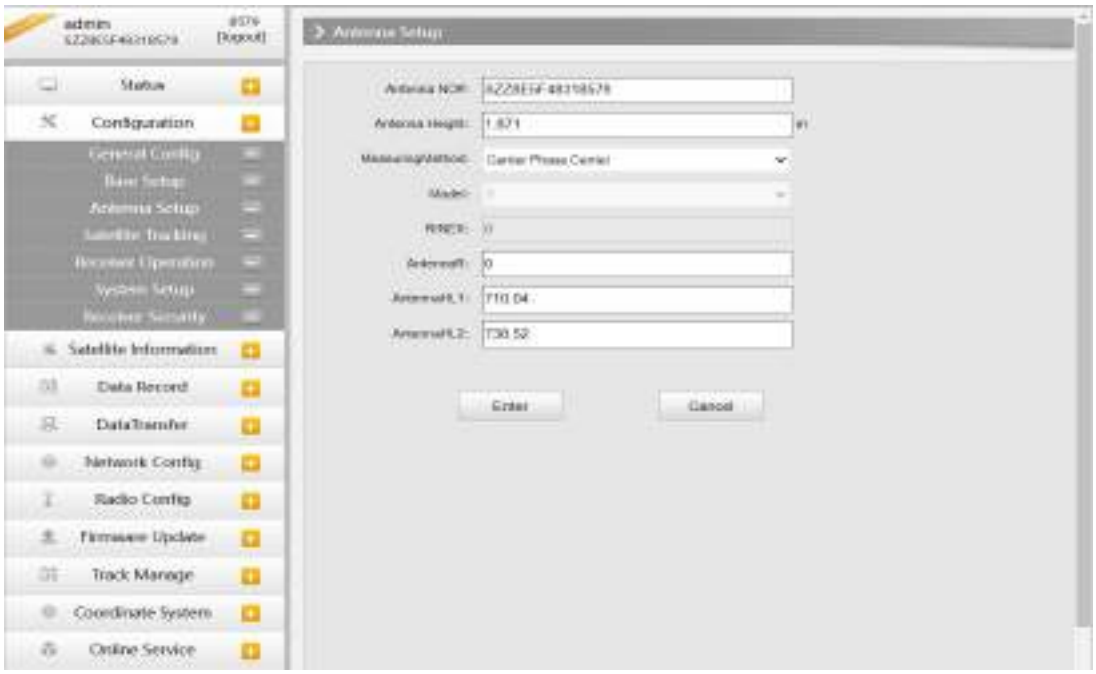
DifferInterval: Base differential transmit interval (seconds/once)

PDOP Value: This value is setup for the PDOP limitation.

Status: Here will display the status for base in real-time.

Antenna Setup

The antenna parameters are configured in this page including the antenna height, measuring method.

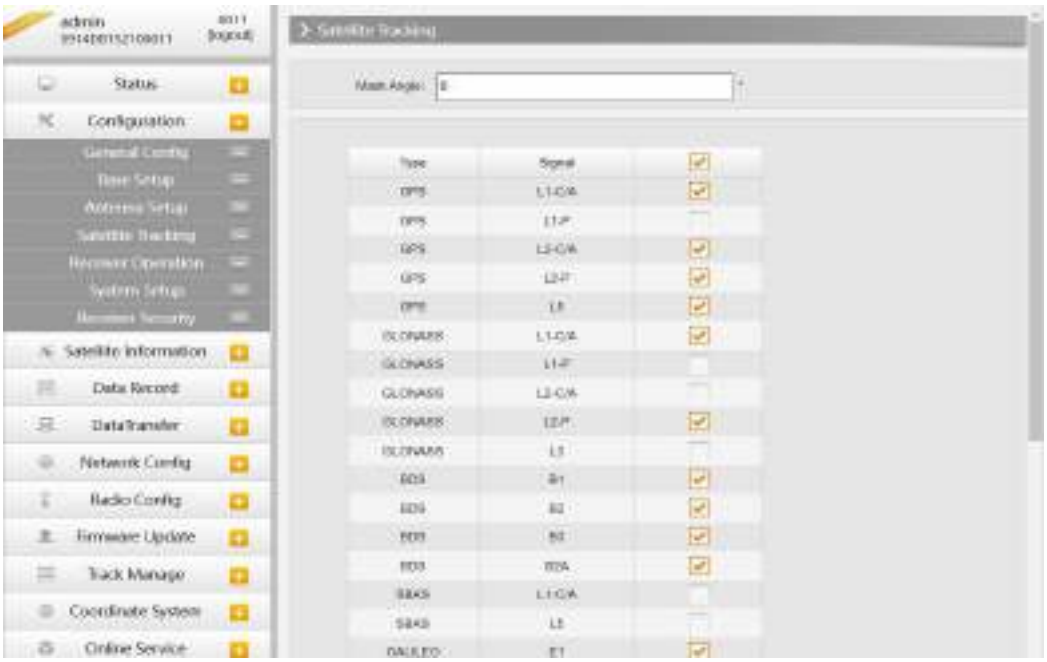


Antenna Height: This is the value for height of antenna while surveying.

Measuring Method: Here provides several methods for measuring the antenna height such as carrier phase center, slant height, antenna edge, height plate and to the bottom.

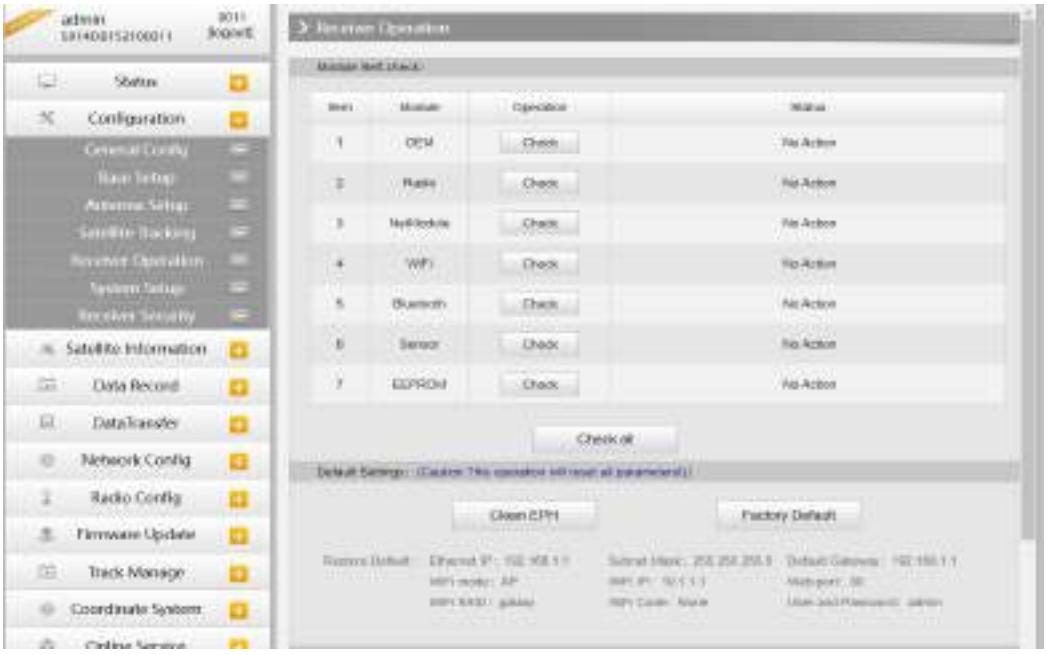
Satellite Tracking

In this page, users can define the mask angle for satellite tracking, and check on the box of corresponding band from the constellation that to use this band or not



Receiver Operation

The page provides all kinds of operations to control the receiver such as self-check operation, clean epochs, factory reset, reboot and power off.



Self-check: Users can also do the self-check from this configuration page, click on the Check all button to check all the modems or click on the check button corresponding to the modem to check one by one.

Clean EPH: Click this button to clear the remaining epochs to let recever track the satellites better.

Factory Default: Click this button to bring the receiver back to factory default setting.

Reboot: Click this button to restart the receiver.

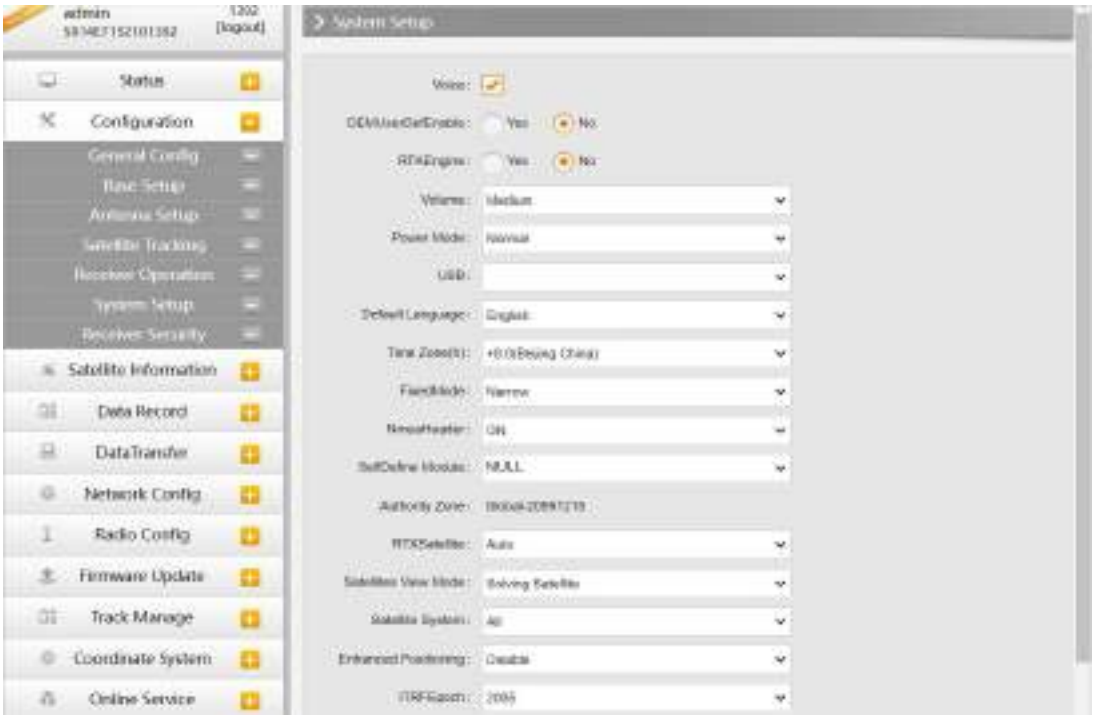
Power Off: Click this button to power off the receiver.

Reset OEM(cold): to reset OEM, and receiver will restart.

Reset OEM(hot): to reset OEM, receiver will not need to restart.

System Setup

This page is used to control Voice prompt, volume of voice, power saving, USB mode and the default language for receiver.



Voice: Check on this box to turn on the voice guide for ALPS1, uncheck it to turn off the voice guide.

OEMuserdefEnable: check “No” for ALPS1.

RTKEngine: check “No” for ALPS1.

Voice Volume: Define the voice volume for ALPS1’s speaker.

Power Mode: Configure the receiver to use the power saving mode or not.

USB: Now ALPS1 supports the USB mode and Network interface at the same time through the usb type-c cable.

Default Language: Configure the default language for ALPS1 which associates with voice guide.

TimeZone(h): Use this to setup the corresponding time zone for your country or area.

FixedMode: Some receiver has the option for fixed mode narrow or wide, but this option is not

working on ALPS1.

NMEAheader: Choose the output data header in GN, GP or HE format.

Self-defense module: To set a user-defined work mode and output mode for receiver. Usually please choose NULL.

Authority zone: Default means the default area. Global-20991215 means it can work in all around the world.

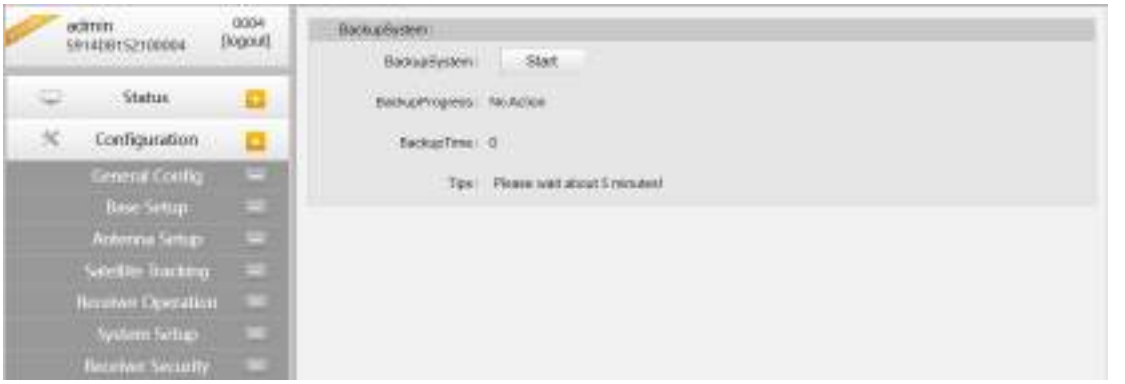
Satellites View Mode: There are two methods, Solving Satellite and Common Visible Satellite.

Satellites System: You can choose the different satellite systems in here.

Enhanced Positioning: It has a big influence for RTK when the ionosphere is active, so you can try turn on this feature.

ITRFEpoch: epoch selection, select an epoch at a different time based on the update time.

Receiver security: to backup the receiver system, so that we can use the backup system if the receiver has any problem.

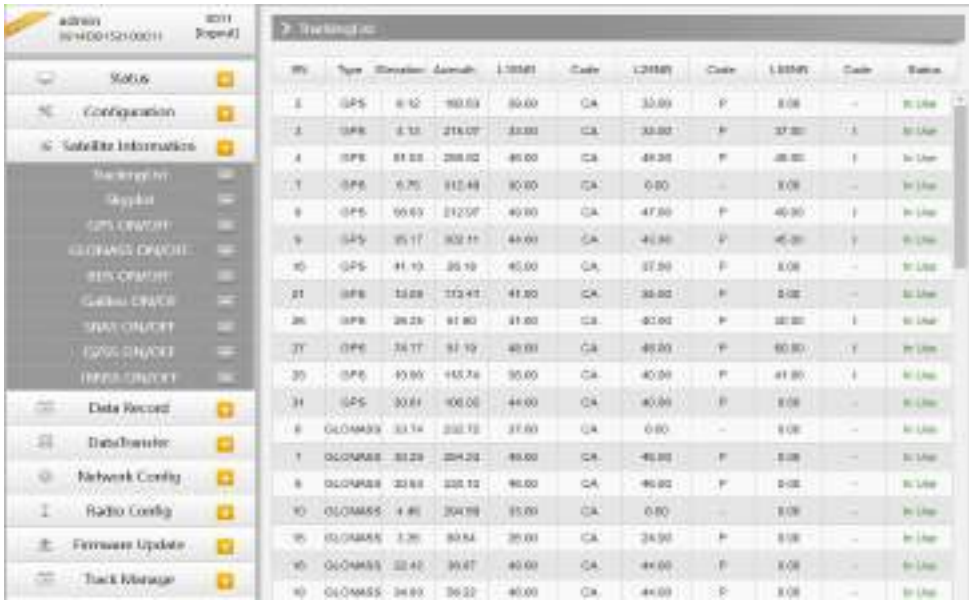


§3.4.3 Satellite Information

The “Satellite Information” provides all kinds of tables, graph and the skyplot to view the information of tracking satellites. And it is allowed to configure to use which satellite in constellation on/off page by checking on the corresponding box.

Tacking Table

Here is the table to list all current used satellites and the other information for these satellites.



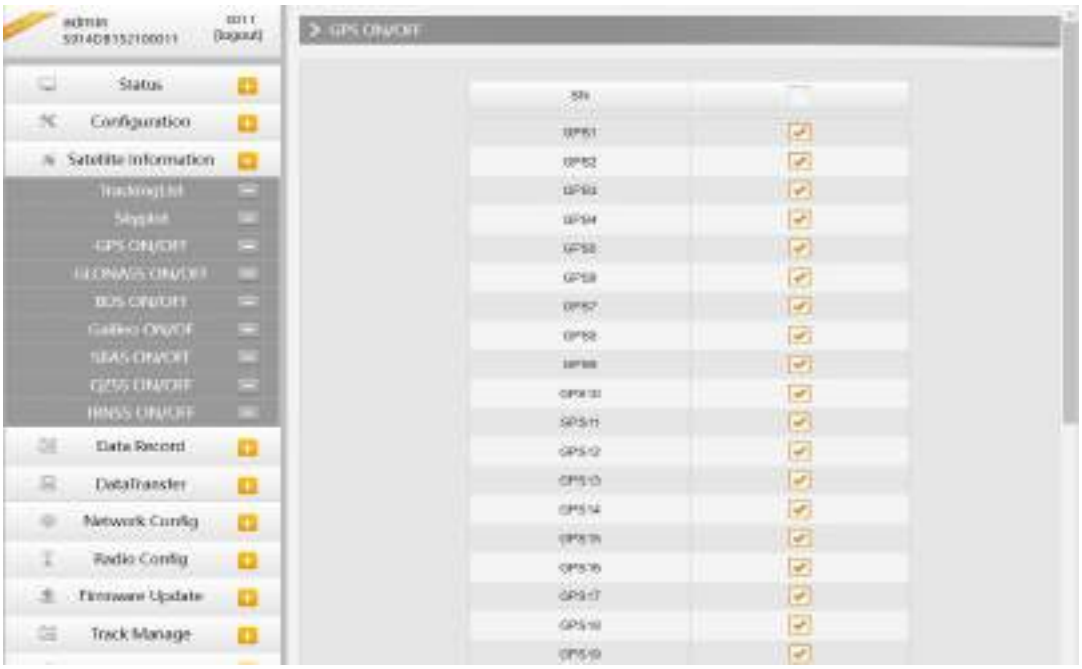
Skyplot

In this page, all the tracking satellires are shown on the skypolt, this let users intuitively view and know where the current position of satellite is.

GPS on/off

For all the running GNSS constellations or the augmentation system,ALPS1 allows to configure to use which satellite or not.

In gnss on/off page, all the running satellites are listed, and unselect the box corresponding to the satellite to not use it.



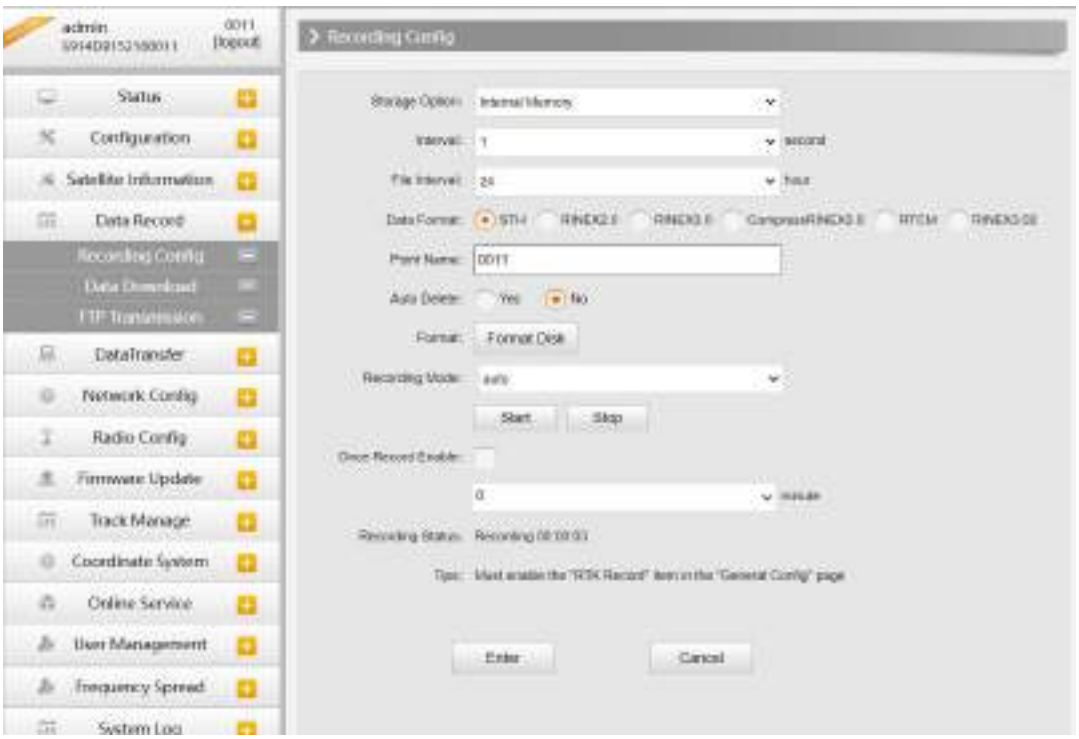
GLONASS on/off: to check and uncheck the satellites for tracking
BDS on/off: to check and uncheck the satellites for tracking
GALILEO on/off: to check and uncheck the satellites for tracking
SBAS on/off: to check and uncheck the satellites for tracking
QZSS on/off: to check and uncheck the satellites for tracking
IRNSS on/off: to check and uncheck the satellites for tracking

§3.4.4 Data Record

The “Data Record” performance is mainly used to configure all the parameters for receiver in static mode. Much more operations can be done on ALPS1 such as storage path, interval, data format and data files download.

Recording Config

The page provides more practical operations for raw data storage.



Storage Option: Here are the options to be selected for where the raw data will be stored, internal memory or external memory.

Interval: This is the sampling interval for data storage, 50Hz (0.02s) sampling interval now is available for ALPS1.

File Interval: This is used to defined the data storage time for the static file.

Data Format: Here are 3 options to selected for ALPS1 to store what kind of format data, STH, Rinex2.0 and Rinex3.0.

Point Name: A point name is required, the last 4 digits of SN is default setting for the point name.

Auto Delete: This is used to configured ALPS1 to delete the previous data files automatically if the memory is full.

Format: Click this button to format the internal memory for ALPS1.

Recording Mode: Here are 2 options to configure ALPS1 to record raw data automatically or not if it achieves the sampling conditions.

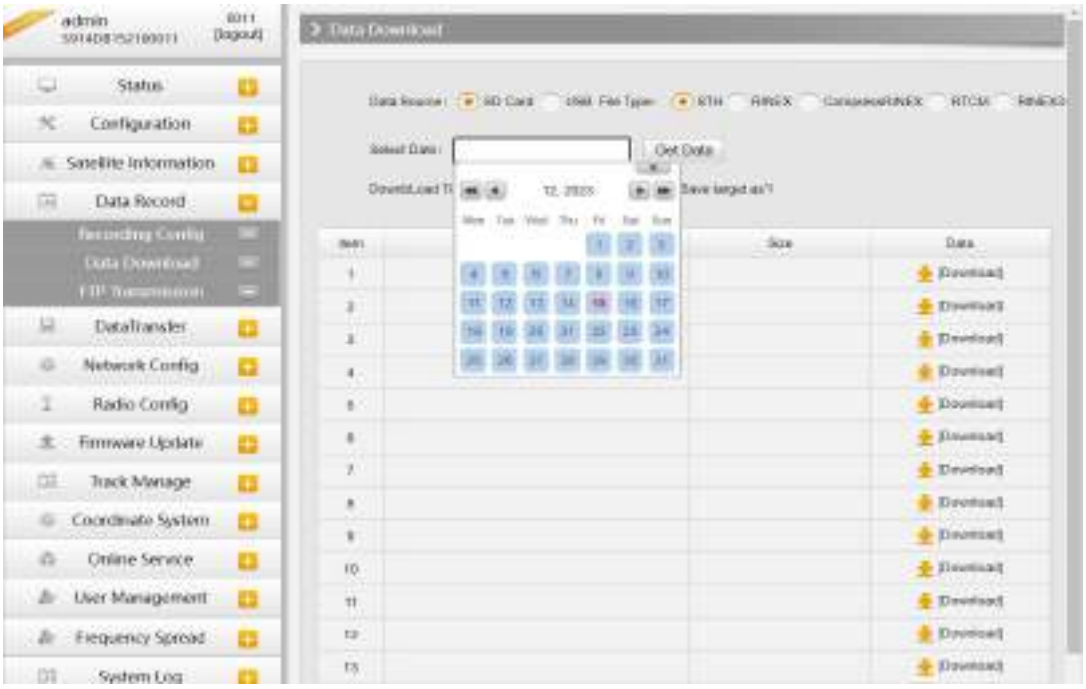
Once Record Enable: to set a Timer for static recording, for example if set 5 minutes, then the receiver will only record 5 minutes, after that receiver will stop record static data.

Recording Status: Here shows the status(time) of static data storage.

Data Download

This page provides the data files to download.

Choose the storage where the static data recorded, and file type, then click on the blank of "Select Date" to choose what date the data was recorded and click "Get Data" button, all the files recorded in the date you choose will show in the table, tap download button to download the data files.



FTP Transmission

FTP is a file transfer protocol.

ALPS1 via FTP protocol, as ftp client mode to automatically send static and dynamic files on receiver disks to the ftp server.

§3.4.5 Data Transfer

This performance contains General, Serial Port Config, TCP/IP Config, NTRIP Config and Data Flow Config. The “Data Transfer” allows to configure the output mode for raw observation data and differential data, as well as to the NTRIP performance configuration.

General

This page shows the service condition and the output contents of the ports, if the port item display in green, that means the port is being used, and the port is not used while the item display in red.

Serial port Config

This page is allowed to configure the baud rate, odd-even check and the data flow for serial port (5-pin port) and Bluetooth.

CAUTION: do not change the default value in this page for each item, if you want to change the settings, please contact with SOUTH technician for further support.

In the dropdown list of data flow, there shows 4 items for selection.

Raw observation data: This is the raw observation data straight from OEM board.

Correction Data: This is the correction data straight from OEM board.

Navigation Data: This is the navigation data output from receiver such as NMEA-0183, GSV, AVR, RMC and so on. It is configured in Data Flow Config page.

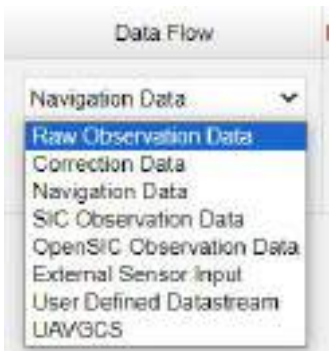
SIC Observation Data: This is the user-defined format observation data from SOUTH.

OpenSIC Observation Data: This is the open version of SOUTH user-defined format observation data for secondary development.

External Sensor Input: The Data that input via an external sensor.

User Defined Datastream: You can choose this option when you want to defined datastream.

UAVGCS: UAV data format.

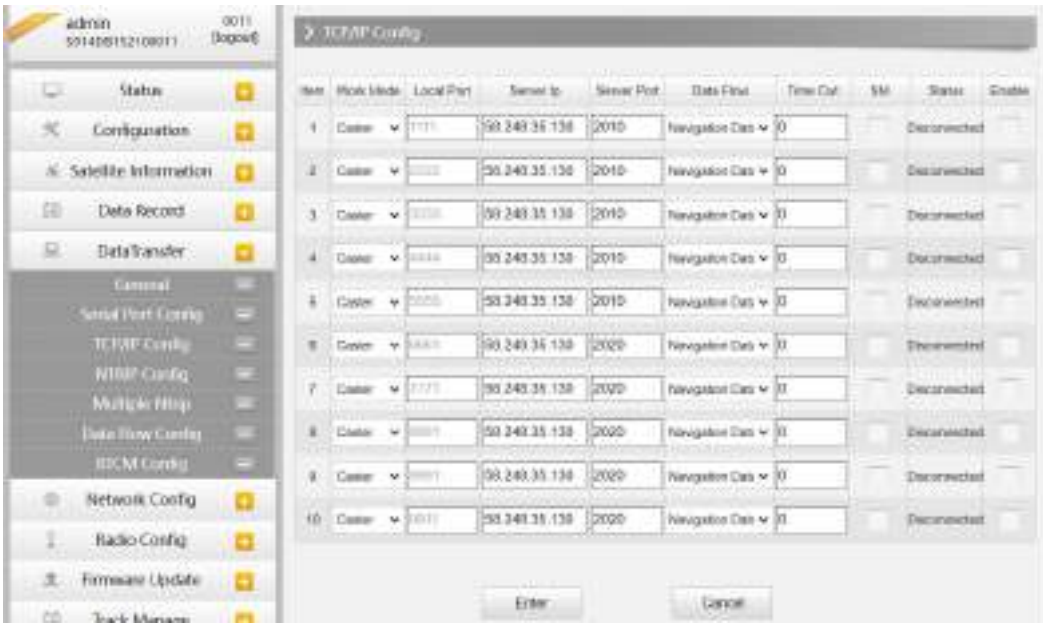


TCP/IP Config

This is used to configured the raw data or navigation data to be uploaded or transferred to a server. And there are Caster and Server working mode for this performance.

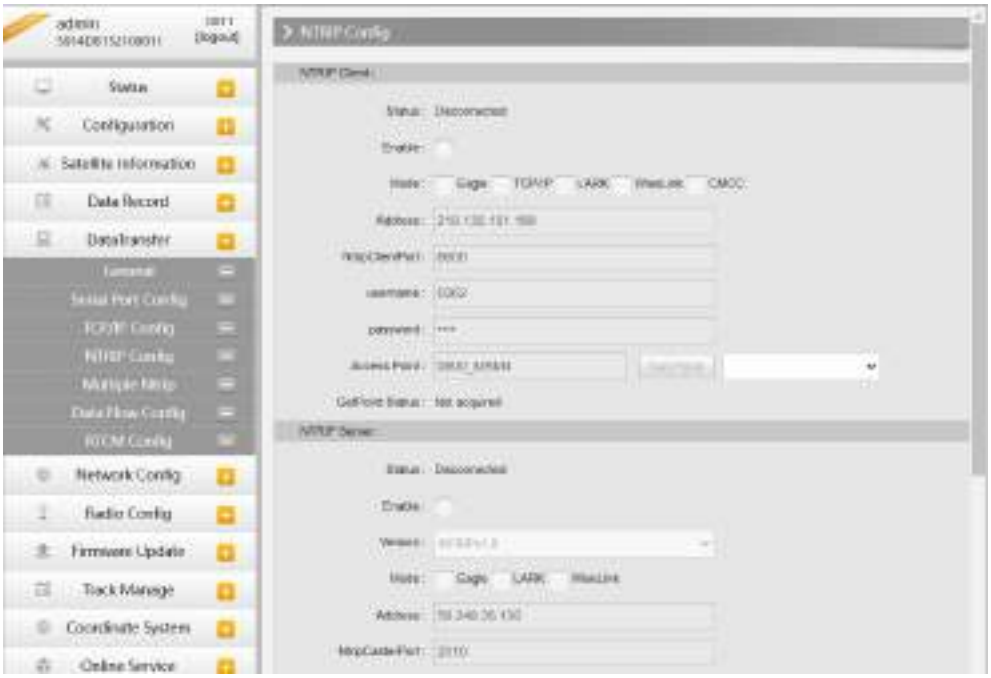
Caster: If this working mode is selected, ALPS1 will be a client to upload the data to a specify server if it connects to the internet by WIFI. Input the specified IP and port for server, and the data format what is uploaded. Then users are able to see the uploaded data on server.

Server: ALPS1 will upload the data onto internet by the static WIFI if server is selected, then users are able to obtain its dynamic data by accessing to ALPS1 through the IP from receiver.



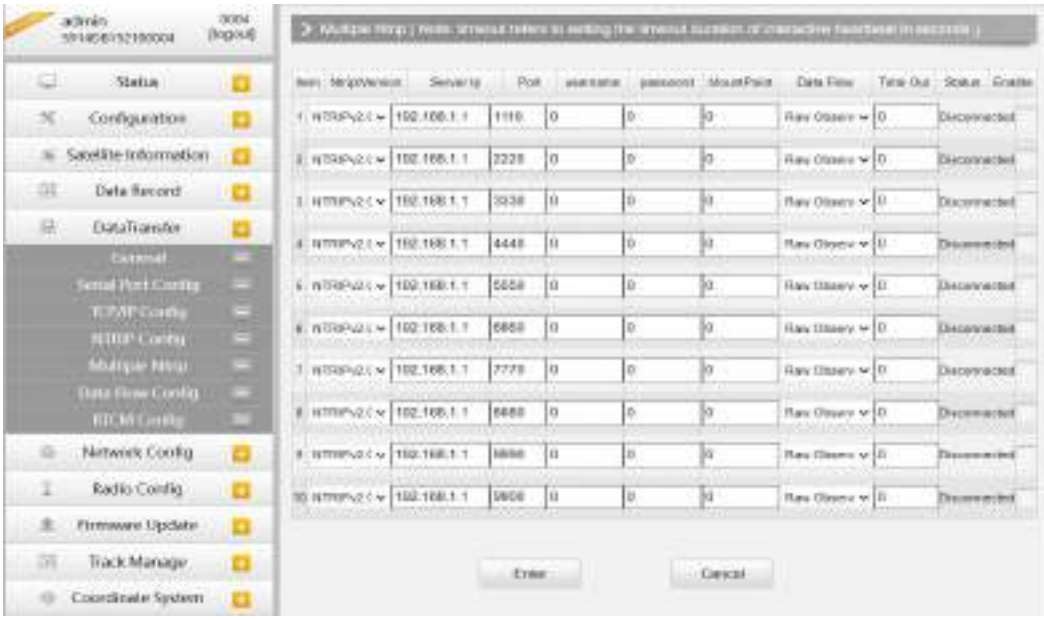
NTRIP Config

This is used to configure the NTRIP performance while receiver is going to connect to internet. ALPS1 supports complete NTRIP performance including NTRIP Client, NTRIP Server and NTRIP Caster.



Multiple Ntrip

To transmit corrections to different server at the same time through Ntrip protocol



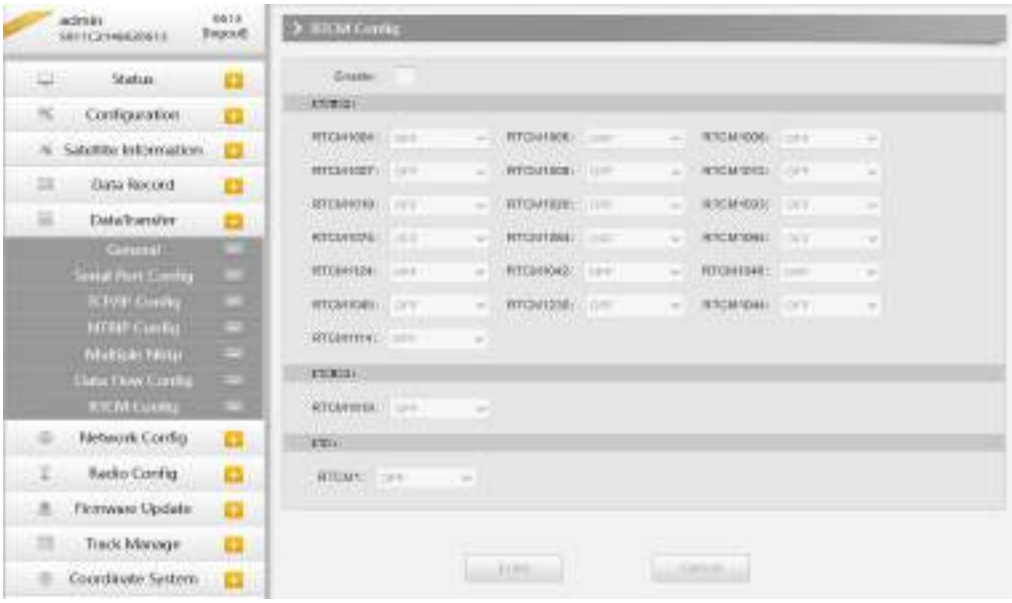
Data Flow Config

In this page, users can optionally to configure the content and the update rate of data flow that to output or not to output what kind of data format.

Click on the dropdown list for each data format to define the update rate

RTCM Config

In this page, users can set different differential signal formats.



§3.4.6 Network Config

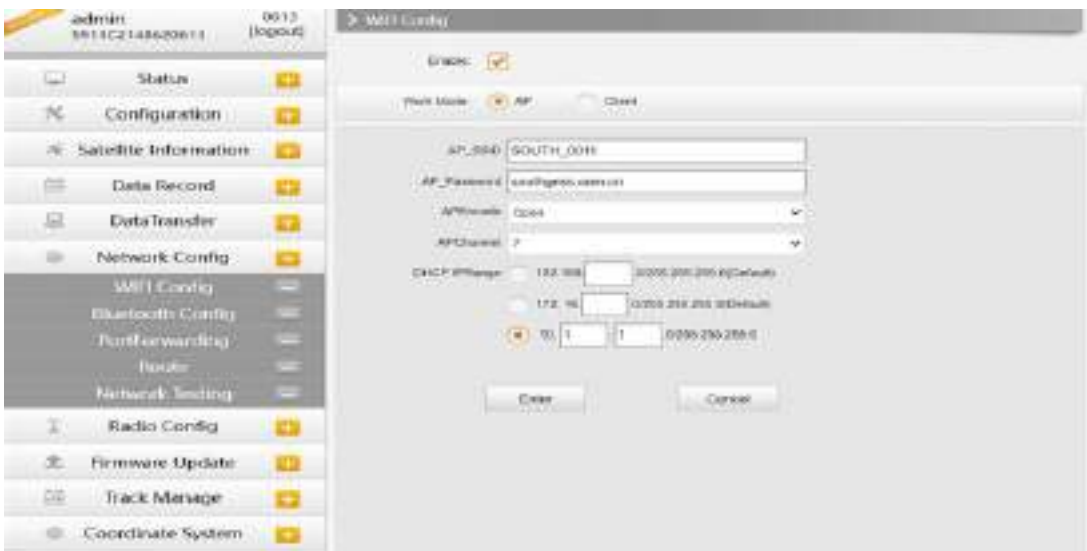
WIFI Config

This is mainly used on the WIFI configuration for ALPS1, there are AP mode and Client mode for optional.

AP: This is used to enable the WIFI hotspot for ALPS1 to broadcast for mobile terminals such as smartphone or tablet to connect and access the Web UI.

Check the box of AP in Work Mode to enable the WIFI hotspot forALPS1, and define the SSID, password, encryption method and broadcasting channel for WIFI connection.

DHCP IP Range: This is allowed to user-defined the IP for Web UI login.



Client:

This option enables ALPS1 to search and connect the other WIFI hotspot which connects to the internet, the receiver is able to download and use the mountpoint from reference station.

Client_SSID: This is the WIFI hotspot which ALPS1 is going to connect

Scan: Click this button to search the surrounding available WIFI hotspot.

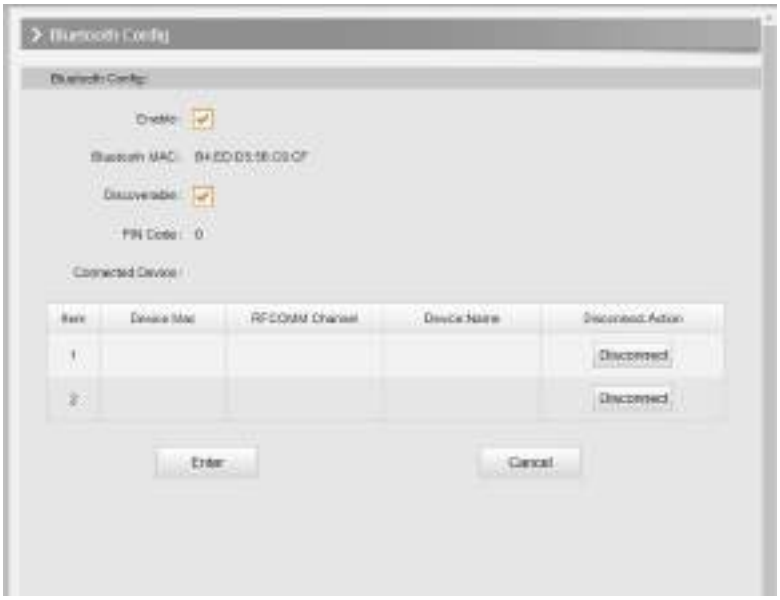
Password: This is the password which the WIFI hotspot requires.

IP fields: If ALPS1 successfully connects to the WIFI, there will be an LAN IP address generated by ALPS1.

ClearSSID: Click this button to clear the SSID list.

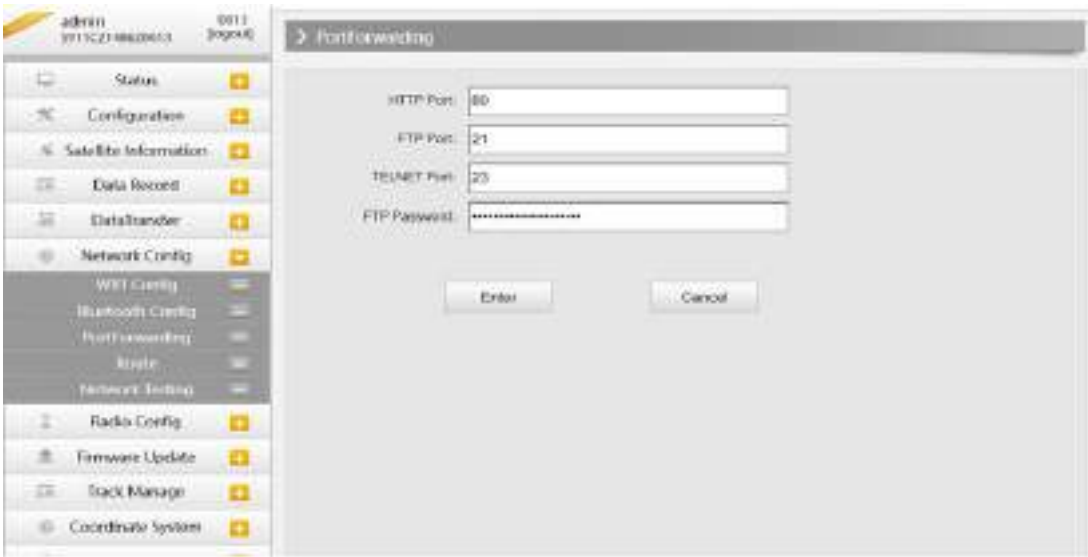
Bluetooth Config

In this page, users can view the information and connection status of Bluetooth, such the MAC of Bluetooth, discoverable or not, the PIN code, and the connection devices in following table. The advanced Settings module enables Bluetooth search.



Port Forwarding

This page is mainly used to view and configure the internet transmission port for ALPS1, customize and debug receiver.



NOTE: Usually we will keep the default setting in this page, if you would like to modify it, please contact with SOUTH technician for more supports.

Route

This is mainly used to view and configure the parameters for router, only under the condition of customize and debug receiver.

NOTE: Usually we will keep the default setting in this page, if you would like to modify it, please contact with SOUTH technician for more supports.

Network testing

In this page , after entering the IP address, the user can query the network status.

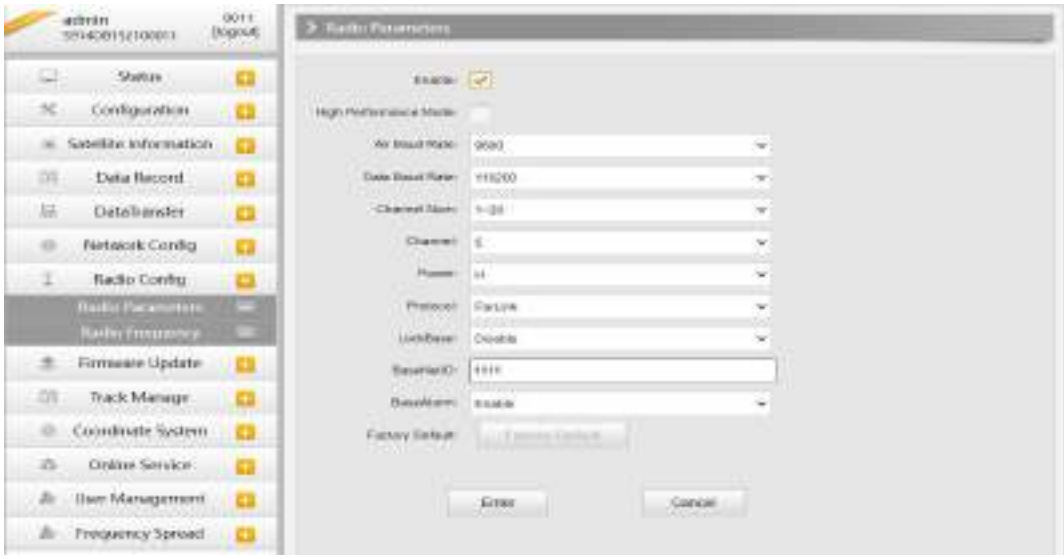
§3.4.7 Radio Config

As the name implies, the parameters of radio can be done in “Radio Config”, it is divided into

Radio Parameter and Radio Frequency.

Radio Parameter

This page is mainly used to configure the parameters for internal radio module of ALPS1.



High performance mode: To increase the radio performance in the forest and harsh environment, both Base and Rover should be enable this function at the same time, and the protocol should be farlink. If Rover doesn't support Farlink protocol, then the Base should disable this function, otherwise Rover cannot get fixed solution. Usually we suggest clients disable this function.

Air Baud Rate: This represents the data transmission rate in the air of internal radio, the higher value, the bigger of data size transmitted per second, usually keep the default setting with 9600.

Data Baud Rate: This represents the rate of data transmission port of internal radio. The rate should be the same in both Base and Rover. In general, the data baud rate of SOUTH radio module has been unified to be 19200, keep it as default.

Channel: This is the communication channels for internal UHF, the value of the channel must be the same both in Base and Rover.

Power: This appears only in Base mode, the radio transmitting power is allowed to define in High, Middle or Low power.

Protocol: This is radio communication protocol for data transmission, SOUTH (SOUTH) ， Farlink and TRIMTALK are optional in this page and SOUTH is the default setting, if it is changed, Base and Rover must use the same protocol for communication.

LockBase: If users choose FarLink protocol, the signal sent when the base station connects to the mobile station will be locked and will not be interfered by other base stations.

BaseNetID: If enable the LockBase, then you can input the ID of the Base you will receive.

BaseAlarm: If Base receiver moves(by some unexpected reasons), rover will receive a

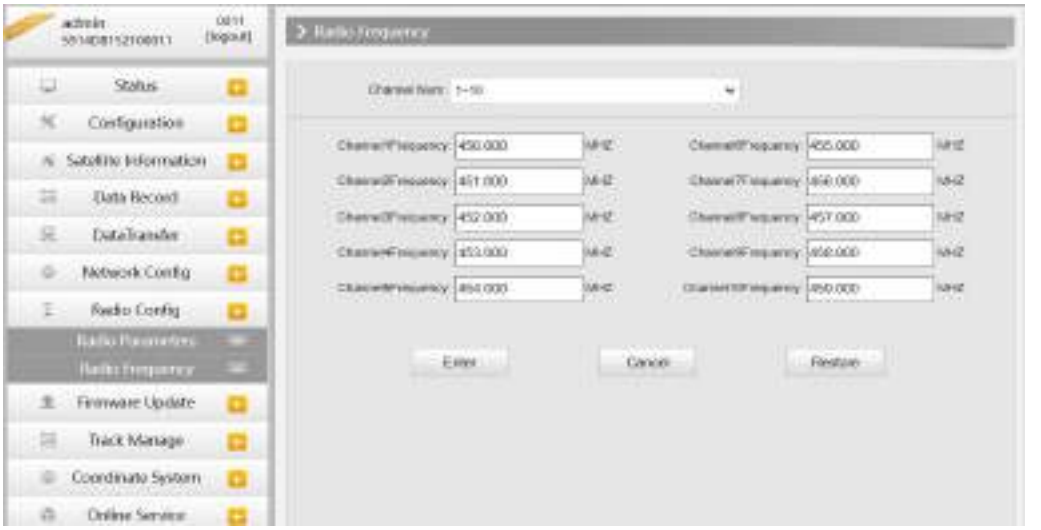
notification about the base movement.

Factory Default: Click this button to restore the factory default for internal UHF module.

Radio Frequency

For ALPS1, the powerful internal radio module supports much more radio channels apply to the legal frequency in different countries or areas.

There are 16 radio channels listed in this page after clicking on radio frequency. Users are able to change the frequency freely in the channel spacing, click Restore button to bring the frequency of each channel back to default setting.



§3.4.8 Firmware Update

Update the latest firmware for receiver or for corresponding modems can be done in “Firmware Update”.

Firmware Update

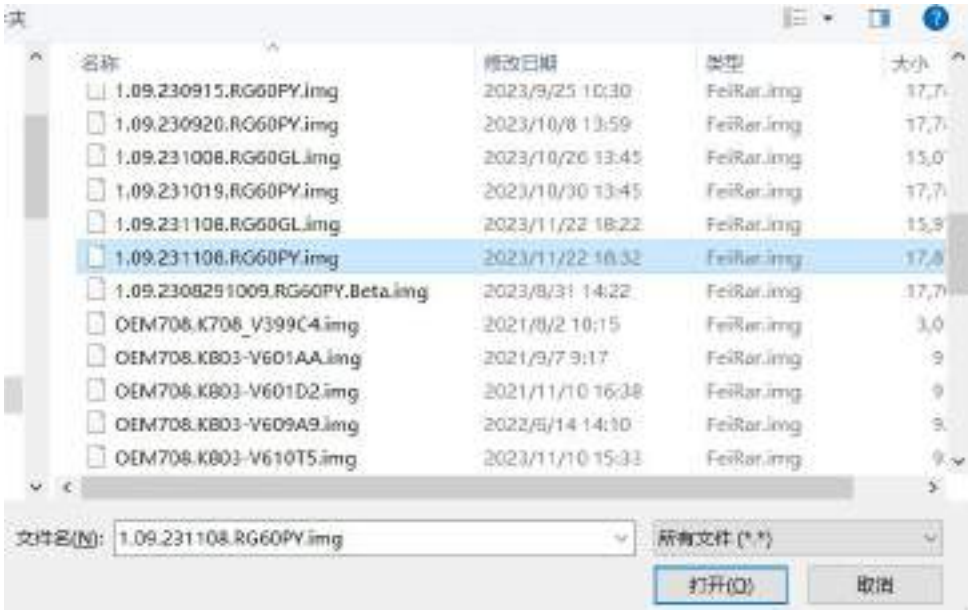
This page displays all the information of the firmware which current installed on ALPS1, and allows to update the latest version firmware for receiver. To get latest version firmware please contact with SOUTH technician.

Online Update:ALPS1 supports to update the firmware online anytime if there is something update or optimized.

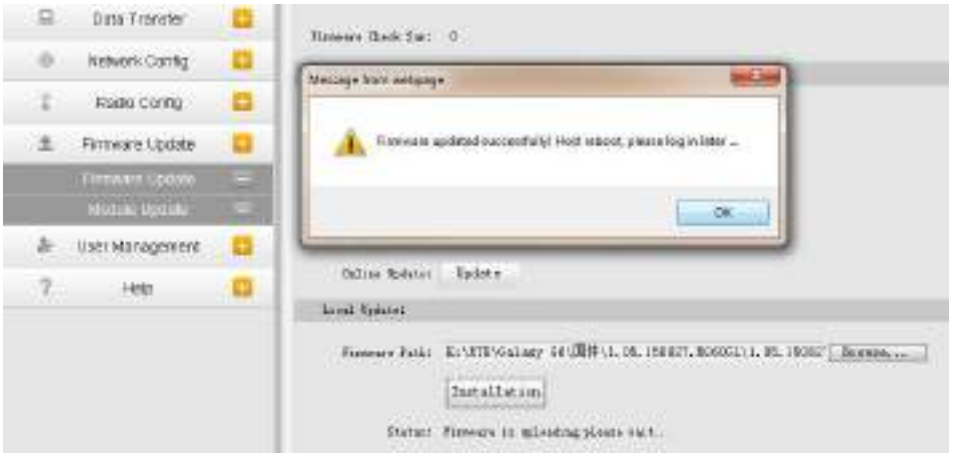
Local Update: Update the latest firmware by using a firmware file.

How to upgrade the firmware with Local Update

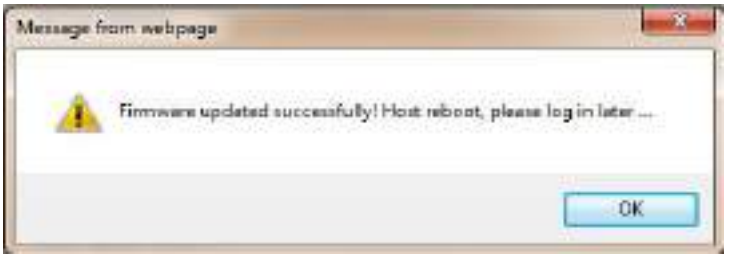
a) Click on “Browse” button to load firmware file (Please take in mind that the firmware is ended with .img as the extension name).



b) And then click “Installation” button to start upgrading.



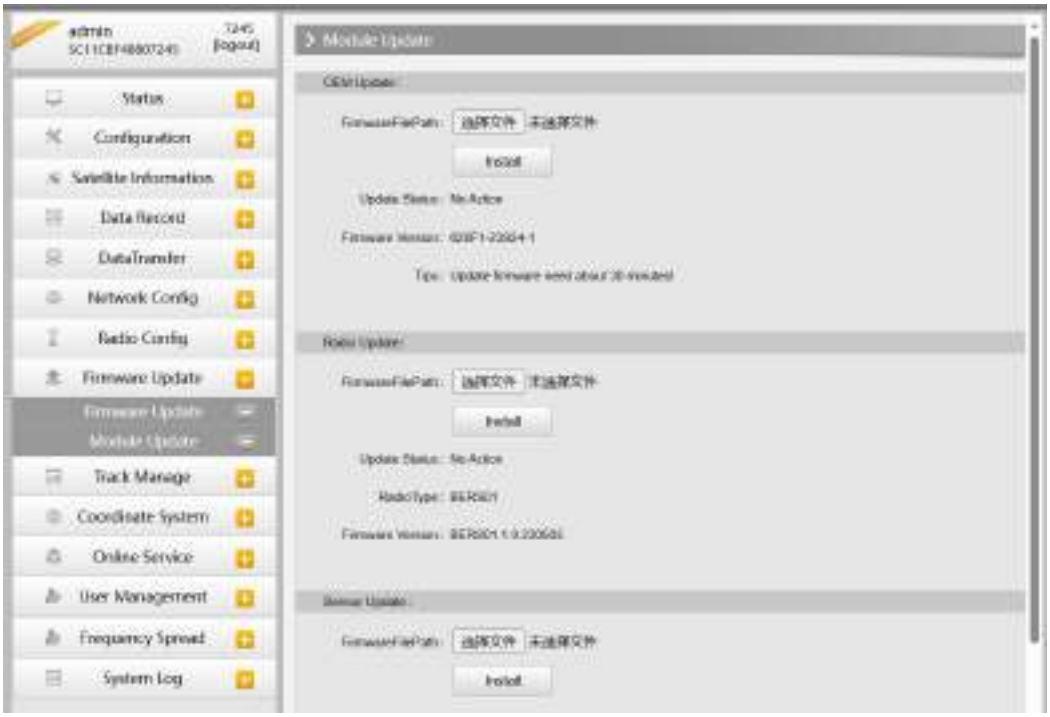
c) After the firmware is completed upgrading, a dialog will appear saying “Firmware updated successfully! Host reboot, please log in later…”, then the receiver will restart automatically.



SPECIAL REMIND:ALPS1 doesn’t support to update the firmware with the help of INstar program any more, in the future, update the firmware for ALPS1 shall be done through the Web UI.

Module Update

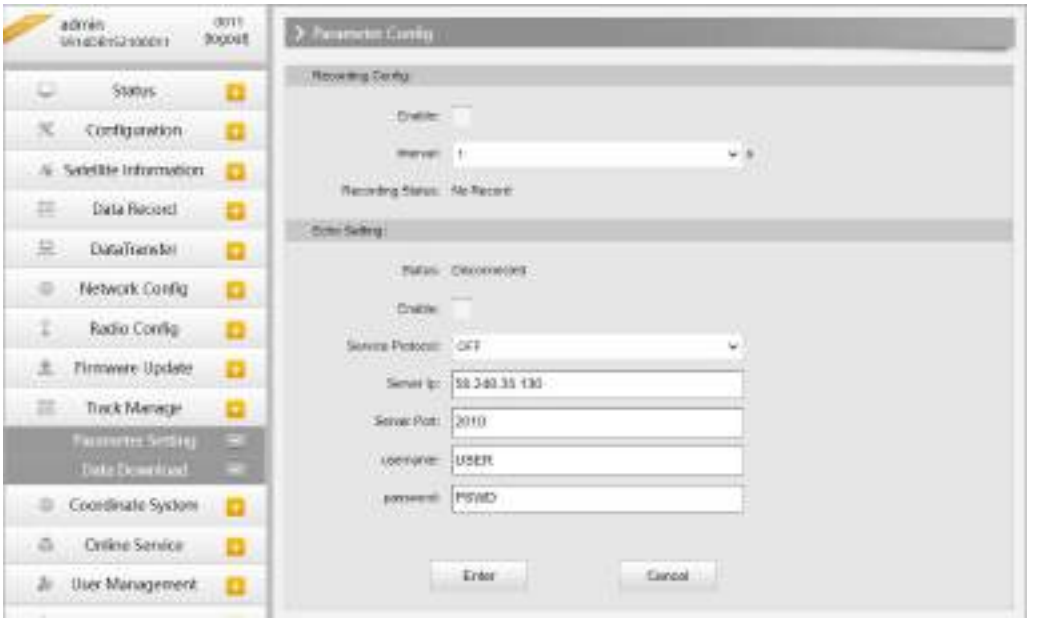
This page is used to update the firmware for corresponding modem such as OEM board, radio module and sensor.



§3.4.9 Track Manage

ALPS1 now supports to record the track while doing measurement, and upload the data onto the server.

Parameter Setting

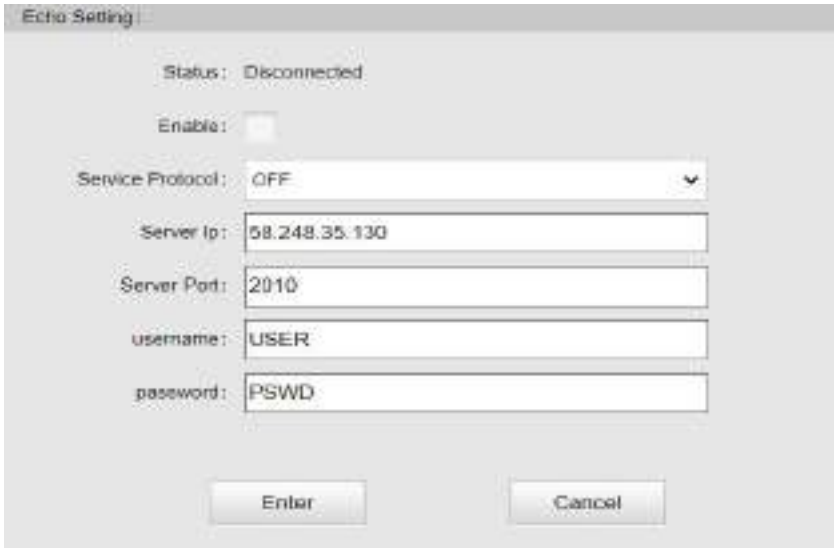


Record Setting

Check on the box of "Record Enable" to activate track recording function, and choose a proper recording interval in dropdown list of "Record Interval".

EchoEnable Setting

This configuration dialog is used to upload the recording data to a server in real-time.



Data Download

On this page, users can download the track data file from receiver. Choose the recording date and click “Get Data” to load all the data files recorded at that day, then choose the files and click download button.

§3.4.10 Coordinate System(reserve)

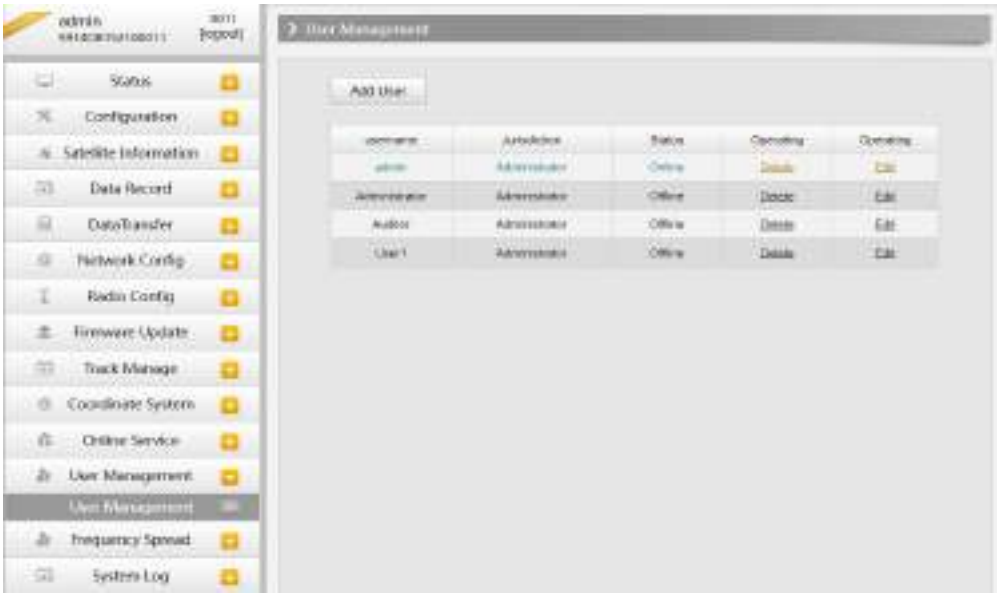
ALPS1 allows users to setup the local coordinate system on internal web UI management. The instrument would output the local coordinates according to this coordinate system.

§3.4.11 Online Service(reserve)

This function is to upload the data onto a server real-time, including Navigation data, raw observation data, correction data, SIC observation data and open SIC observation data, basic information data.

§3.4.12 User Management

This page is used to manage the authority of login Web UI for users, including the username, password and add users.

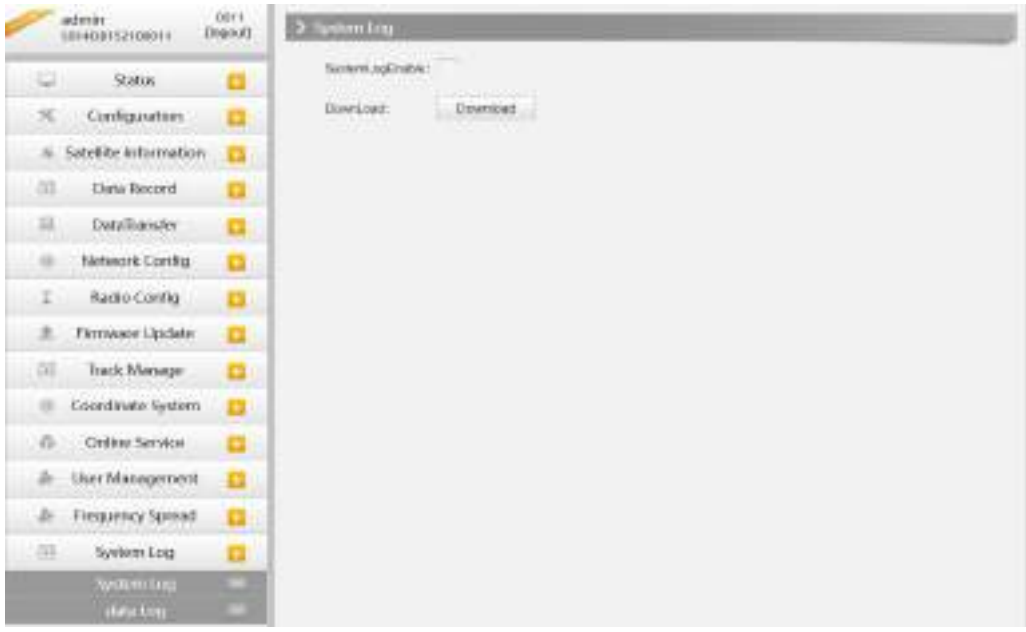


§3.4.13 System log

System log

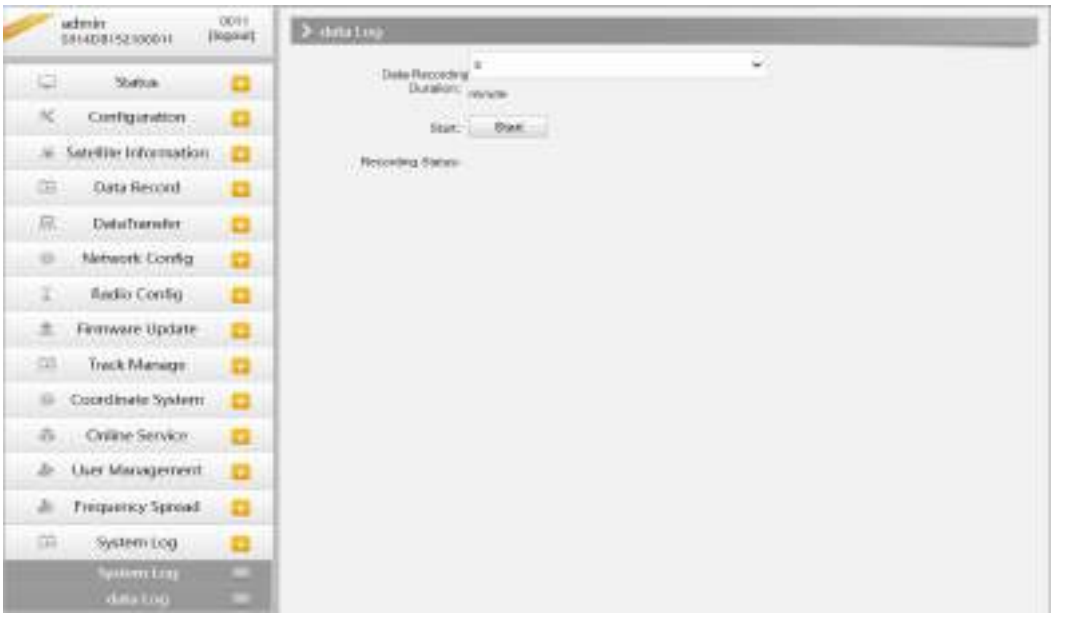
In this page, users can download the system log book of receiver (the log book can help to backtrack the working status of receiver).

NOTE: Only the administrator can modify any parameters for receiver and manage users, and the ordinary users only have the right to view the relative parameters.



Data log

In this page, users can record data and choose duration.



Chapter 4 New functions

§4.1 AR Stakeout

Augmented Reality (AR) stakeout revolutionizes conventional surveying methods by integrating various sensory modalities, including visual and auditory. This approach eliminates the proficiency gap between experienced surveyors and novices by providing real-time visual guidance within authentic environments. Additionally, voice prompts are employed when nearing designated targets. This streamlined process allows surveyors to stake out targets without the need for leveling the pole, relying on visual and auditory guidance for precise stakeout each time.

This function must be tilt survey initialization. After completing the tilt survey initialization, select the point to be lofted, click the [AR] icon on the right side of the screen, and then lofted according to the direction and position displayed on the interface. (Note that the direction of the device camera is the same as the direction of the controller)

WIFI connect

Use wifi connection to connect to the device. The device is connected to CORS to achieve a fixed solution.

IMU activation

Click the "Point stakeout" function, select a point and turn on the tilt survey function. Shake the device as prompted to initialize the tilt survey. (Note that the pole height is consistent with the actual pole height)

After the initialization page is displayed, perform initialization as prompted. After the initialization succeeds, the tilt measurement icon is displayed as follow.

Choose point and open AR

Click the AR icon to realize the real scene lofting.

Over 10 meters (default) use the rear camera for orientation, after approaching to switch the bottom camera real scene to find points;

§4.2 Photogrammetry

ALPS1 visual positioning broadens the scope of RTK applications through the synergistic integration of photogrammetry and RTK positioning technologies. With an 8-megapixel camera, “Fast” IMU and the latest positioning algorithm, ALPS1 is adept at capturing and processing images or videos to derive precise coordinates. Therefore, it excels in surveying targets that pose challenges for traditional methods, including intricate corners beneath roofs, obstructed fields, and bridges spanning rivers. This capability enhances surveying versatility, allowing for the efficient and accurate surveying and mapping of locations that were previously difficult to access with RTK surveying techniques.

When surveyors have a high-quality internet connection, they can process image data online through the network and cloud servers. ALPS1 can obtain coordinate data for image measurements with 2cm accuracy in just a few minutes. This processing mode balances high accuracy and fast processing speed.

When outside the coverage area of internet, surveyors can achieve offline processing of image data through the data controller app. This processing mode boosts the fastest processing speed by saving time of uploading image data, providing 4cm accuracy results within 30 seconds.

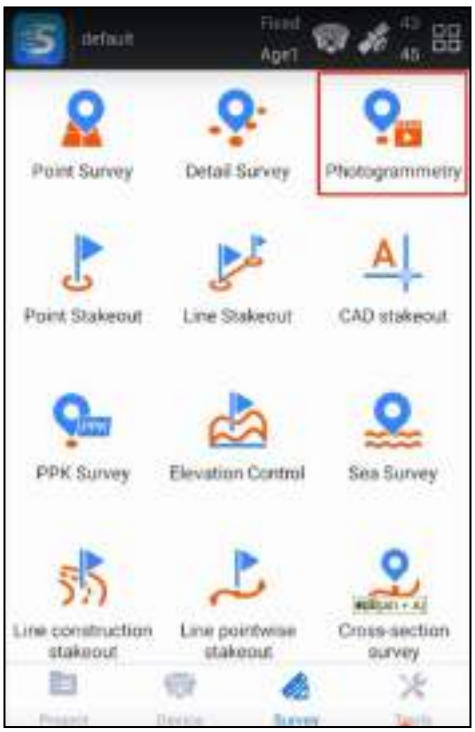
There are three modes for you to choose from：‘Takin Photos Mode’、‘Taking Videos Mode’ and ‘Modeling for Post-processing’. Use ‘Taking Videos Mode’, keep the target inside the frame, take at least 5 photos around or in a circular motion, with a walking distance of more than 2 meters.

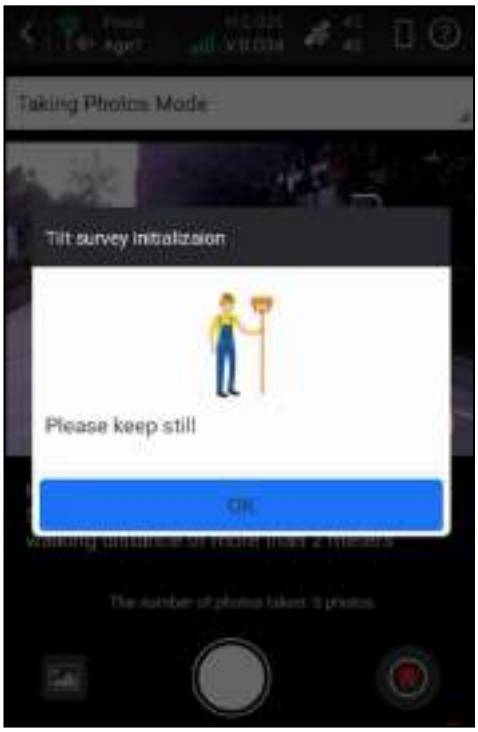
Use ‘Taking Videos Mode’, click to start shooting, keep the target to be measured in sight, walk horizontally or in a circular motion to shoot video for at least 5 seconds, and walk more than 2 meters. Click to end the shoot.

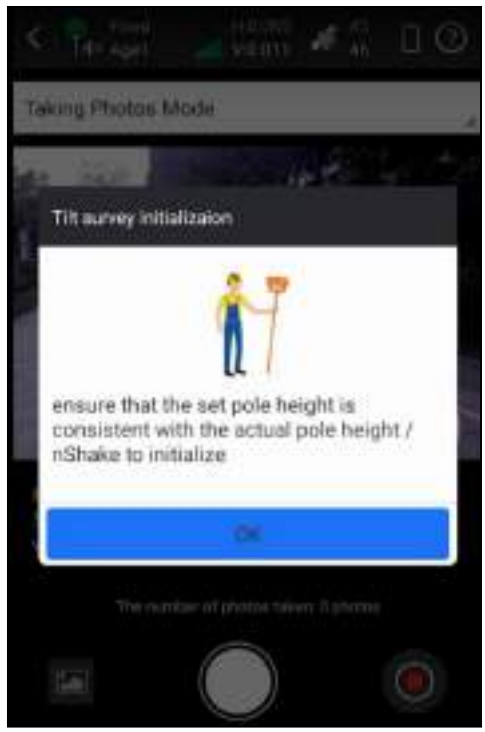
Online solution

1) Use wifi connection to connect to the device. The device is connected to CORS to achieve a fixed solution.

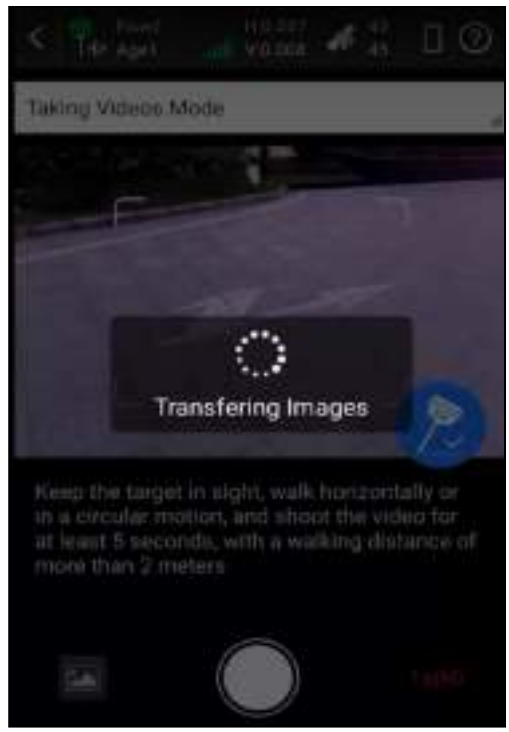
2) To enter photogrammetry, this function needs to be combined with the tilt survey function. If the tilt survey function is available, shake the device as prompted to initialize the tilt survey. (Note that the pole height is consistent with the actual pole height)





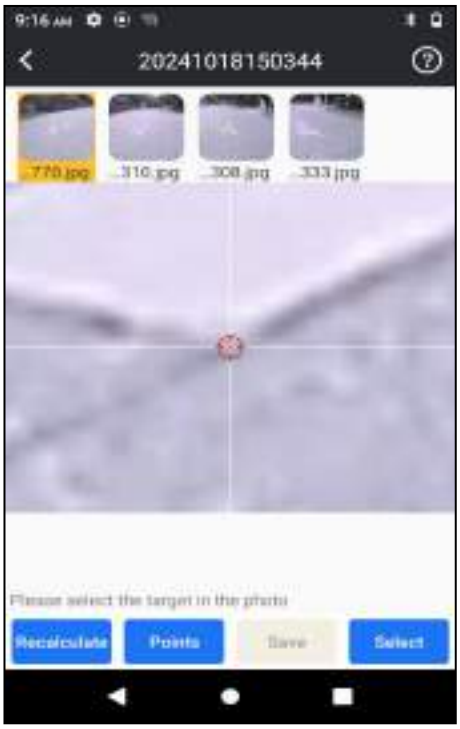


3) There are three modes for you to choose from： ‘Takin Photos Mode’、‘Taking Videos Mode’and ‘Modeling for Post-processing’. Use ‘Taking Videos Mode’, click to start shooting, keep the target to be measured in sight, walk horizontally or in a circular motion to shoot video for at least 5 seconds, and walk more than 2 meters. Click to end the shoot. (Photo transfer in progress: The picture taken by the device is being transferred to the controller)



4) Click OK to perform the upload server calculation. (The calculation time is related to the number of uploaded pictures, the more pictures, the longer it takes)

5) After the solution is completed, click OK, select three pictures, select the same target point, you can calculate the coordinates

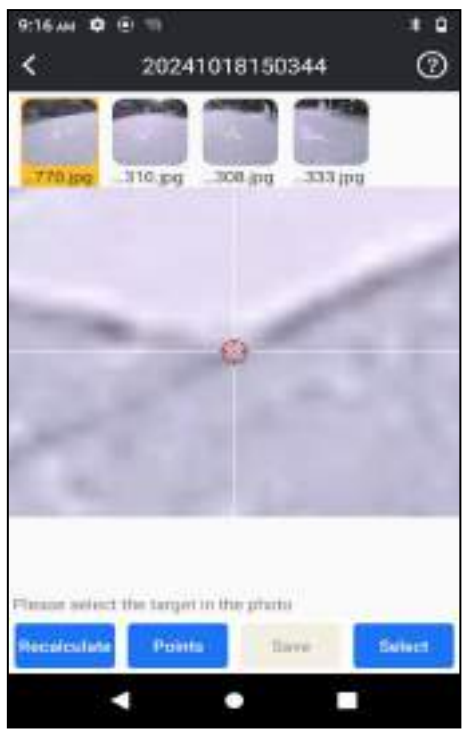


Local solution:

This feature can be used when the controller or phone without SIM card or cannot access the internet, not need to upload images or videos to the server for processing and calculate. The calculate is done solely by the device's processor, you can use the photogrammetry to be performed normally even in areas without internet access, greatly convenience work in difficult environments.

1) Photogrammetry when the device does not have Internet access.Click Click on top right corner in main page for Photogrammetry, then choose Solution method.

2) After online solution successful, if you want to offline recalculate, choose Select photos when enter Image Gallery, click bottom-left Recalculate then choose Local Solution.



3) After online solution failed, if you want to if you want to offline recalculate, choose Select photos when enter Image Gallery, then click Local Solution.

SOUTH's 3D modeling technology are fully utilized and transformed in ALPS1. The results of image measurements by ALPS1, can be seamlessly integrated with data outcomes from UAV.

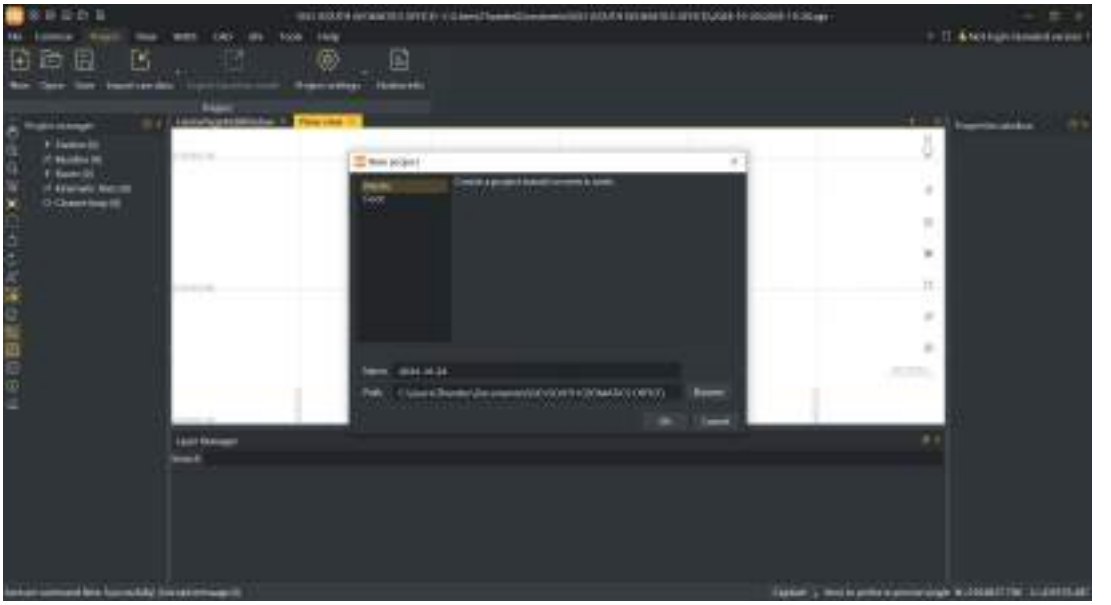
UAV surveys often face challenges of data gaps, leading to incomplete model outcomes. In such cases, surveyors can use ALPS1 to collect image data on the ground and use SGO to modeling then incorporate it into aerial survey data as a supplement, thereby enhancing the overall model outcome.

UAV Survey for SOUTH building, Lion statue detail lost

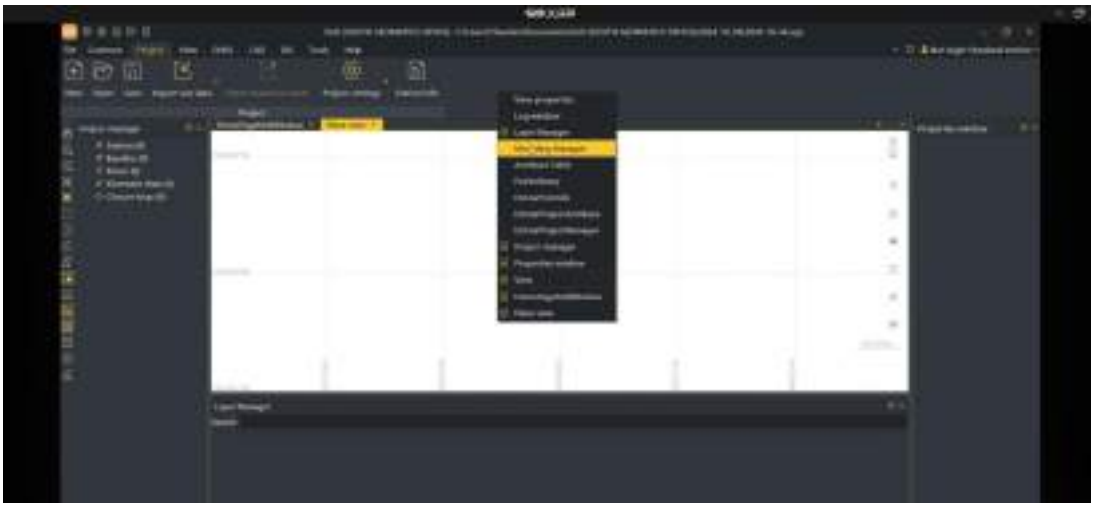
ALPS1 scan the Lion statue

Detailed steps:

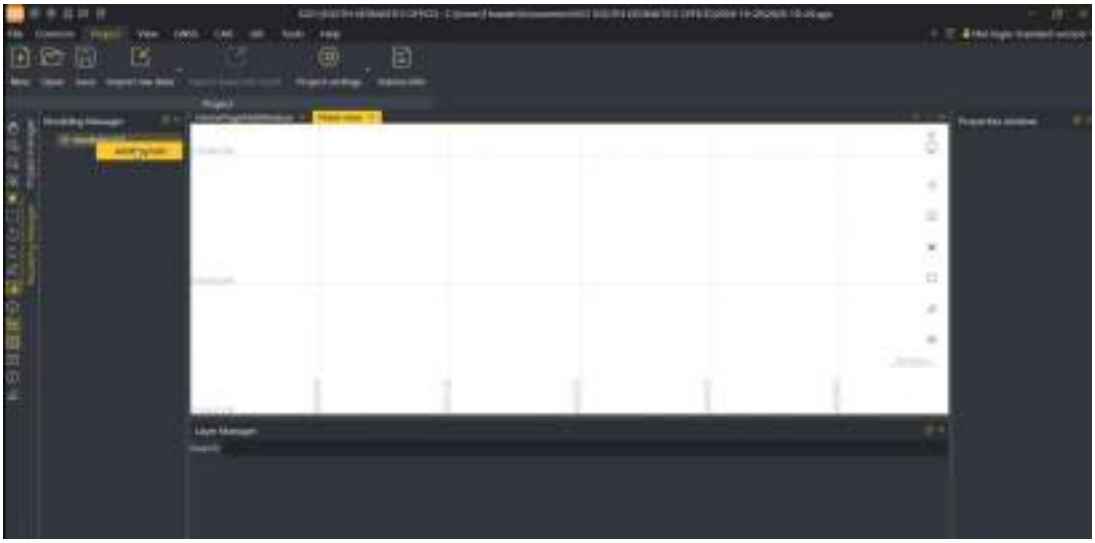
1) New project in SGO.

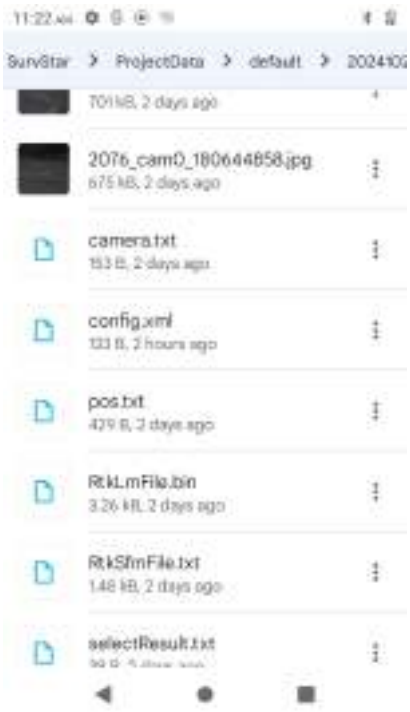


2)Right-click Toolbar area to choose Modeling manager.

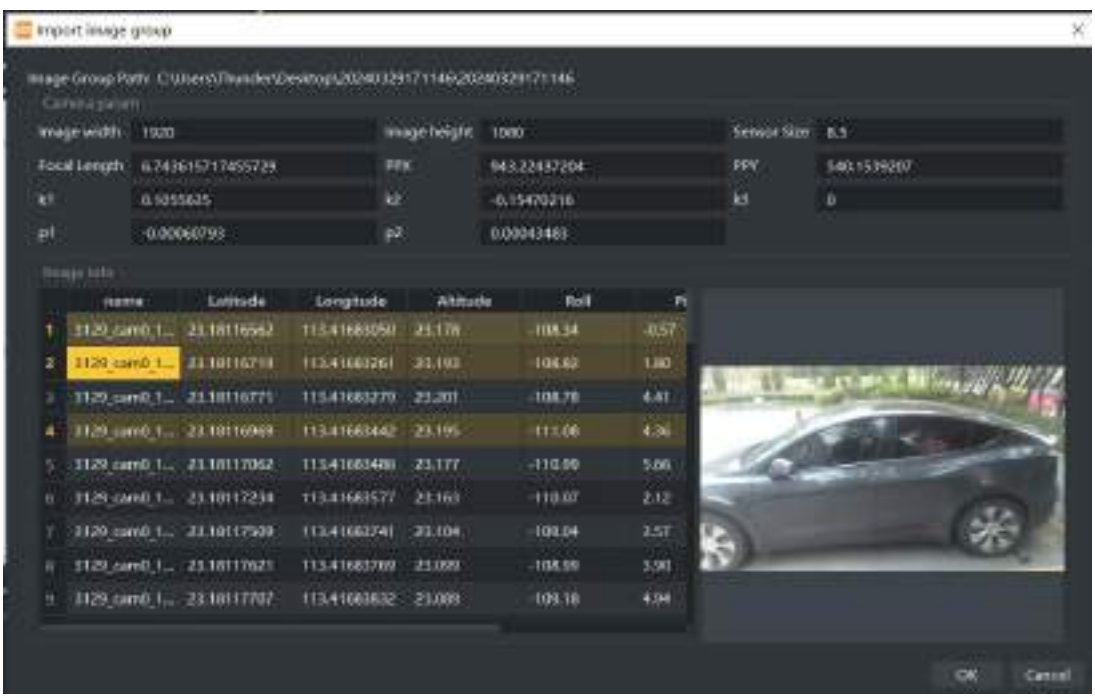


2) Right-click Modeling manager to choose photos folder. In Survstar-projectdata-default.

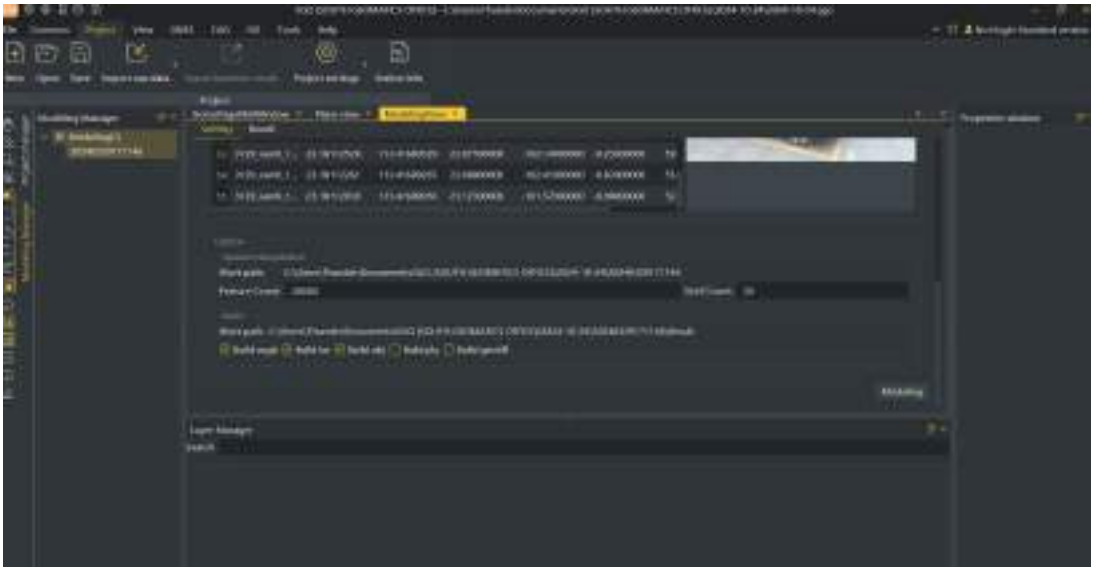


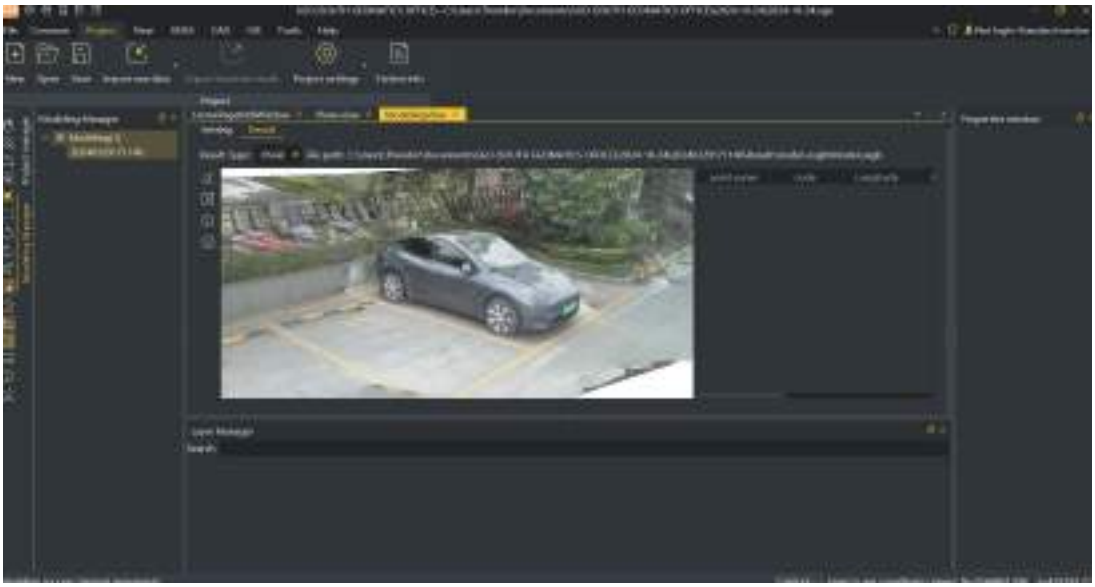


4) You can setting the parameters and preview photos in Import image group page.



5) Click Modeling when you finished settings.





§4.3 Laser Survey

Laser survey is an instrument that accurately measures the distance to a target by modulating a certain parameter of the laser. Pulse laser ranging involves emitting a brief pulse or sequence of pulses towards the target during operation, with the photodetector receiving the reflected laser beam from the target. The timer measures the time it takes for the laser beam to travel from emission to reception, allowing for calculation of the distance from the rangefinder to the target.

Point acquisition is carried out according to the position of the laser point.

Features:

1) Laser distance survey(indoor, outdoor)
2) Laser points survey
3) Laser AR(connect the ALPS1 WiFi)
4) Laser Intersection feature to improve the accuracy of laser survey(Direct rendezvous, Point library rendezvous)
5) Laser stake out

Functional main interface.

Laser distance and points survey

Connect the ALPS1 Bluetooth or WiFi(if use the Laser AR) by SurvStar, choose Laser survey in Survey.

Make sure the IMU available then turn on the laser function, the laser is shone onto the selected point. When you got a stable with the laser point, you can collect points now.

Intersection function

By intersecting two or more points, you will get more accurate point coordinate.

Click the setting menu, choose the intersection method.

Direct rendezvous is when the points are collected, you will directly obtain directly the coordinates of the intersection points.

Point library rendezvous is choose the points in point database, then obtain the coordinates of the intersection points.

Laser point stake out

After the laser collect point, enter the point stake out mode, select the point to stake out.

Chapter 5 Accessories

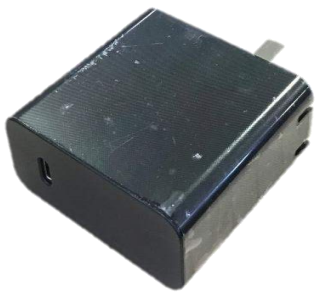
§5.1 Instrument Case

The instrument case for ALPS1 contains two layers of packing: the inner layer is filled with

anti-collision foam, the host and other accessories can be dispersed and embedded; the outer layer is a hard instrument case, sealing-strong, wear-resistant anti-wrestling. Compact, durable, can effectively prevent the impact, easy to clean.

§5.2 Charger &Adapter

ALPS1 is equipped with a rechargeable internal battery, it uses a type-c cable and a PD adapter for the charging.



§5.3 Differential Antennas

The differential antennas are as shown above;

The UHF differential antenna is required to install to the interface at the bottom of receiver if ALPS1 is set up into internal UHF mode.

§5.4 Cables

Type-C cable

This cable is used to connect the receiver with computer for static data transmission, Web UI accessing and firmware update.

§5.5 Other Accessories

Other accessories include carbon fiber pole, controller bracket, connector, tribrach, etc.

The model and type of instrument accessories will change with the upgrade of the instrument. The specific configuration can refer to accessories list.

reference received, including interference that may cause undesired operation.

Appendix technical specifications

GNSS Features	
Channels	1698
GPS	1C, L1C/A, L2C, L2P(Y), L5
GLONASS	G1, G2, G3
BDS	B1I, B2I, B3I, B1C, B2a, B2b
GALILEO	E1, E5a, E5b, E6, AltBOC*
SBAS	L1*
IRNSS	L5*
QZSS	L1, L2C, L5*
MSS L-Band*	Reserve
Positioning Output	1Hz~20Hz
Initialization Time	< 10s
Initialization Reliability	>99.99%
Positioning Precision	
Code Differential Positioning	H: 0.25 m + 1 ppm RMS V: 0.50 m + 1 ppm RMS
GNSS Static	H: 2.5 mm + 0.5 ppm RMS V: 3.5 mm + 0.5 ppm RMS
Static (Long Observation)	H: 2.5 mm + 0.1 ppm RMS V: 3 mm + 0.4 ppm RMS
Rapid Static	H: 2.5 mm + 0.5 ppm RMS V: 5 mm + 0.5 ppm RMS
PPK	H: 3 mm + 1 ppm RMS V: 5 mm + 1 ppm RMS
RTK(UHF)	H: 8 mm + 1 ppm RMS V: 15 mm + 1 ppm RMS
RTK(NTRIP)	H: 8 mm + 0.5 ppm RMS V: 15 mm + 0.5 ppm RMS
SBAS Positioning	Typically<5m 3DRMS
RTK Initialization	2~8s
IMU Tilt Angle	0°~60°
Hardware performance	
Dimension	130mm(φ)×75mm(H)
Weight	870g (battery included)
Material	Magnesium aluminum alloy shell

Operating Temperature	-45℃~+75℃	
Storage Temperature	-55℃~+85℃	
Humidity	100% Non-condensing	
Waterproof/Dustproof	protected from long time immersion to depth of 1m, fully protected against blowing dust	
Shock/Vibration	Withstand 2 meters pole drop onto the cement ground naturally	
Power Supply	6-28V DC, overvoltage protection	
Battery	Inbuilt 6800mAh rechargeable Lithium-ion	
Battery Life	25h (static)	
Communications		
I/O Port	5-PIN LEMO interface (external power port + RS232) Type-C interface (charge+OTG+Ethernet) UHF antenna interface	
Internal UHF	2W, RX/TX, radio repeater and router	
UHF Frequency	410-470MHz	26-30dBm
UHF Modulation	GMSK	
UHF Protocol	Farlink, Trimtalk, SOUTH, HUACE, Hitarget, Satel	
Range	Typically 8km with Farlink protocol	
Bluetooth	Bluetooth 3.0/4.1 standard, Bluetooth 2.1 + EDR (2402 ~ 2470 MHz)	8dBm
Bluetooth Modulation	GFSK, π/4-DQPSK, 8-DPSK	
NFC	support	
Wi-Fi	802.11 b/g/n standard (2412 ~ 2468 MHz)	13-16dBm
Modulation	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g/n: OFDM(64QAM, 16QAM, QPSK, BPSK)	
Data		
Storage	4/16GB SSD internal storage Automatic cycling storage Support external USB storage (OTG)	
Data Transmission	Plug and play mode of USB data transmission Supports FTP/HTTP data download	
Data Format	Static data format: STH, Rinex2.01, Rinex3.02 and etc. Differential data format: RTCM 2.1, RTCM 2.3, RTCM 3.0, RTCM 3.1, RTCM 3.2 GPS output data format: NMEA 0183, PJK plane coordinate, Binary code Network model support: VRS, FKP, MAC, fully support NTRIP protocol	
Sensors		
IMU	Built-in IMU module, calibration-free, 60°	

Camera	Visual positioning camera: 8MP (can be used in AR stakeout) AR stakeout camera: 2MP
Laser	3R green laser
Electronic Bubble	Controller software can display electronic bubble, checking leveling status of the carbon pole in real-time
Thermometer	Built-in thermometer sensor, adopting intelligent temperature control technology, monitoring and adjusting the receiver temperature
User Interaction	
OS	Linux
Buttons	Dual buttons
Indicators	Satellites, data and power indicators
Display	1.14', 135*240 pixel
Web Interaction	With access to Web UI via WiFi or USB connection, users can monitor the receiver status and change the configurations
Voice Guidance	Chinese/English/Korean/Spanish/ Portuguese/Russian/Turkish/French/Italian
Secondary Development	Provides secondary development package, and opens the OpenSIC observation data format and interaction interface definition
Cloud Service	The powerful cloud platform provides online services like remote management, firmware updates, online registers, etc.
FCC	FCC ID 2AJTU-INNO8
**Reserve for future upgrade.* *Remarks: Measurement accuracy and operation range might vary due to atmospheric conditions signal multipath, obstructions, observation time, temperature, signal geometry and number of tracked satellites. Specifications subject to change without prior notice*	

Appendix Technical Terms

Ambiguity: unknown quantity is the integer number of cycles of the carrier phase measured from the satellite to the receiver.

Baseline: The connection line of the two measurement points, on which to receive GPS signals and collect observation data simultaneously.

Broadcast ephemeris: message released by the satellite demodulator satellite orbit parameters.

SNR (Signal-to-noise ratio): an endpoint signal power to noise power ratio.

Cycle skipping: interfere loop skips a few cycles from a balanced point, and stabilize in the new equilibrium point, this makes the phase integer number of cycles to generate an error.

Carrier: As the carrier, Frequency, amplitude or phase modulation of the modulated wave by a known reference value.

C / A code: GPS coarse / acquisition code, modulate the pseudo-random binary code for the 1023 bit duplex, the bit rate of which is 023MHz, and code repetition period of 1ms.

Difference measurement: GPS measurements employ cross-satellite cross-receiver and cross-epoch.

Difference Positioning: the method of determining the relative coordinates between two or more receiver by tracking the same GPS signal.

Geometric dilution of precision: Describe the contribution of satellite geometry errors factor in dynamic positioning

Eccentricity: where a, b of the semi-major axis and semi-minor axis.

Ellipsoid: mathematical graphics formed when an ellipse moves around the minor axis of rotation in Geodetic Survey.

Ephemeris: the position of celestial bodies over time parameters.

Flattening:

a is the semi-major axis, b is the semi-minor axis, e is the eccentricity.

Geoid: similar to the mean sea level and extends to the mainland special planes. Geoid everywhere perpendicular to the direction of gravity.

Ionosphere delay: delay of radio waves through the ionosphere (non-uniform dispersion medium)

L-band: The radio frequency range of 390-1550MHz.

Multipath error: the positioning error caused by the interference between two or more radio signal propagation path.

Observing session: the use of two or more receivers at the same time to collect GPS data period.

Pseudo Range: GPS receiver in the time required to copy the code aligned with the received GPS code offset and multiplied by the speed of light to calculate the distance. This time offset is the difference between the signal reception time (time series of the receiver) and the signal emission time (satellite time series).

Receiver channel: GPS receiver RF mixer and IF channel, can receive and track satellites two carrier signals.

Satellite configuration: the configuration status of the satellite with respect to a specific user or a group of users within a specific time.

Static position: do not consider the point of measurement of the movement of the receiver.

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

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