Insight V2

Technician Manual

Catalogue

ChapterI Preface

Read this chapter, you will have a brief knowledge of SOUTH Company and Insight V2 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 is as follows:

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This manual is about Insight V2, to explain how to install, set up and use the RTK system as well as the accessories. We recommend that you read these instructions carefully before using the instrument.

§1.2 Main Features

- **AR Stakeout**

Stakeout with the real scenes

Visible and convenient

- **Fixed Solution in Seconds**

Advanced SoC & ROS make fixed faster

5 constellations 16 bands

50+ satellites used in seconds

- **Durable Battery & Fast Charging**

Internal 6800mAh battery, capable of working for 24 hours.

Type-C & PD protocol support fast charging

Power bank supported for long-lasting projects

- **Internal Radio**

Better signals receiving

Farlink protocol for long distances communication

➢ **Efficient IMU**

Maximum angles of 60°

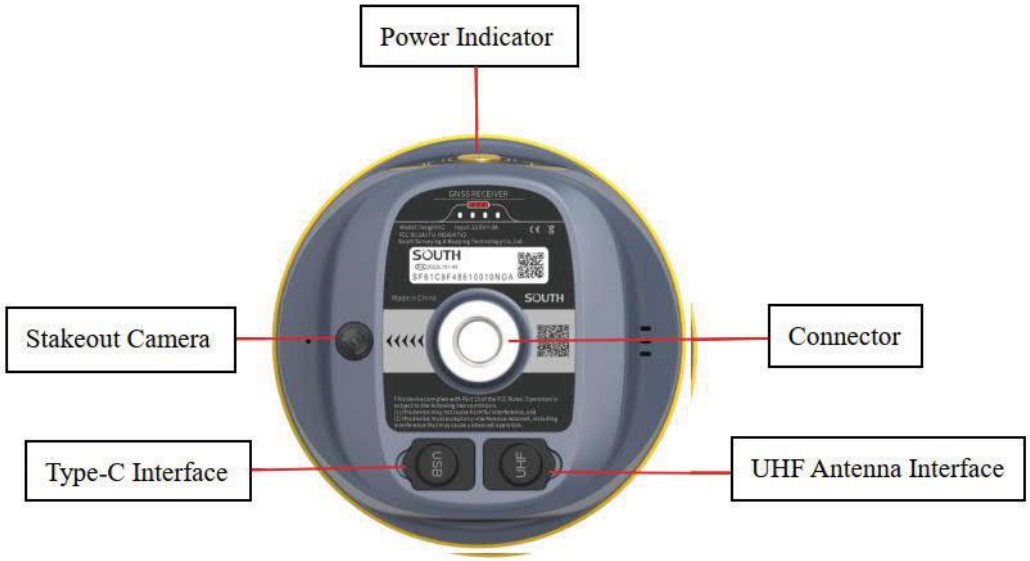
200Hz

Without leveling the bubble, working efficiency increases by 30%

ChapterII Hardware Component

Reading this chapter, you can grasp the components, installation and the function of Insight V2 measuring system

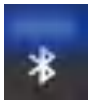
§2.1 Bottom Components



Components & Interface	Details
UHF Antenna Interface	Install UHF antenna here
Power Button	Turn on/off the receiver
Type-C interface	Transmit data and charge the receiver
Connector	Connect the receiver to a pole or a tripod
Power Indicator	Indicate the present power

§2.2 Front Components

Insight V2 has 3 indicators and one button.

Image	Components	Details
	Power Button with Indicator	➢ Turn on/off the receiver ➢ Select work modes and confirm ➢ Glow in red when the receiver is on
	Bluetooth Indicator	Off--No Bluetooth connection Glow in blue--Bluetooth connected
	Data Indicator	➢ **UHF Mode:** Flash at the data receiving intervals ➢ **WiFi:** Flash--network dial-up or WIFI connection (10Hz) After successful dialing, flash at the receiving interval ➢ **Static Mode：** Flash per second--record data Off--not record ➢ **Rover Mode:** Flash in green--fixed solution; Flash in red--receiving corrections but not fixed solution ； Off--no corrections

§2.3 Basic Operation

§2.3.1 Check Work Mode

Press the power button once in the state of power-on, the instrument will prompt with voice message about the current working mode (for example, “Rover, internal radio mode”). The power indicator at the bottom show the power. There are four lights and each light represents 25% of the

total power.

§2.3.2 Power On

Press the power button when it is off. When you hear a beep and see all indicators are on, release the power button to turn on Insight V2.

§2.3.3 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 the power button, then the instrument will switch off.

§2.3.4 Set Work Mode

Press and hold the power button for about 6 seconds and pass over the state of power off (do not release the button even if the instrument says “power off”), then V2 will say “start to set work mode”, at this moment, release the power button, the working mode will be repeated from Rover to Static.

§2.3.5 Self-Check

Self-check is a useful operation to simply check the main hardware components if the instrument is 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 if the instrument says “power off” and “start to set work mode”), then V2 will say “start to self-check”, at this moment, release the 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.

§2.3.6 Factory Reset

Press and hold the power button for about 20 seconds and pass over the foregoing states ("power off", "start to set work mode", "start to self-check"), V2 will get into factory reset progress with voice message saying "start to restore manufactory default", at this moment, release the power button, all the indicators glow and the instrument will perform the factory reset automatically. After this progress is complete, the instrument will restart with the factory default settings.

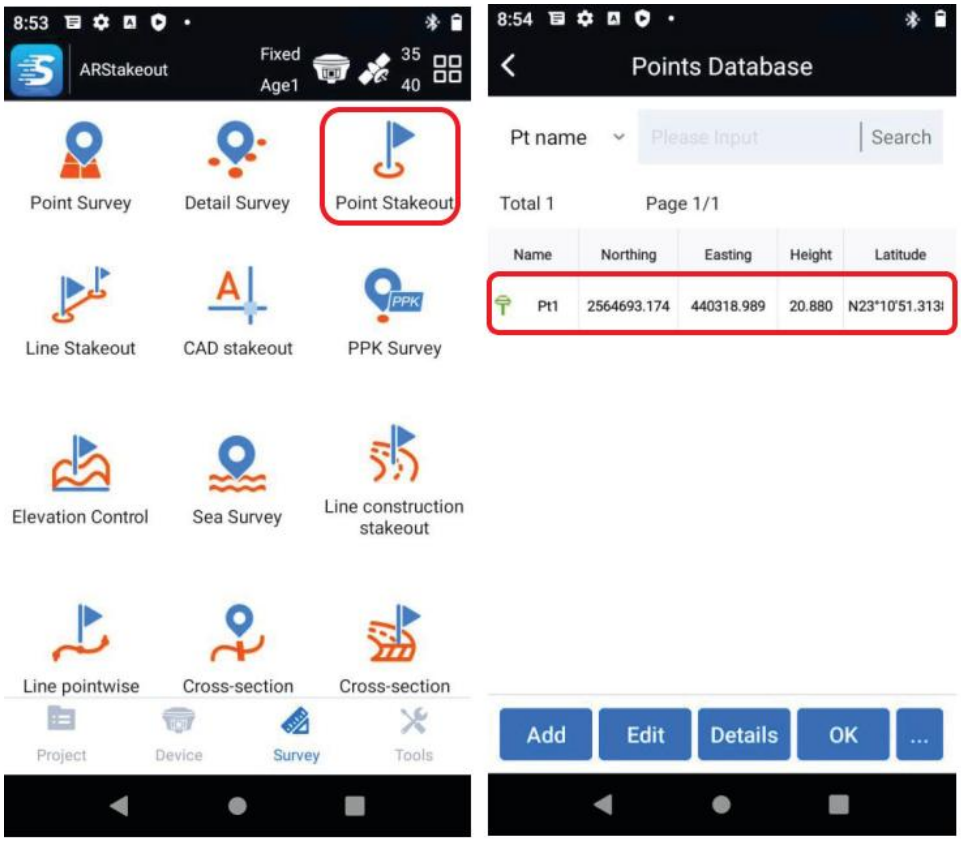
§2.4 AR Stakeout

Notice: AR stakeout need to work with a data controller, and it requires the software SurvStar.

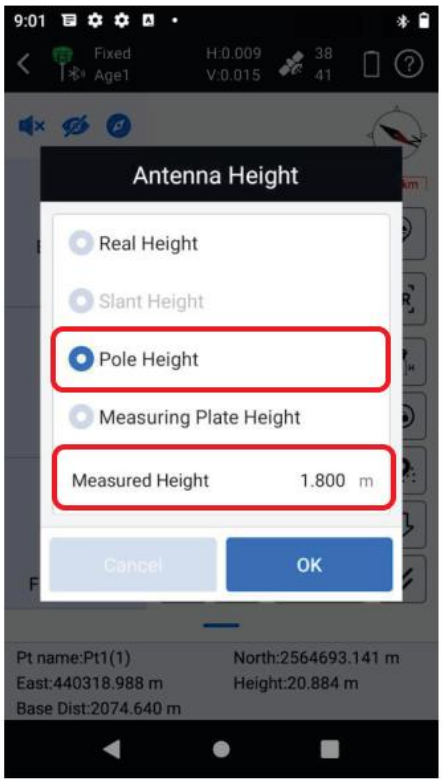
AR stakeout is the innovative function of V2. To use this function, you need to have:

- ✓ Insight V2
- ✓ a data controller (with a SIM card available)
- ✓ a pole
- ✓ SurvStar software

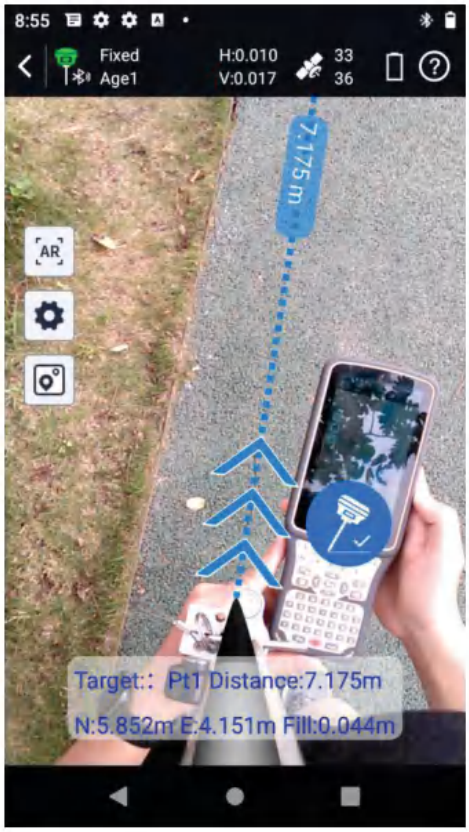
First, run SurvStar and select Point Stakeout. Choose the point you want to stakeout.

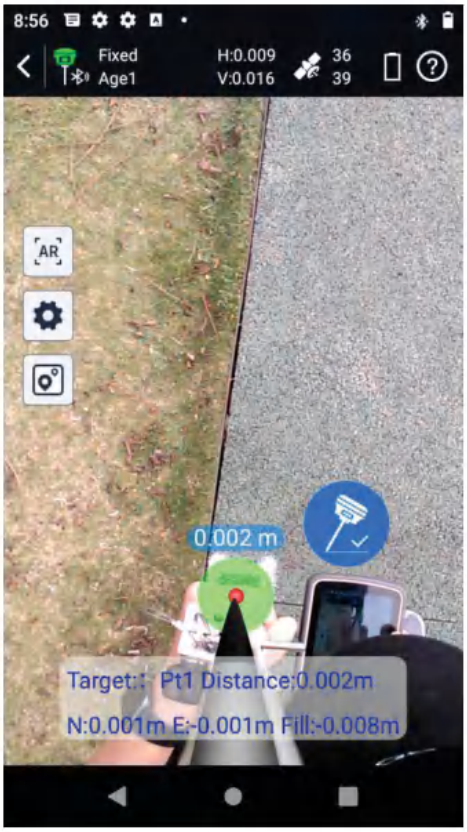


Second, set pole height. Make sure it is consistent with the present pole height.



Third, initiate tilt survey. After successfully initiating, click  to start AR stakeout.





ChapterⅢ Accessories

§3.1 Instrument Case

The instrument case for Insight V2 contains two layers of packing: the inner layer fills with anti-collision foam; the host and other accessories can be dispersed and embedded; the outer layer is a sturdy instrument case, sealing-strong, wear-resistant and anti-wrestling. Compact, durable, effectively prevent impact; meanwhile, easy to clean.

§3.2 Charger &Adapter

Adapter

USB cable

Red light: under charging
Green light: fully charged

§3.3 UHF Antenna

It is used for rover-internal radio mode.

§3.4 Type-C Cable

The Type-C cable is to connect the receiver with PC, sending static data and update the firmware.It can also charge the data controller.

ChapterIV Web UI Management

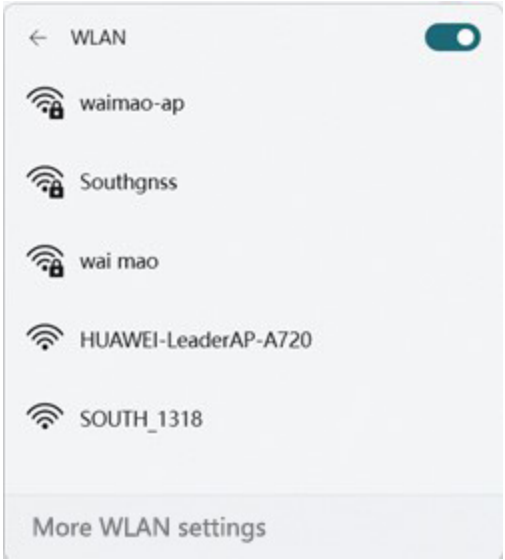
§4.1 Overview

Utilizing the smart embedded Linux operating system and SOUTH intelligent cloud technology, the Web UI allows users to configure and monitor the status of V2 in real time. Both WiFi and USB are available to access Web UI.

§4.2 Access by WiFi

The WiFi hotspot default setting is on. Search the WiFi hotspot named SOUTH_xxxx using smartphones, tablets or laptops, then establish the WiFi connection, and input the **default IP (10.1.1.1)** into the browser. On the login interface, input "admin" as the username and password.

For example, search the WiFi hotspot from a Insight V2 receiver using a laptop PC, choose the WiFi hotspot and click on connect button to establish the connection without a password.



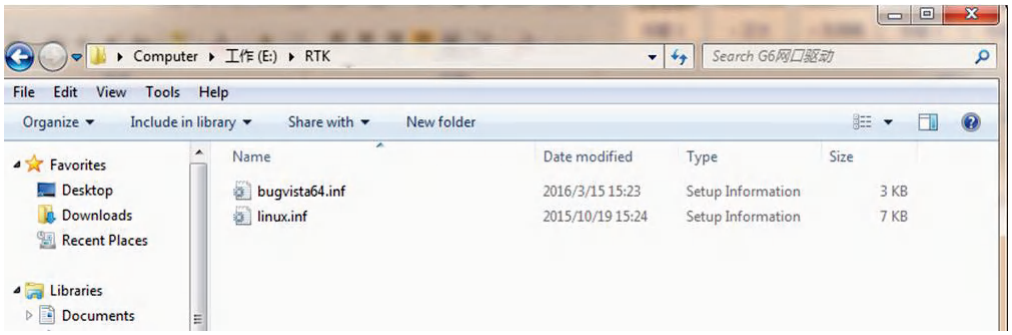
Run IE browser on a computer and input the default IP (**10.1.1.1**) into the address bar, after a while, the system login interface is refreshed, then input **"admin"** as username and password to log in.

§4.3 Access by USB

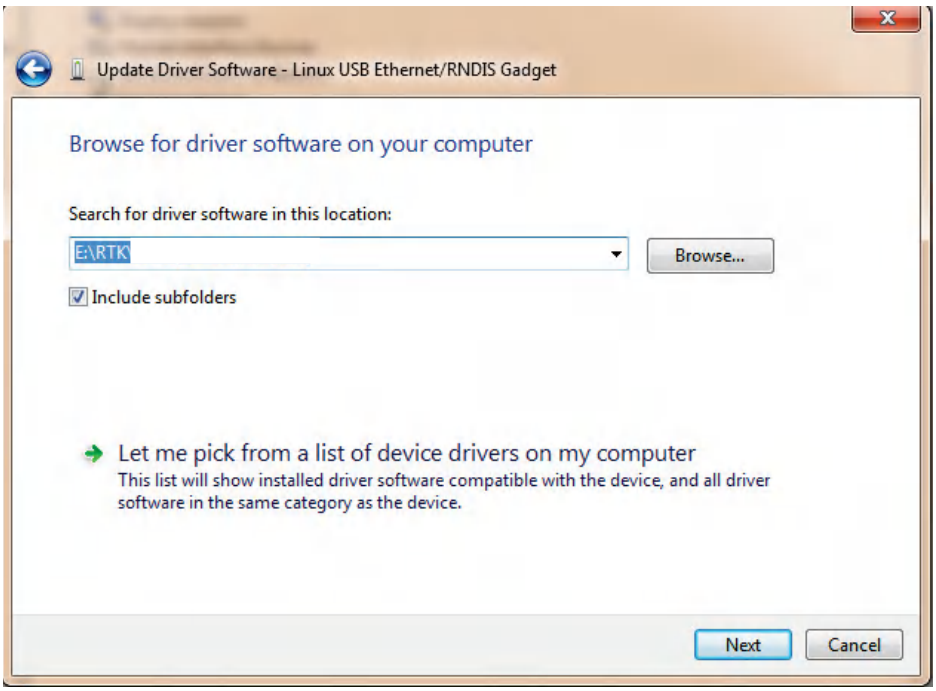
In this mode, the 7-pin USB port USB port of Insight V2 must work as an Ethernet port, then internal Web UI shall be accessed via a USB cable connection with the computer.

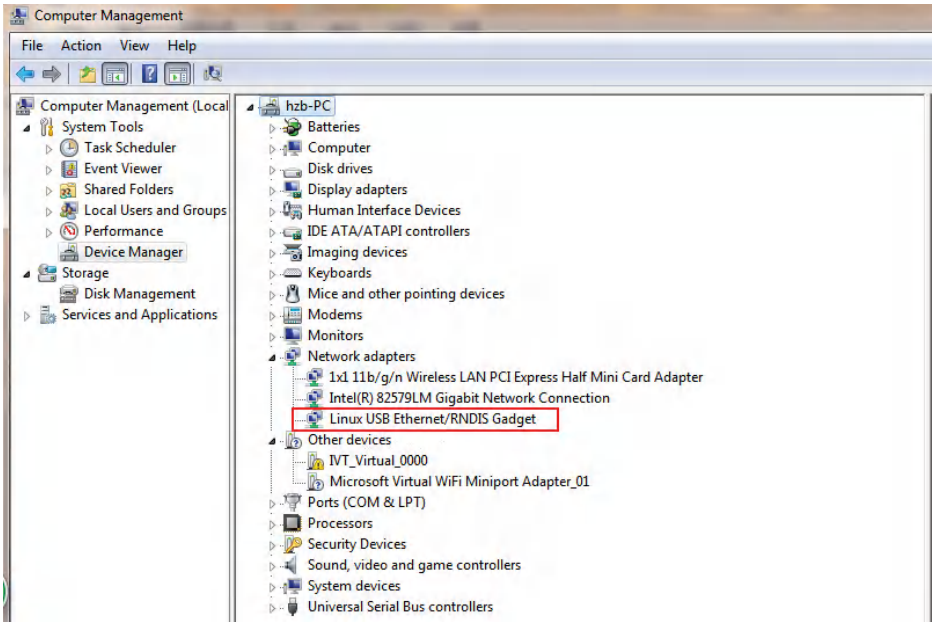
First of all, a corresponding driver is required to install on the computer to activate this function.

The driver should be compatible with your computer operating system. The file bugvista64.inf is applied to 64-bit operating system, and linux.inf is for 32-bit operating system.



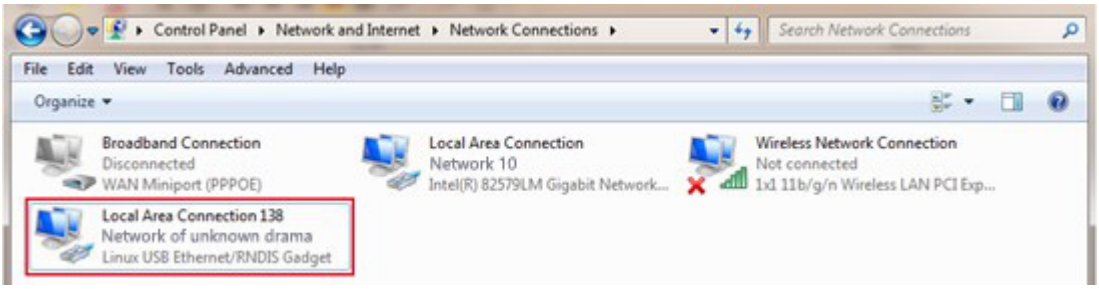
Choose the folder with the suitable driver





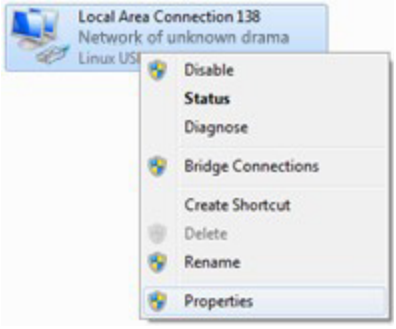
NOTE: *The driver can be downloaded from the official website. You are welcome to contact us if you need more support.*

If the driver has been successfully installed, the USB port of Insight V2 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 connecting Insight V2 to the computer via USB network interface.

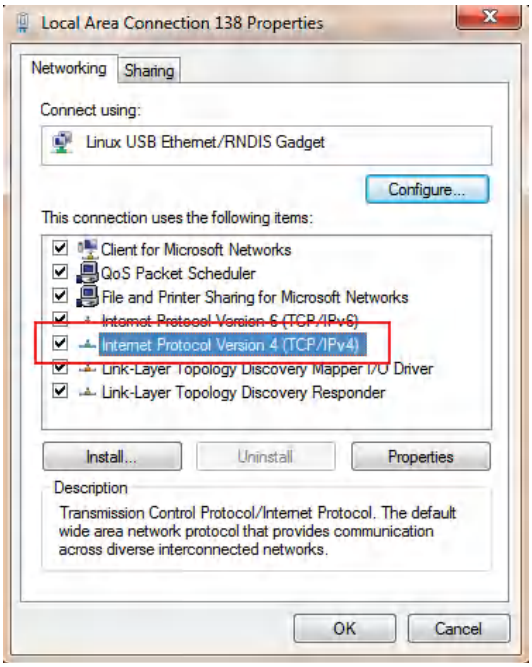


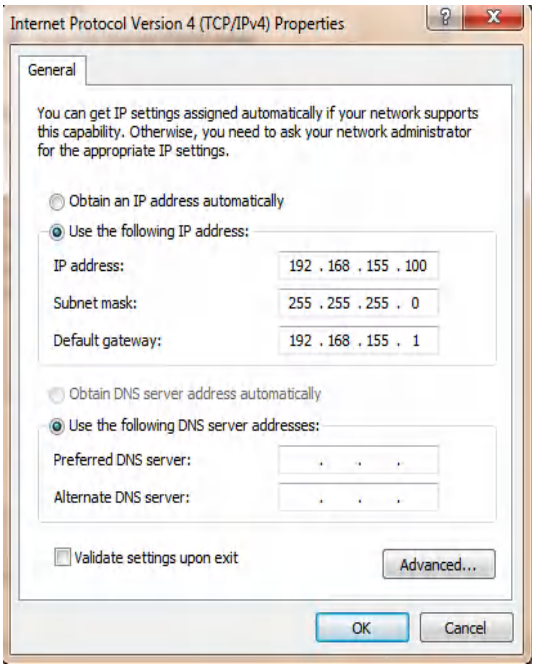
However, sometimes the computer cannot detect the receiver by USB network interface because there is something wrong with acquiring IP; therefore, we need to do something to avoid such problems, that is to set a fixed LAN IP for the connection:

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



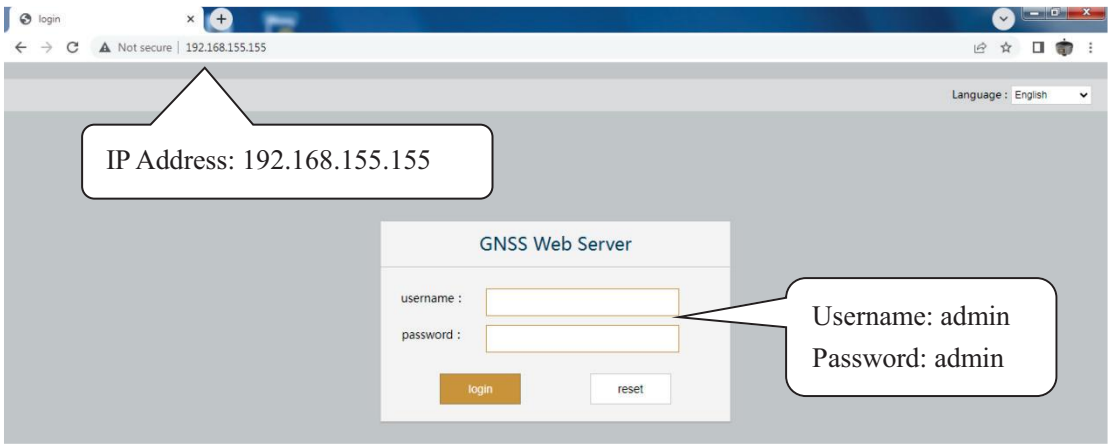
Then double click on Internet Protocol Version 4 (TCP/IPv4) option or click on properties button to call out Internet Protocol Version 4 (TCP/IPv4) properties window, set the fixed LAN IP address as shown in the following list, then click "OK" button and confirm the settings, return to the IE browser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





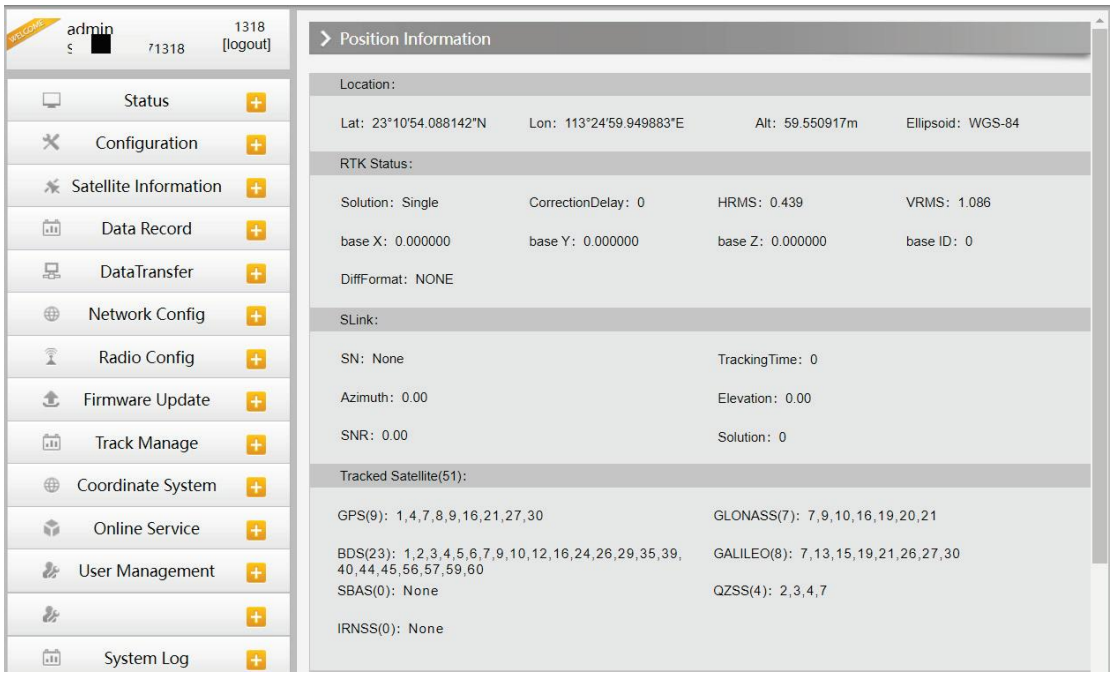
Run IE browser on computer and input the default IP (**192.168.155.155**) into the address bar, after

a while, the system login interface is refreshed, then apply **"admin"** for username and password to log in.



§4.4 Web UI main interface

After login the Web UI management of V2 by WiFi or USB connection, the main interface appears with displaying configuration items and positioning. As shown in the following figures.



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

Ref	Component	Description
	Status	Positioning information, satellite tracking and others will be displayed on this page

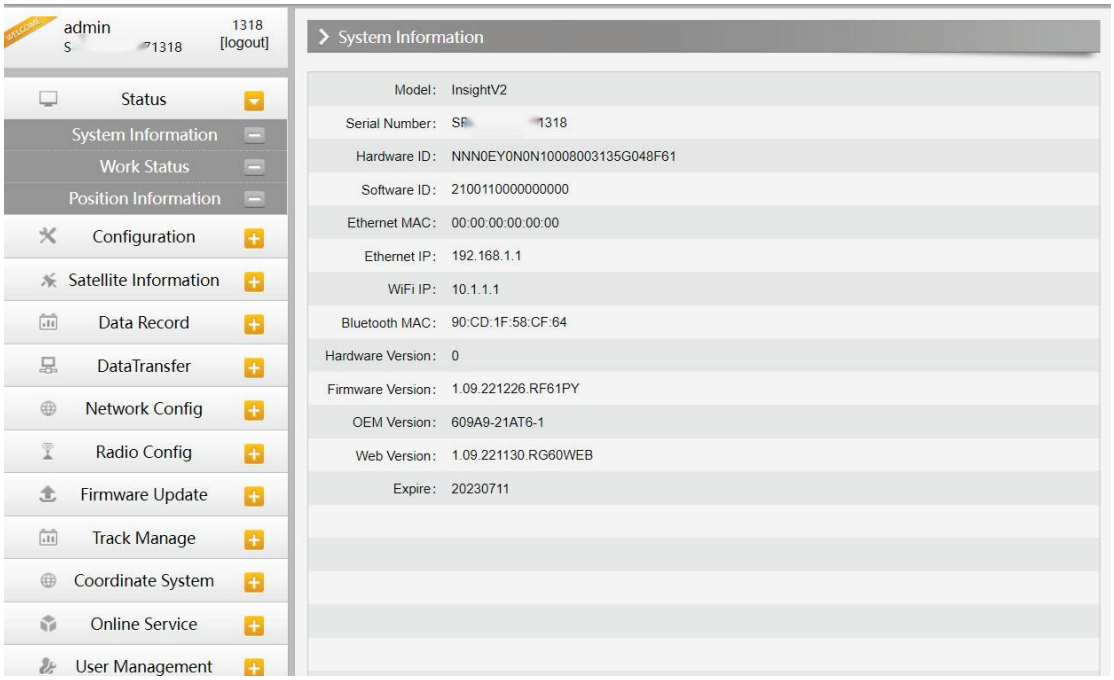
	**Configuration**	It contains registration for the receiver, base configuration, antenna configuration, satellite configuration, receiver configuration and system configuration.
	**Satellite Information**	Display and control whether the satellites are used or not
	**Data Record**	Configure the parameters 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 module
	**Firmware Update**	It is used to upgrade the firmware for the receiver and each module
	**Track Manage**	Record track file while doing measurement
	**Coordinate System**	Setup a local coordinate system for V2
	**Online Service**	Upload data onto a server in real time
	**User Management**	Add and manage the Web UI users
	**Help**	Offers solutions

§4.4.1 Status

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

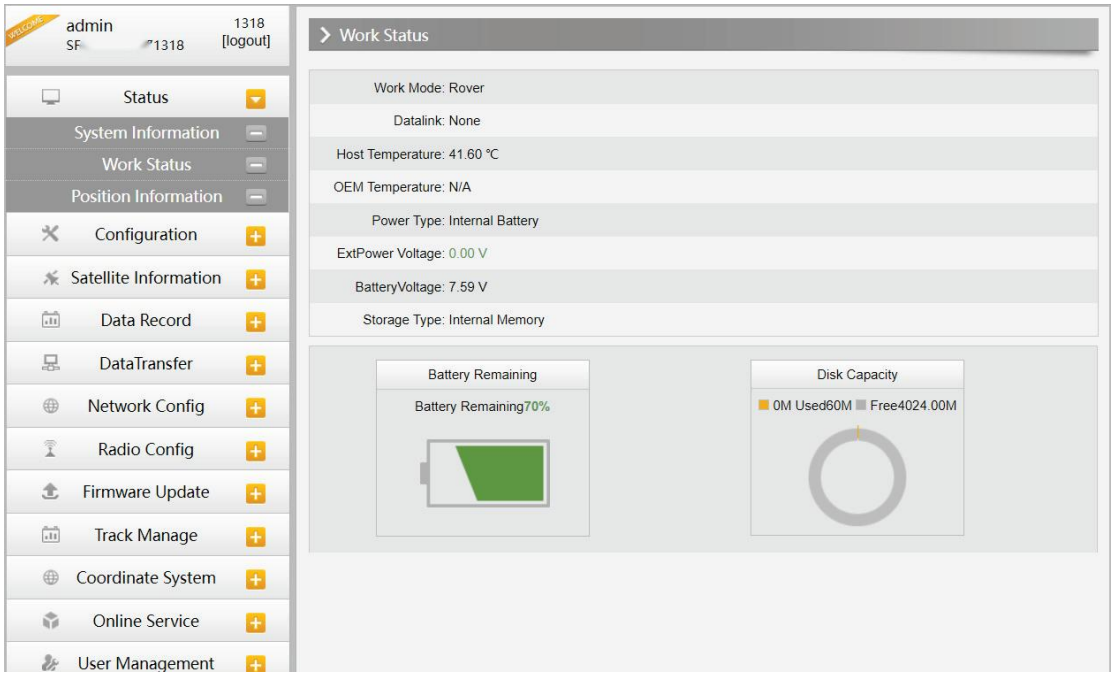
System Information

On this page, all the information about V2 is displayed, such as serial number, hardware ID, MAC address, firmware version and so on.



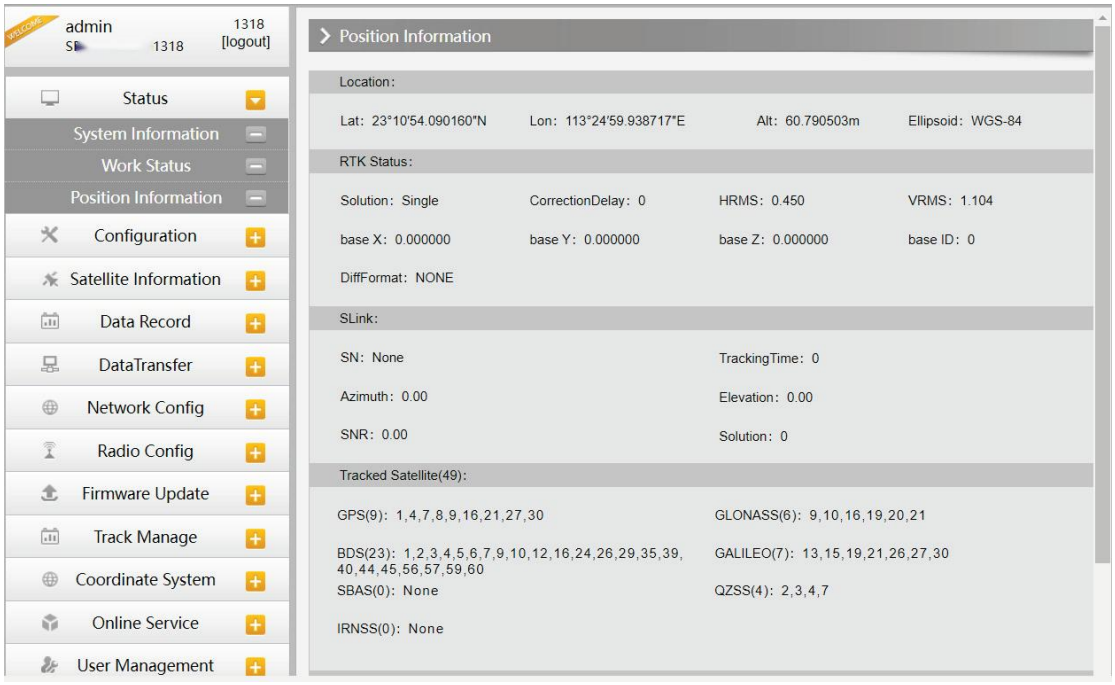
Work Status

The physical state of V2 such as working mode, datalink, host temperature, remaining power and free space is obtained from this page



Position Information

On this page, users can clearly glance through current position information and satellite information

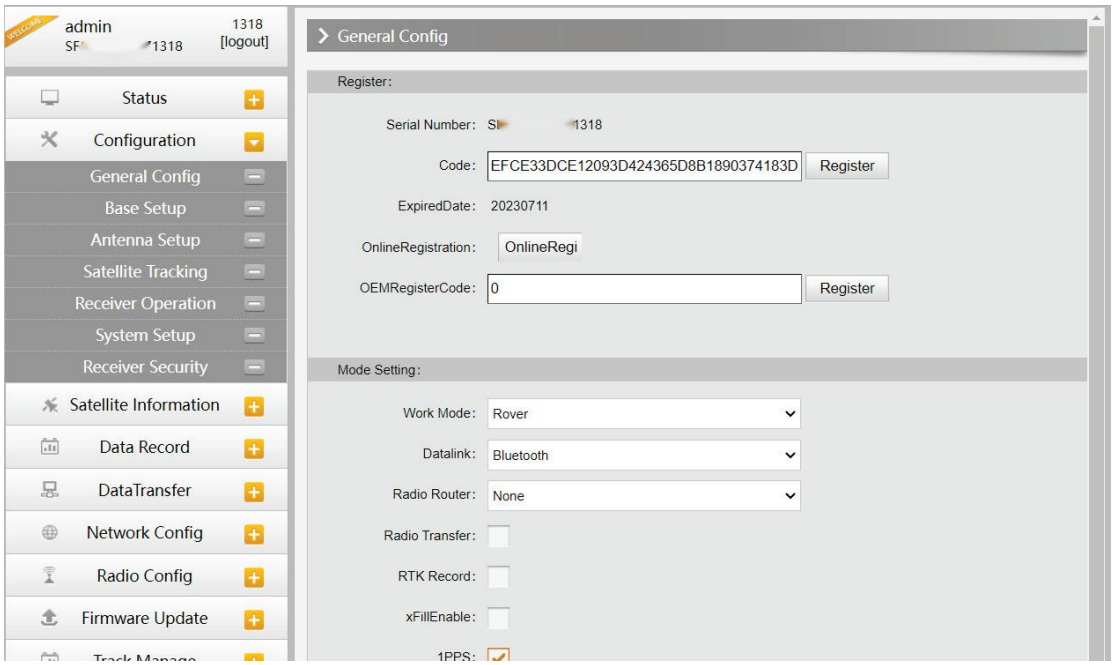


§4.4.2 Configuration

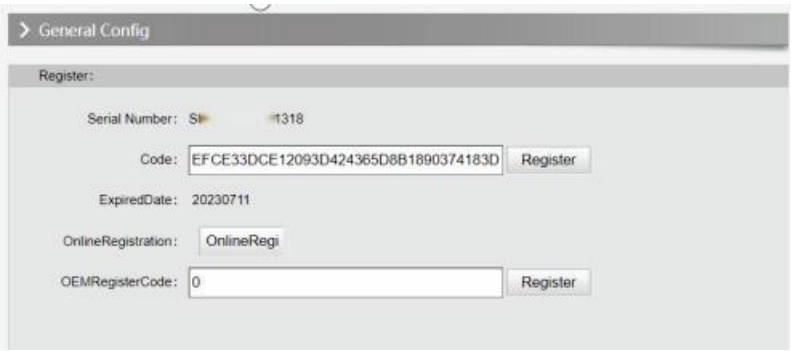
General Config, Base Setup, Antenna Setup, Satellite Tracking, Receiver Operate and Default Language are contained under the Configuration menu. Users are able to configure all kinds of parameters for Insight V2 under the Configuration menu, and all the settings will immediately take effect after saving.

General Config

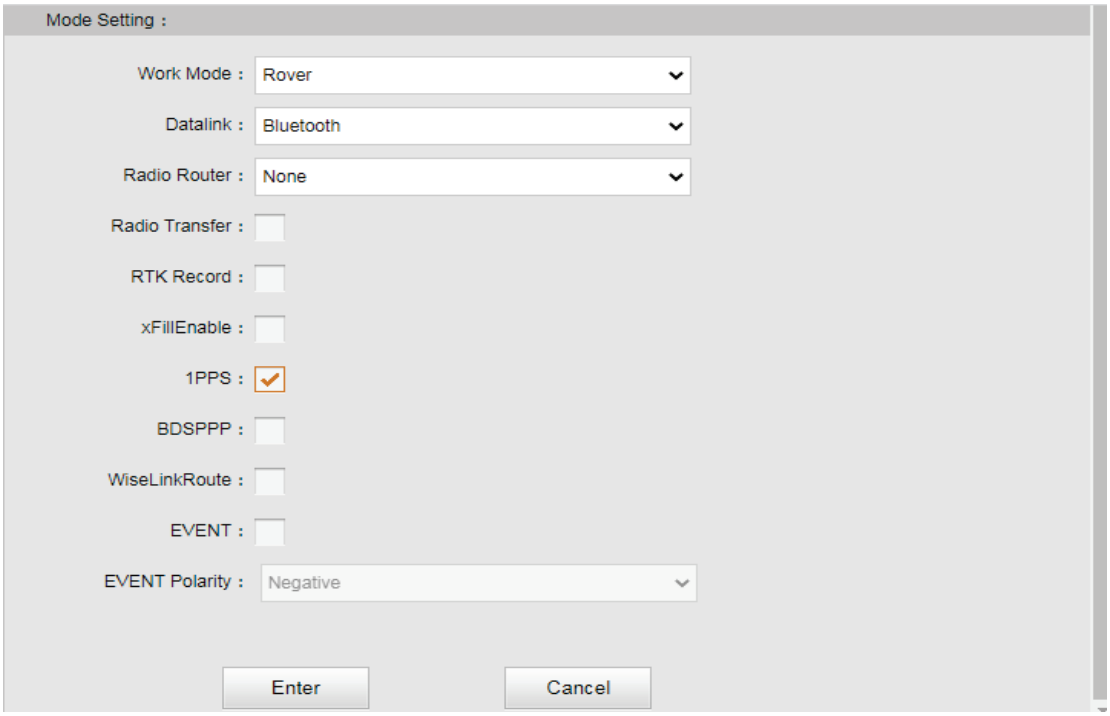
The registration of the receiver and work mode setting can be completed on this general configuration page.



If the code of Insight V2 has expired or is ready to expire, please provide the serial number of your V2 for us to apply for another available code, then input the code into the blank or register the receiver online.

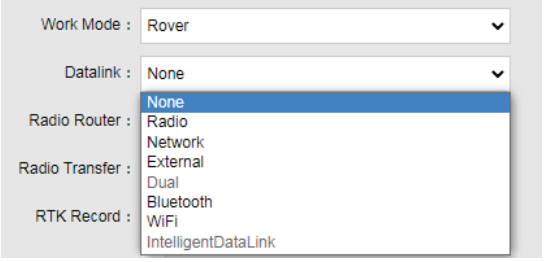


V2 allows users to set work mode and datalink from this Web UI with only a mobile phone or a tablet through the WiFi hotspot.

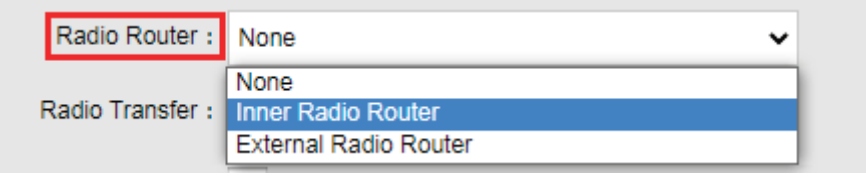


Work Mode: There are “Rover”, “Base” and “Static” in this dropdown list

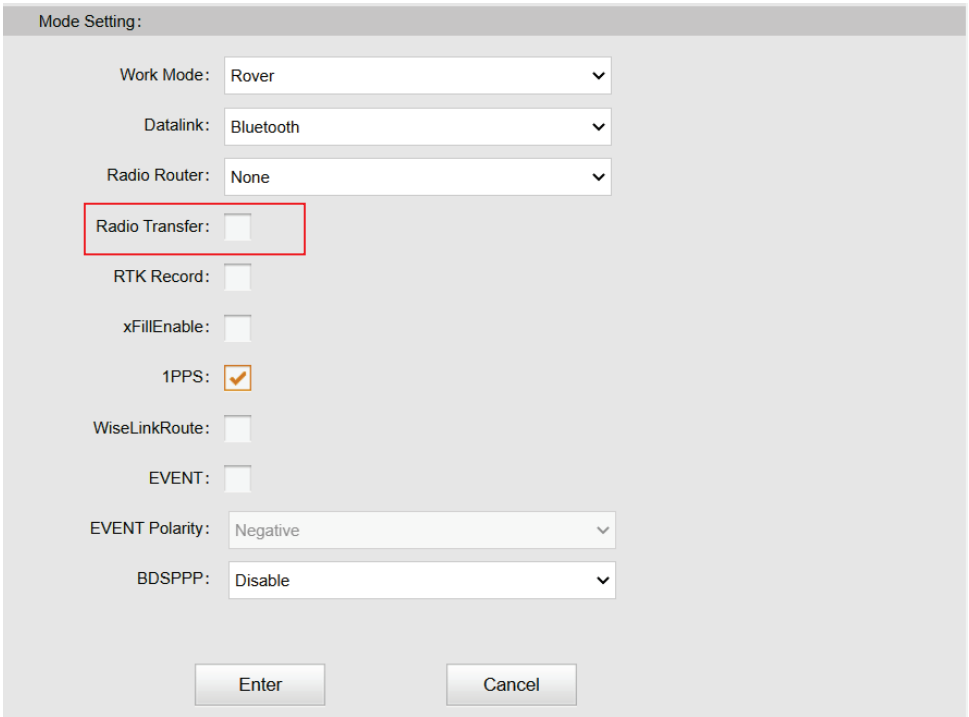
Datalink: Pull down the list and there will be all kinds of options for datalink, such as “Radio”, “External”, “Bluetooth”, “WiFi”.



Radio Router: This function requires the Internet from external devices connected through Bluetooth or an internal SIM card. Through the Internet, V2 gets correction data from the reference station and then transfers the data to other rovers by radio, with which rovers will have the same reference coordinate. It is practical when you work somewhere with poor reference station signals or need several rovers but only have one SIM card. You can use the internal radio or connect to an external radio to transfer the correction data. This feature is only available in Rover mode.

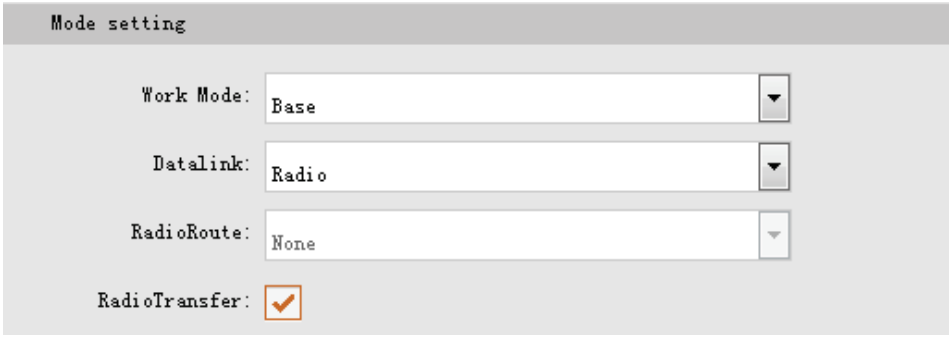


Radio Transfer: This function, also known as Radio Repeater, acquires correction data from the Base station by radio and transfers the data to other rovers by the internal UHF (radio). It is a solution to extend the radio communication range.

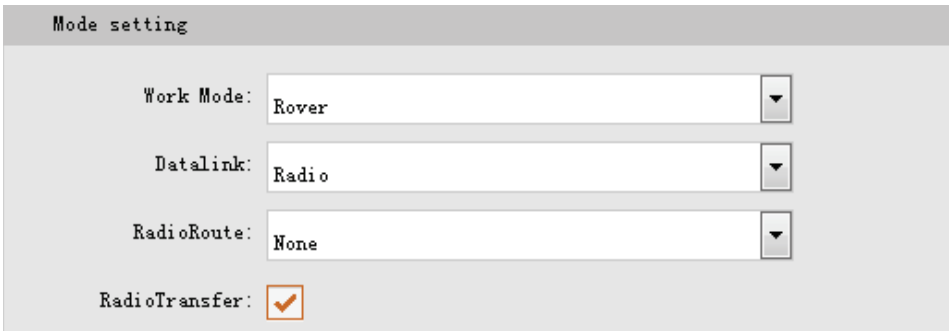


Operation:

1, Check the box of "Radio Transfer" on "General Config" dialog for Base station.



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



3, Configure the datalink of the other rovers to internal UHF mode, then make sure the channel, protocol and frequency are consistent with the "Radio Router" rover (Repeater).

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

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

xFillEnable: The "**Fixed-keep**" function allows V2 to keep centimeter-level accuracy for a few minutes even when the correction data miss.

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

BDSPPP: To use the BDS L-band corrections for centimeter-level real-time position system

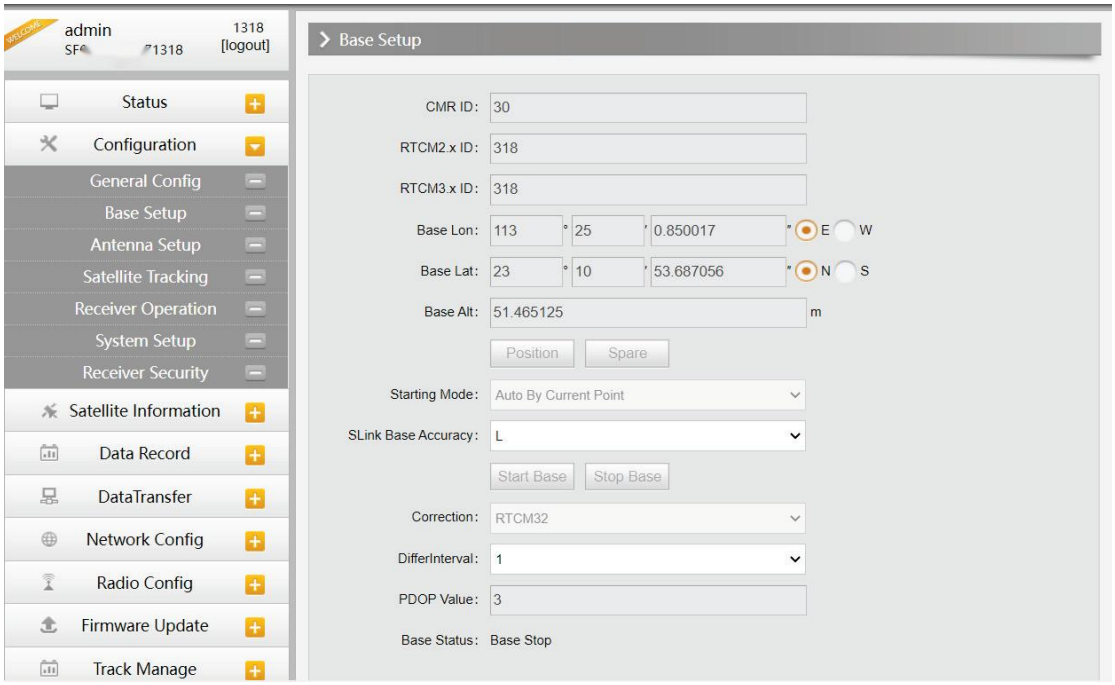
WiseLinkRoute: Receivers use internet first to transmit and receive correction data (a internet server is needed), if lost the internet signals, then receivers will use radio transmit and receive correction data

EVENT: This option is for the EVENT marker input

EVENT Polarity: EVENT input method.

Base Setup

When Insight V2 works as a base, the basic configuration for the base is on 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 the current position

Spare: This is used for the repeat station

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

Correction: Here contains the global general used correction formats including RTCM30, RTCM32

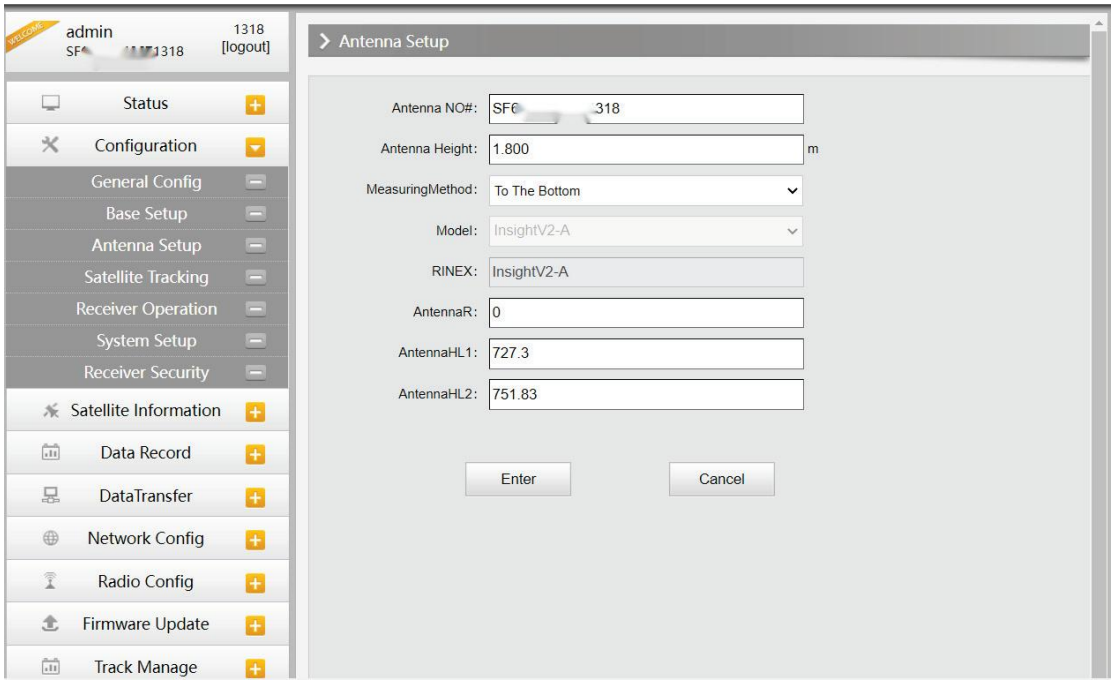
DifferInterval: Base differential transmit interval (seconds/once)

POP Value: This value defines the PDOP limitation.

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

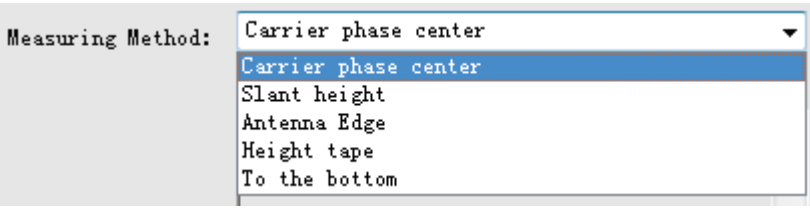
Antenna Setup

The antenna parameters are configured on this page including the antenna height and measuring method.



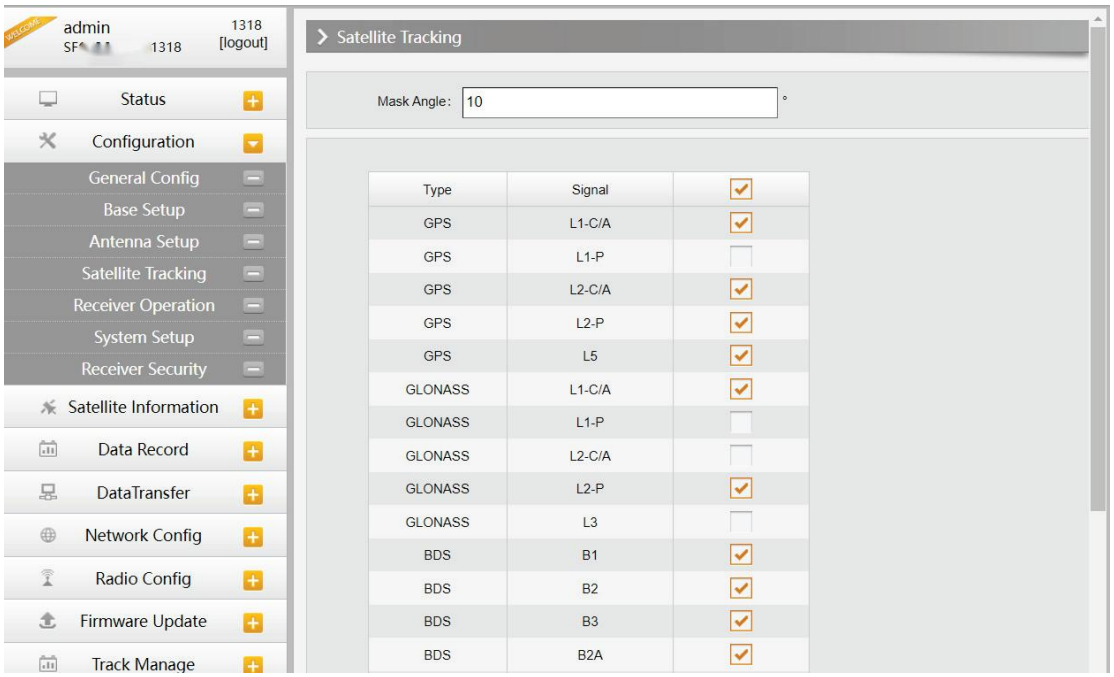
Antenna Height: This is the value for height from ground subjects point to receivers .

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



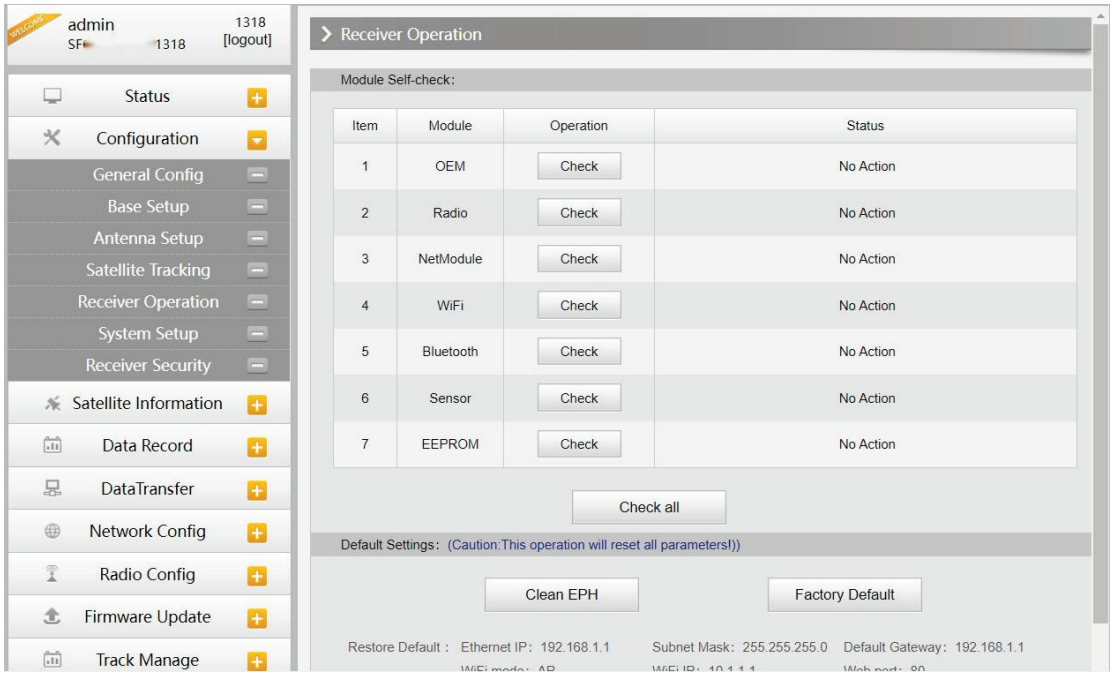
Satellite Tracking

On 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 Operate

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 modules or click on the check button corresponding to the modules to check one by one.

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

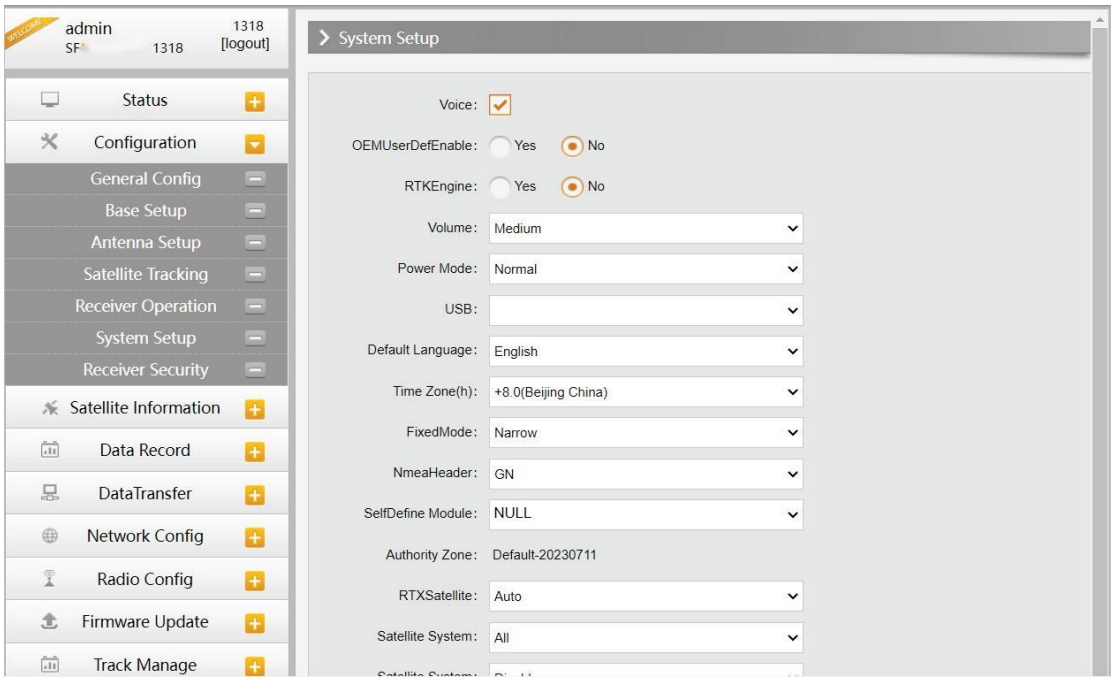
Factory Default: Click this button to bring the receiver back to factory default setting.

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 restart

System Setup

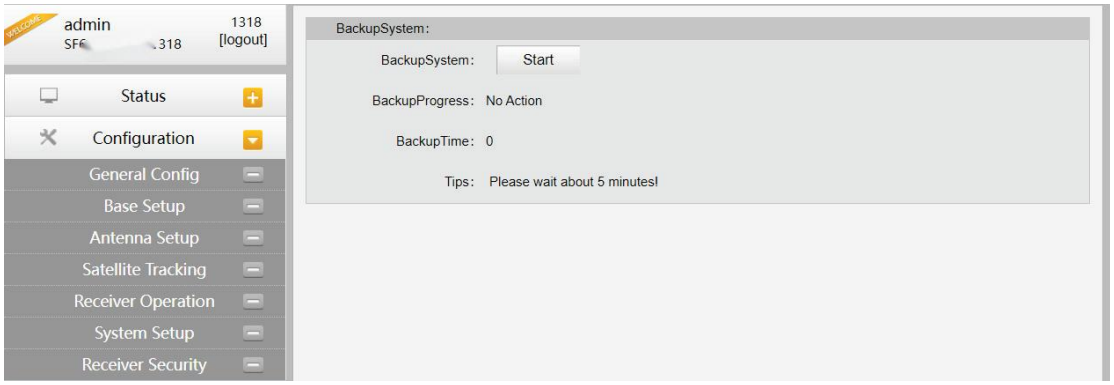
This page is used to control Voice prompt, volume of voice, power saving, USB mode and the default language for receiver.



Voice: Check on this box to turn on the voice guide for Insight V2, and uncheck it to turn off the voice prompt.
OEMUserDefEnable: Check “No” for V2
RTKEngine: Check “No” for V2
Voice Volume: Define the voice volume for Insight V2’s speaker.
Power Mode: Configure the receiver to use the power saving mode or not.
USB: Now V2 supports the USB mode and Network interface at the same time through the USB 7-pin cable
Default Language: Configure the default language for Insight V2 which associates with voice prompt.
TimeZone(h): Use this to set the corresponding time zone for your country or area
FixedMode: Some receivers have the option for fixed mode narrow or wide, but this option is not working on V2
NMEAHeader: Choose the output data header in GN, GP or HE format
Selfdefin module: To set a user-defined work mode and output mode for receiver. Usually choose NULL
Authority code: Authority area (e-fence) code
Authority zone: NULL means no need for code, default means the default area. W means it can work all around the world

RTX satellite: Options for RTX satellite. V2 doesn't support RTK, so we don't need to choose it

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

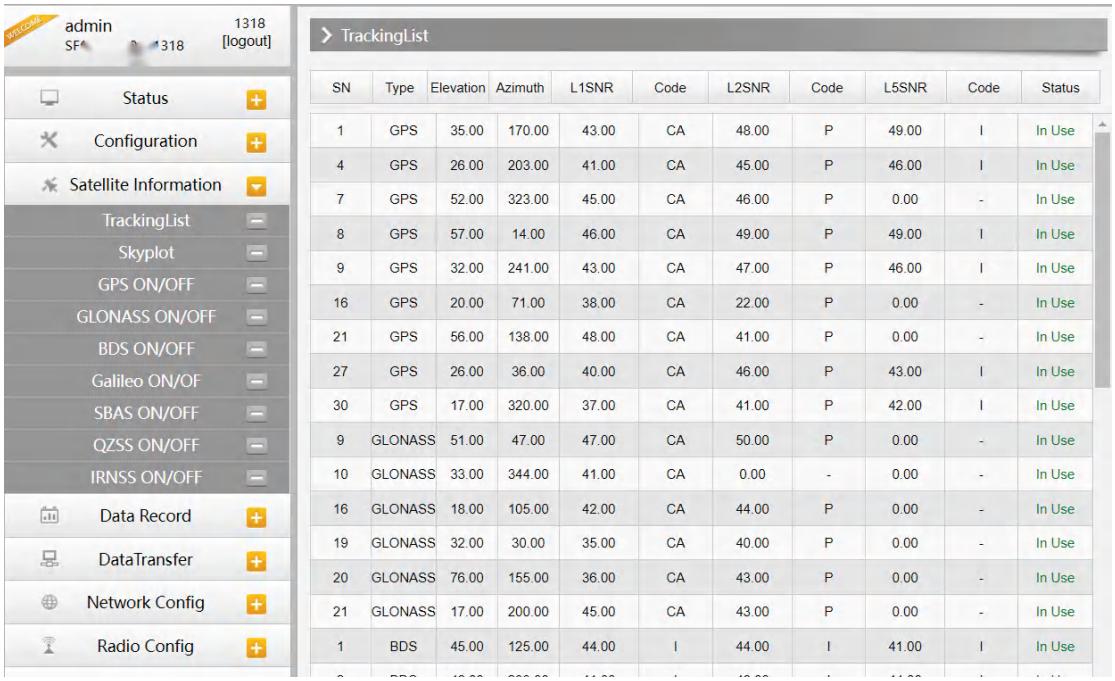


§4.4.3 Satellite Information

The "Satellite Information" provides all kinds of tables, graphs and skyplot to check the information of tracking satellites. And it allows you to decide which satellites to use in constellation on/off page by checking on the corresponding box.

Tacking list

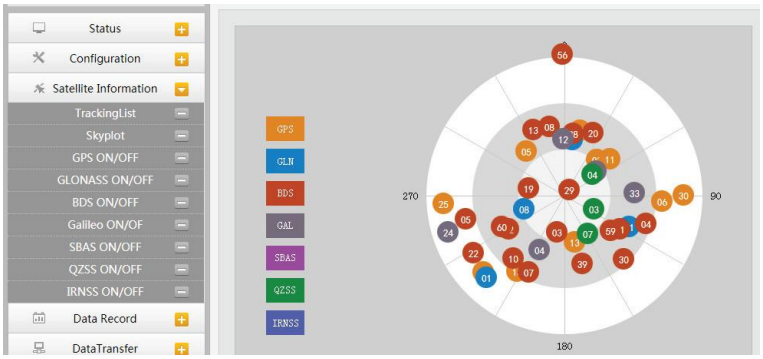
Here is the table to list all current used satellites and the other information about these satellites.



SN	Type	Elevation	Azimuth	L1SNR	Code	L2SNR	Code	L5SNR	Code	Status
1	GPS	35.00	170.00	43.00	CA	48.00	P	49.00	I	In Use
4	GPS	26.00	203.00	41.00	CA	45.00	P	46.00	I	In Use
7	GPS	52.00	323.00	45.00	CA	46.00	P	0.00	-	In Use
8	GPS	57.00	14.00	46.00	CA	49.00	P	49.00	I	In Use
9	GPS	32.00	241.00	43.00	CA	47.00	P	46.00	I	In Use
16	GPS	20.00	71.00	38.00	CA	22.00	P	0.00	-	In Use
21	GPS	56.00	138.00	48.00	CA	41.00	P	0.00	-	In Use
27	GPS	26.00	36.00	40.00	CA	46.00	P	43.00	I	In Use
30	GPS	17.00	320.00	37.00	CA	41.00	P	42.00	I	In Use
9	GLONASS	51.00	47.00	47.00	CA	50.00	P	0.00	-	In Use
10	GLONASS	33.00	344.00	41.00	CA	0.00	-	0.00	-	In Use
16	GLONASS	18.00	105.00	42.00	CA	44.00	P	0.00	-	In Use
19	GLONASS	32.00	30.00	35.00	CA	40.00	P	0.00	-	In Use
20	GLONASS	76.00	155.00	36.00	CA	43.00	P	0.00	-	In Use
21	GLONASS	17.00	200.00	45.00	CA	43.00	P	0.00	-	In Use
1	BDS	45.00	125.00	44.00	I	44.00	I	41.00	I	In Use

Skyplot

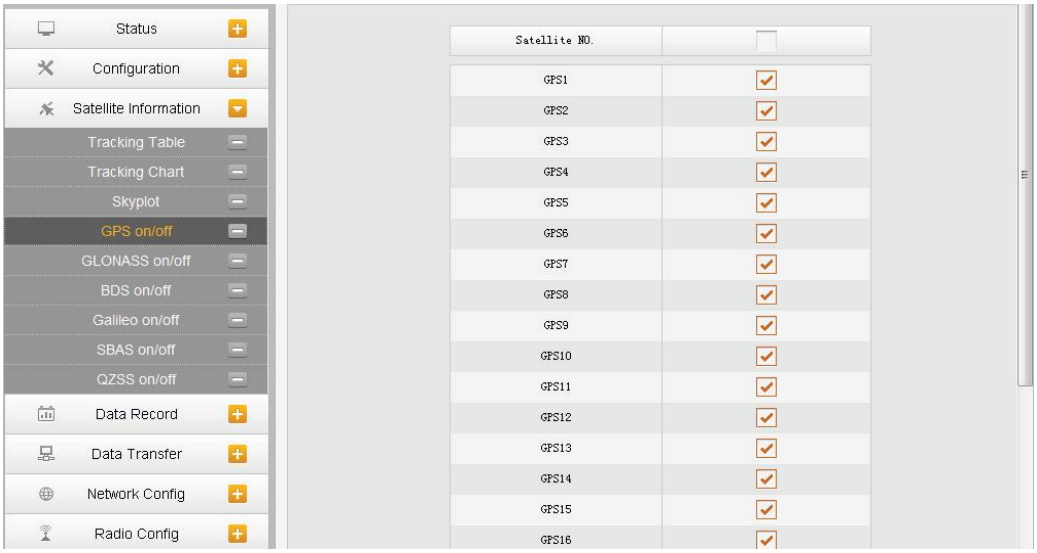
On this page, all the tracking satellites are shown on the skypolt, a intuitively view of the current position of satellites.



GPS on/off

For all the running GNSS constellations or the augmentation system, Insight V2 is able to decide which satellite to use.

In GPS on/off page, all the running satellites are listed, and unselect the box to stop using them.



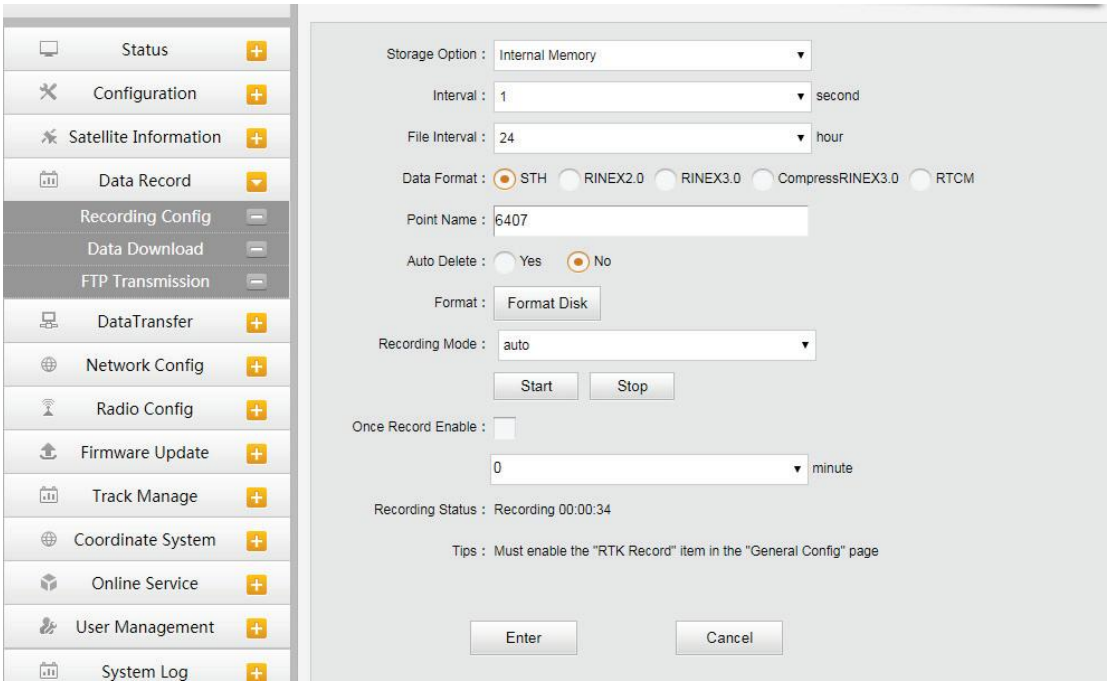
GLONASS on/off: To check and uncheck the satellites for tracking
BDS on/off: To check and uncheck the satellites for tracking
GALILEO on/off: To check and uncheck the satellites for tracking
SBAS on/off: To check and uncheck the satellites for tracking
QZSS on/off: To check and uncheck the satellites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

§4.4.4 Data Record

The “Data Record” can configure the parameters for receiver in static mode. Many operations can finish on Insight V2 Web UI, such as setting storage path, interval, data format and data file download.

Recording Config

The page provides more practical operations for raw data storage.



Storage Option: Here are the options to select where the raw data will be stored--internal memory or external memory.

Interval: This is the sampling interval for data storage

File Interval: This setting defines the data storage time for the static file.

Data Format: Here are 3 formats for Insight V2 to store the data--STH, Rinex2.0 and Rinex3.0.

Point Name: A point name is necessary, and its default setting is the last 4 digits of SN.

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

Format: Click this button to format the internal memory disk for Insight V2.

Recording Mode: Here are 2 options for Insight V2 to record raw data--automatically record the data if it achieves the sampling condition and not automatically record it.

Start/Stop: Click these buttons to start recording or stop recording the raw data.

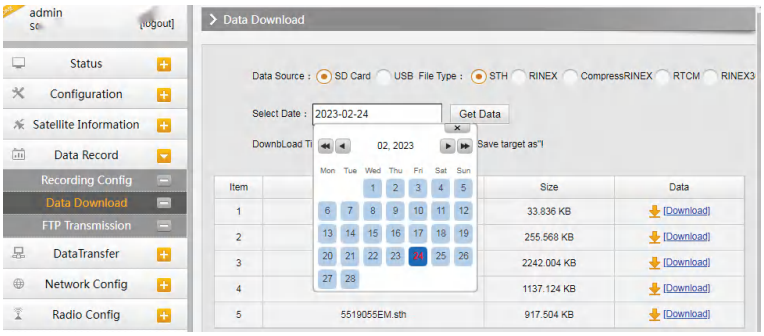
Once Record Enable: Set a Timer for static recording. For example, if it sets 5 minutes, the receiver will only record for 5 minutes, after that the receiver will stop recording static data.

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

Data Download

This page provides the data files to download.

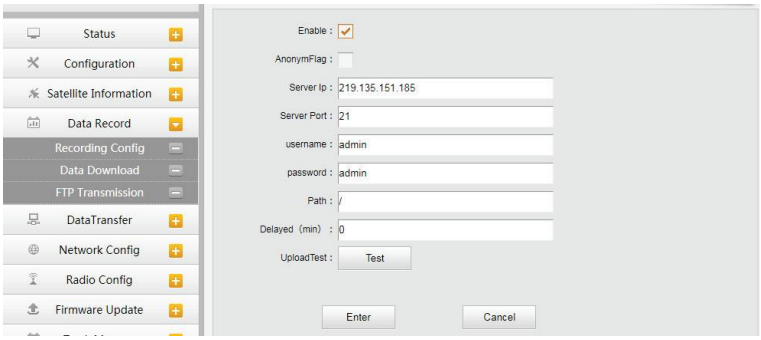
Choose the storage where the static data is recorded(Data Source) and file type. Then click on the blank of “Select Date” to choose a date and click “Get Data” button, all the files recorded in the date you choose will show in the table, tap download button to download the data files.



FTP Transmission

FTP is a file transfer protocol.

By logging in to an existing or newly created FTP server, the user communicates with other hosts by means of file operations (such as file addition, deletion, modification, search, transmission, etc.)



§4.4.5 Data Transfer

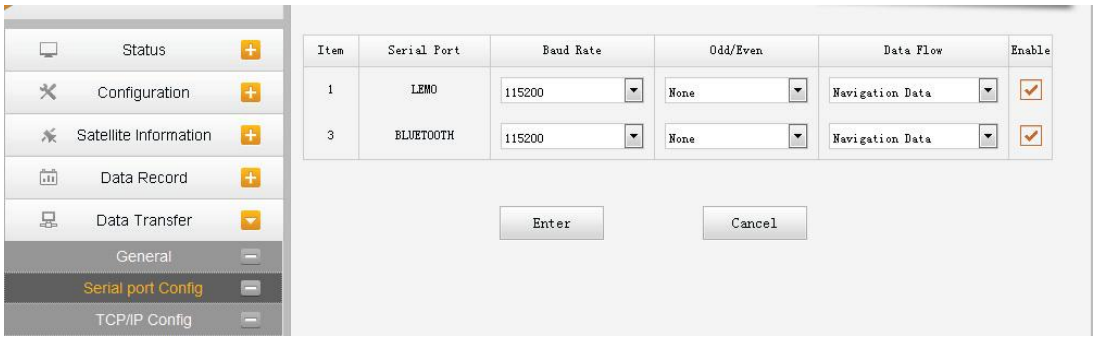
This performance contains General, Serial Port Config, TCP/IP Config, NTRIP Config and Data Flow Config. The “Data Transfer” can configure the output mode for raw observation data and differential data, as well as handle the NTRIP performance configuration.

General

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

Serial port Config

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



CAUTION: We strongly recommend not changing any default value on this page. If you really need to change the settings, please contact SOUTH technician for further support.

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

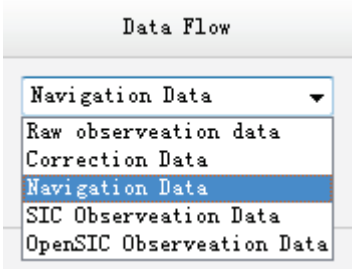
Raw observation data: This is the raw observation data straight from OEM board.

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 on 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.

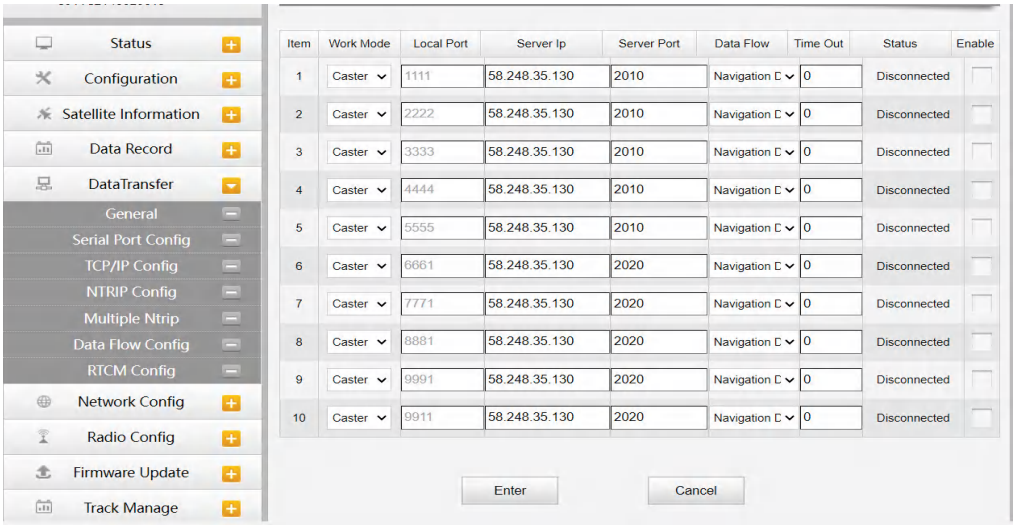


TCP/IP Config

It configures the raw data or uploads and transfers navigation data to a server. There are Caster and Server working mode for this function.

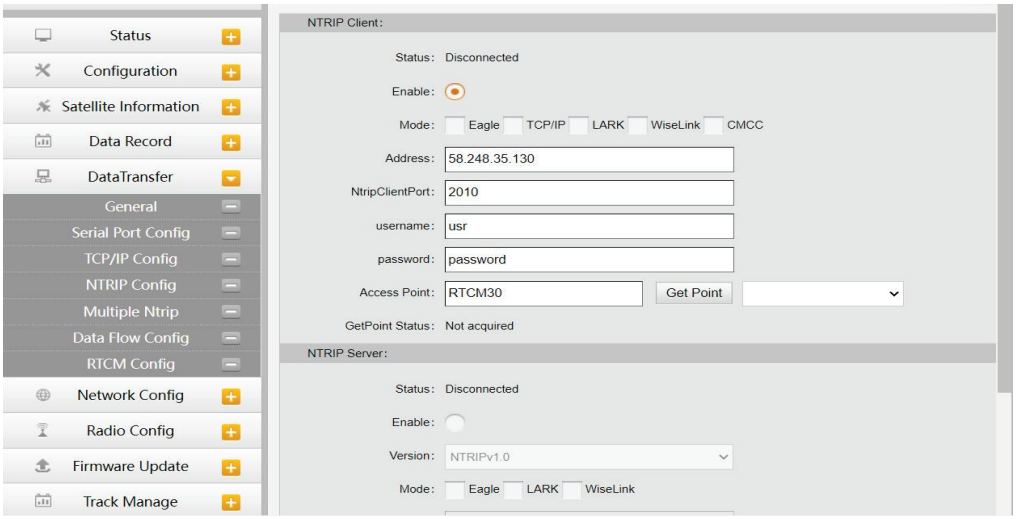
Caster: If this working mode is selected, Insight V2 will be a client to upload the data to a specific server when it connects to the internet by WiFi or GPRS connection with SIM card inserted. Input the specific IP and port for server, and decide the data format. Then users can see the uploaded data on server.

Server: Insight V2 will upload the data onto internet by the static WiFi if the server is selected, then users can obtain its dynamic data by accessing V2 through the IP.



NTRIP Config

It configures the NTRIP modes when you connect a receiver to the internet. Insight V2 supports all NTRIP modes including NTRIP Client, NTRIP Server and NTRIP Caster.



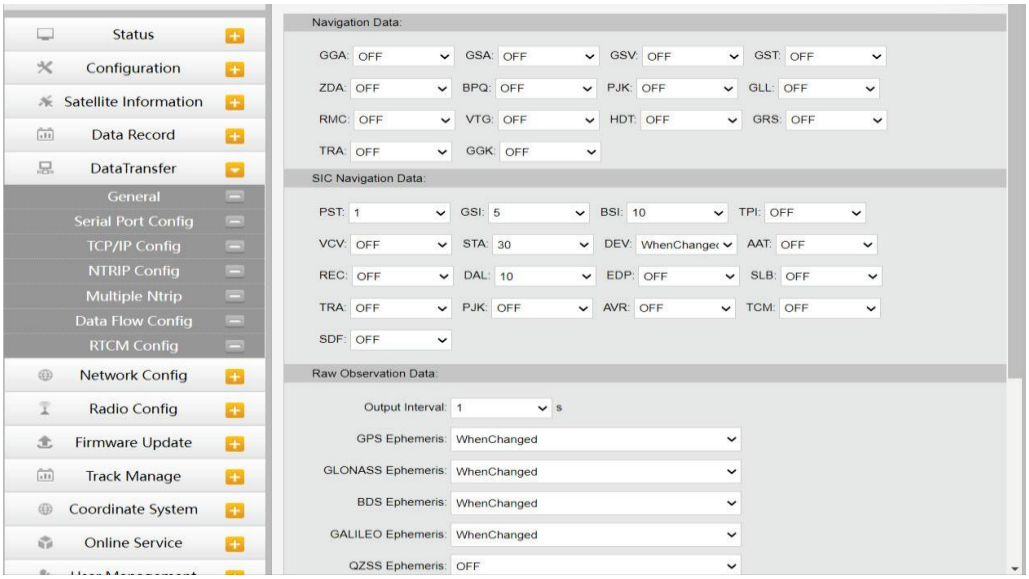
Multiple NTRIP

To transmit correction data to different servers at the same time through NTRIP protocol

Data Flow Config

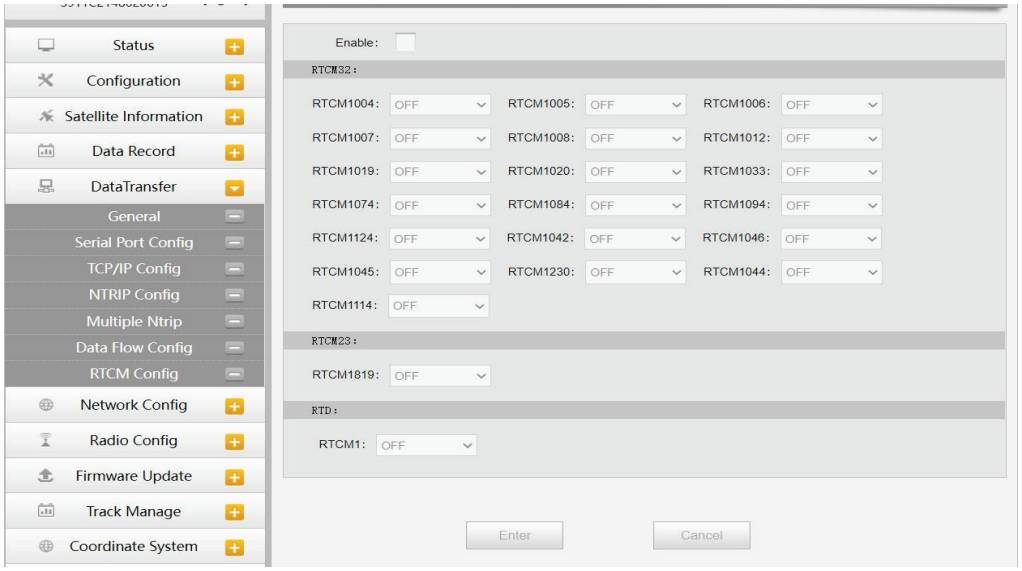
On this page, users can configure the specific contents, the update rate of data flow and which format to output.

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



RTCM Config

On this page, users can set differential signal formats.



§4.4.6 Network Config

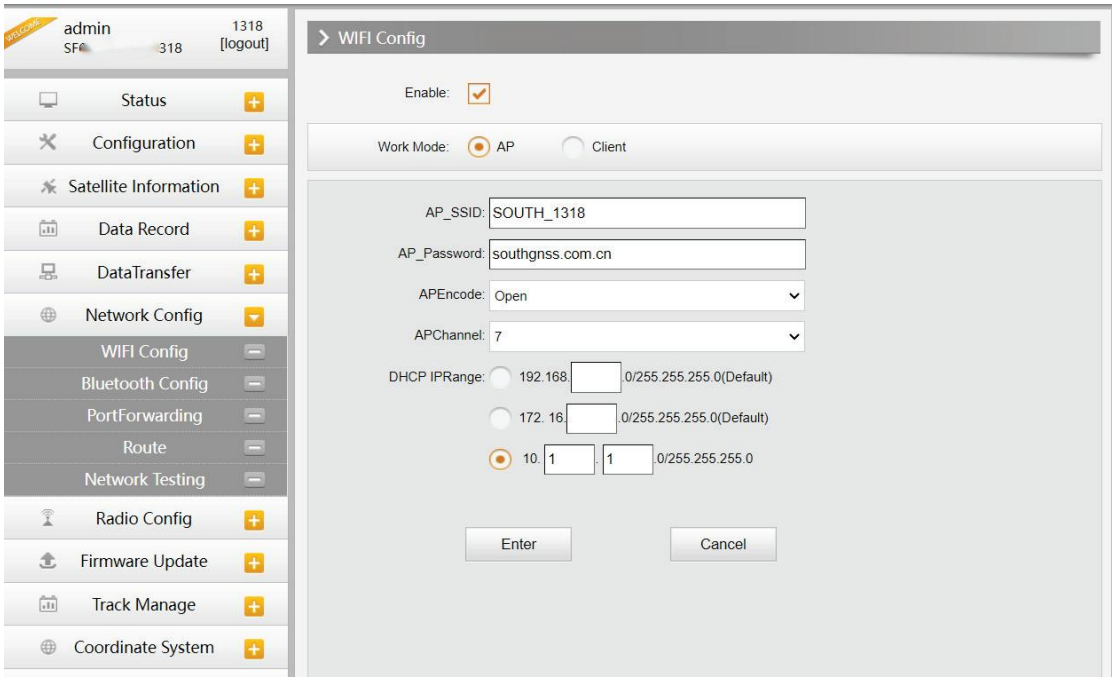
WiFi Config

It configures the V2 WiFi with two mode to choose--AP mode and Client mode.

AP: It enables the WiFi hotspot of Insight V2 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, and define the SSID, password, encryption method and broadcasting channel for WiFi connection.

DHCP IP Range: Allows users to set Web UI login IP.



Client:

This option enables Insight V2 to search and connect to other WiFi hotspots that connect to the internet; the receiver is able to download and use the mountpoint from the reference station.

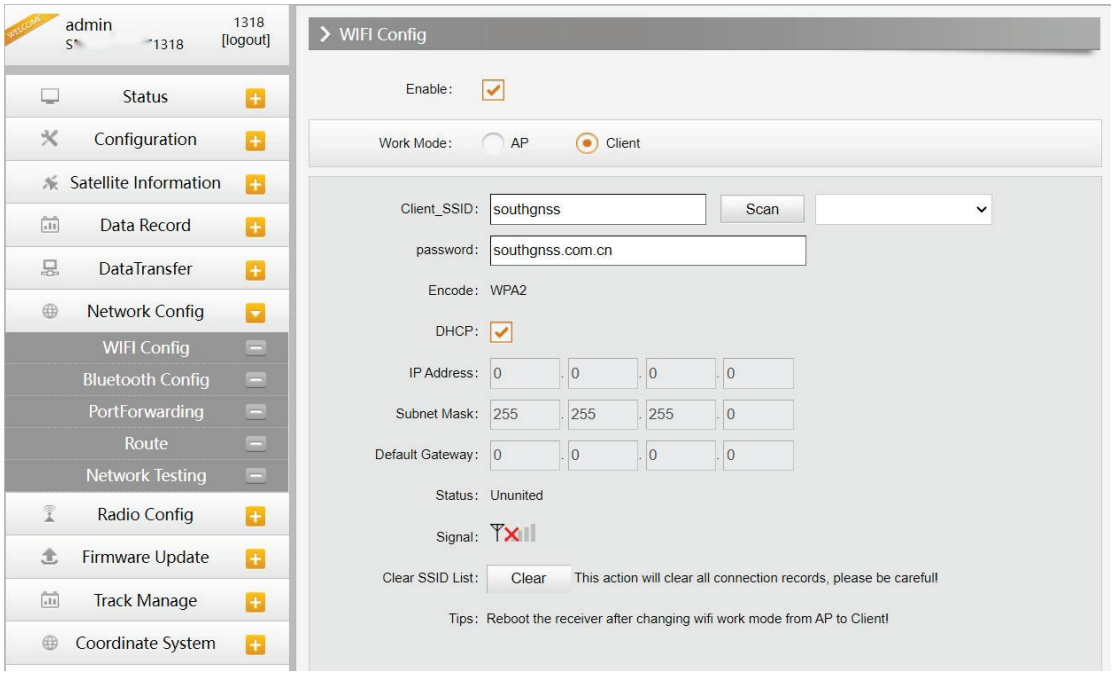
Client_SSID: This is the WiFi hotspot to which Insight V2 is going to connect

Scan: Click this button to search available WiFi hotspots.

Password: This is the password that the WiFi hotspot requires.

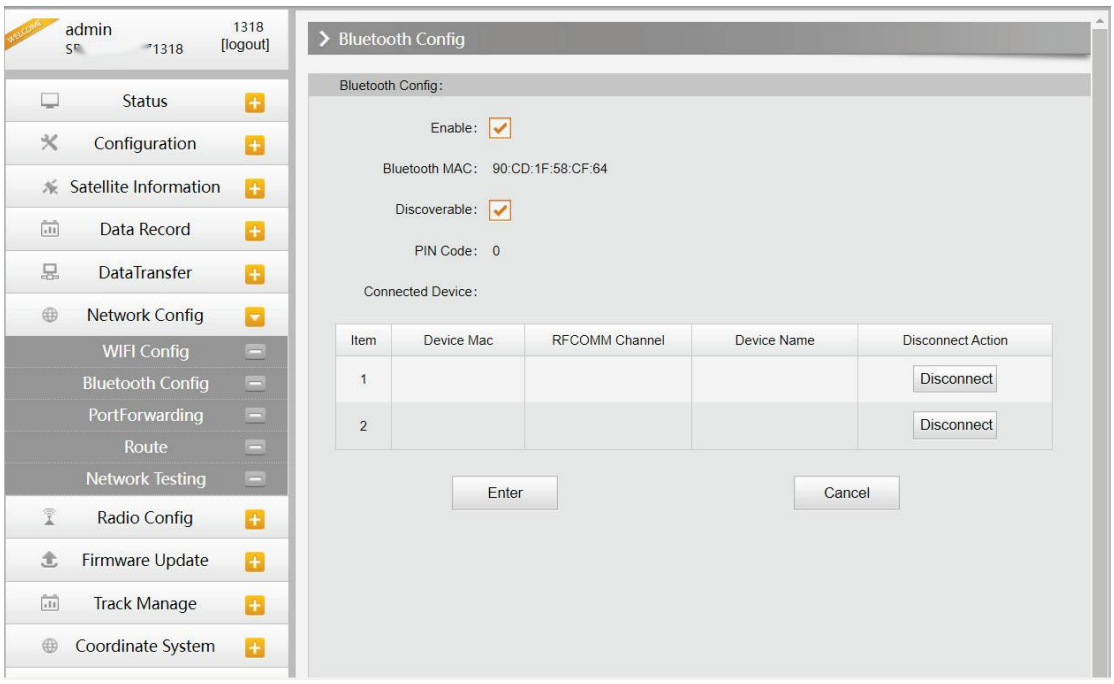
IP fields: If Insight V2 successfully connects to the WiFi, there will be an LAN IP address generated by Insight V2.

ClearSSID: Click this button to clear the SSID list.



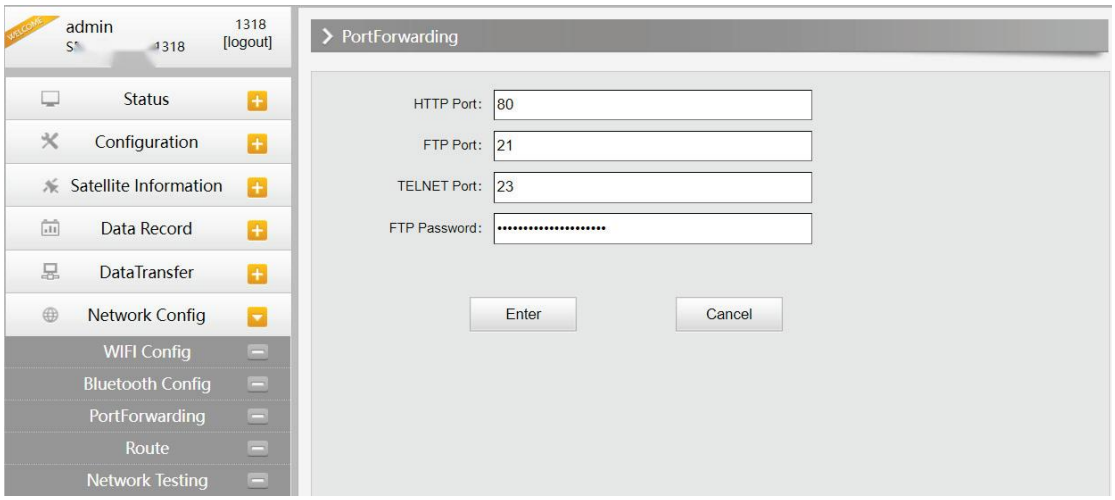
Bluetooth Config

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



Port Forwarding

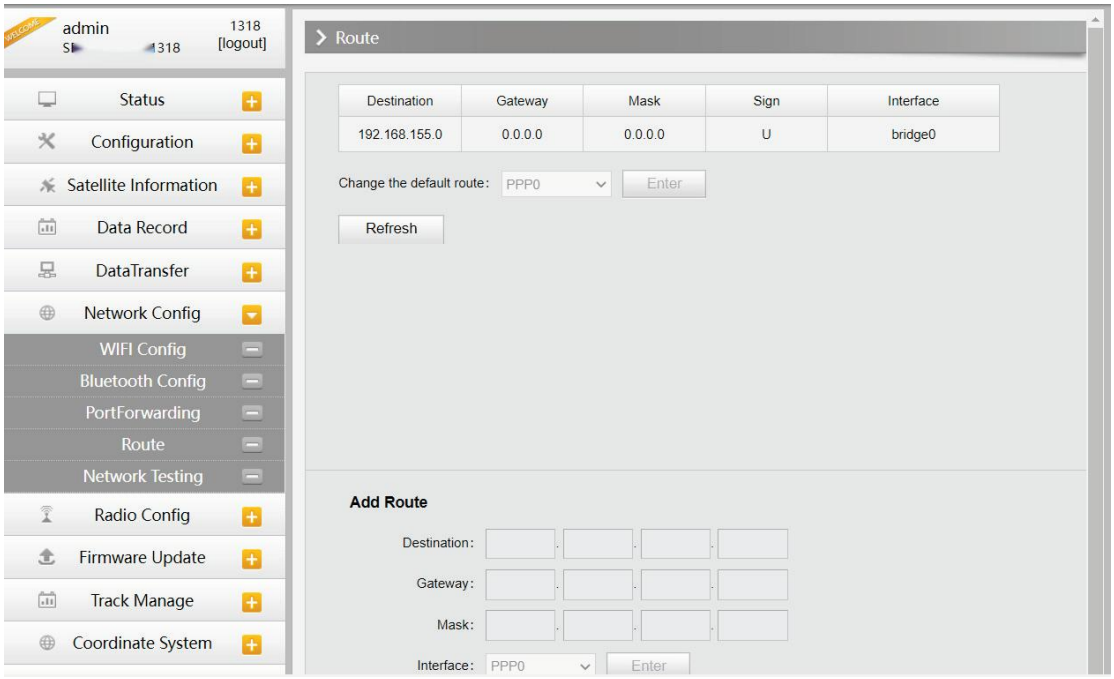
This page is mainly used to view and configure the internet transmission port of Insight V2, customize and debug receivers.



NOTE: We strongly recommend not changing any default value on this page. If you really need to change the settings, please contact SOUTH technician for further support.

Route

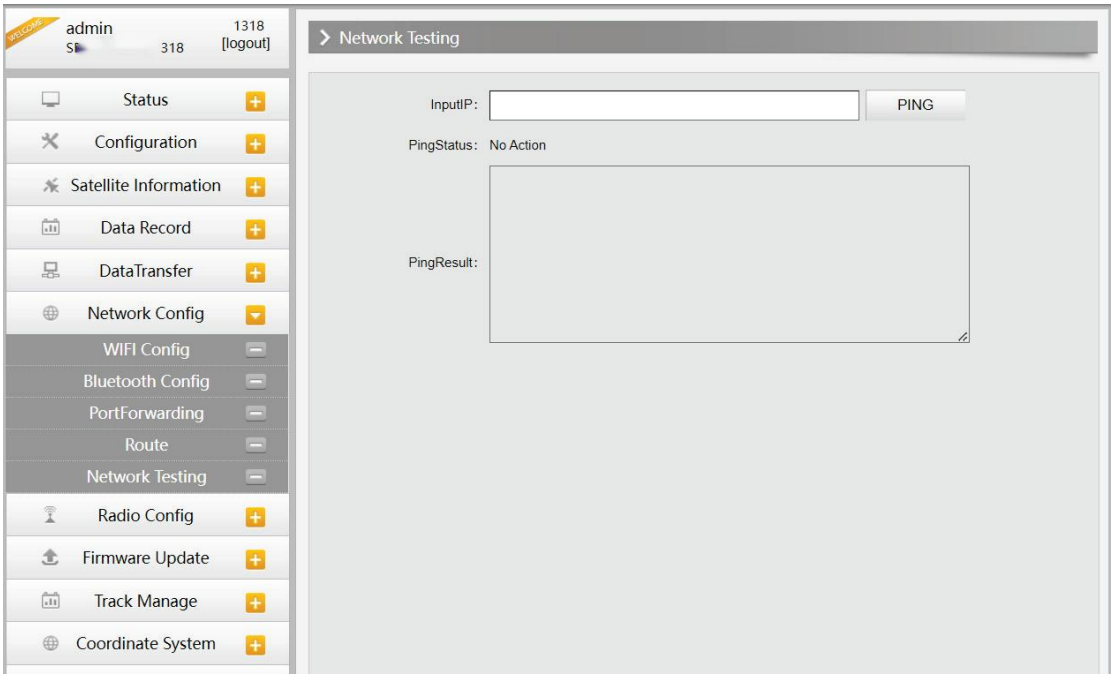
This is mainly used to view and configure the parameters of router, but only under the condition of customize and debug receiver.



NOTE: We strongly recommend not changing any default value on this page. If you really need to change the settings, please contact SOUTH technician for further support.

Network testing

On this page, after entering the IP address, the user can confirm the network status.



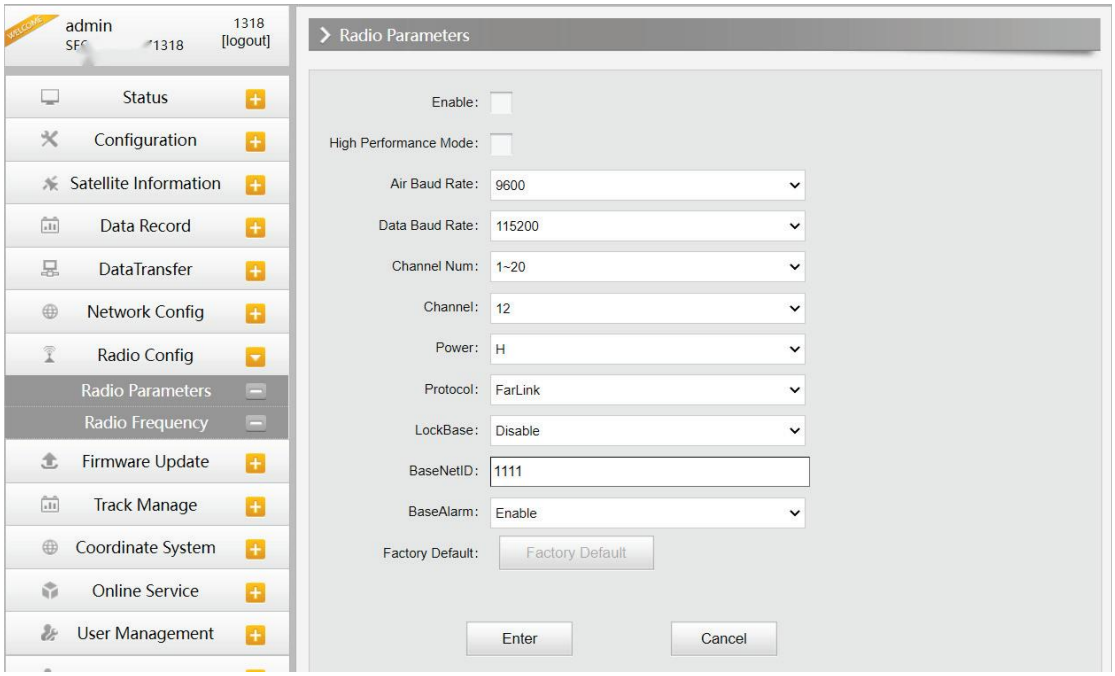
§4.4.7 Radio Config

"Radio Config" can set V2 radio, and it is divided into "Radio Parameter" and "Radio

Frequency".

Radio Parameter

This page is mainly used to configure the parameters for the internal radio module of Insight V2.



High performance mode: To increase the radio performance in the forest and harsh environment; both Base and Rover should enable this function at the same time, and the protocol should be Farlink. If the Rover does not support Farlink protocol, then the Base should disable this function, otherwise, the Rover can not get fixed solution. We recommend disabling this function unless it is necessary.

Air Baud Rate: This represents the internal radio data transmission rate in the air; the higher value, the bigger of data size transmitted per second. We recommend keeping the default setting.

Data Baud Rate: This represents the rate of internal radio data transmission port. The rate should be the same in both Base and Rover. In general, the data baud rate of SOUTH radio module is 19200. We recommend keeping its default.

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

Power: This is only available in Base mode with 3 power settings--High, Middle or Low power.

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

LockBase: If users choose the Farlink protocol, the rover will communicate with a specific base station without interfering by other base stations.

BaseNetID: If enable the LockBase, then you can input the ID of the Base you want to lock onto.

BaseAlarm: If the Base receiver moves(for some unexpected reasons), the rover will receive a notification about the base movement.

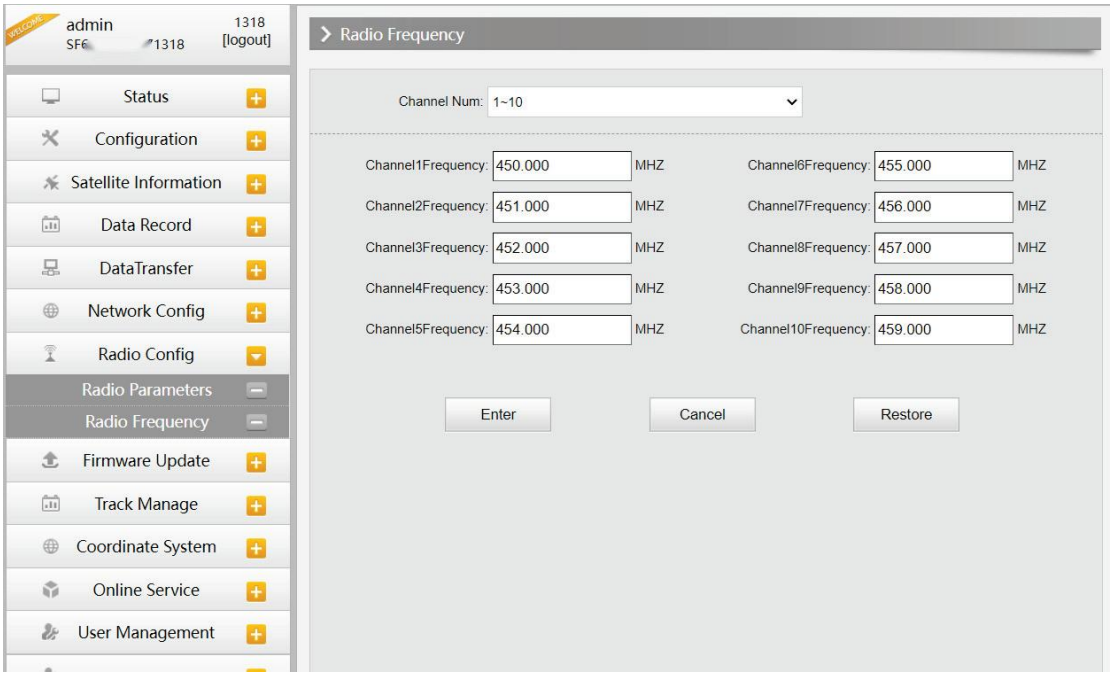
Factory Default: Click this button to restore the factory default for internal UHF module.

Radio Frequency

For Insight V2, the powerful internal radio module supports much more radio channels with legal frequency in different countries or areas.

There are 20 radio channels listed on this page after clicking on radio frequency. Users are able to change the frequency in the channel spacing; click “Restore” button to bring all channels back to default setting.

V2 has integrated satellite tracking, GSM, WiFi, Bluetooth and radio into one antenna. There are three antenna options for the radio frequencies: 410MHz-430MHz, 430MHz-450MHz, 450MHz-470MHz. Please choose a suitable antenna for your V2.

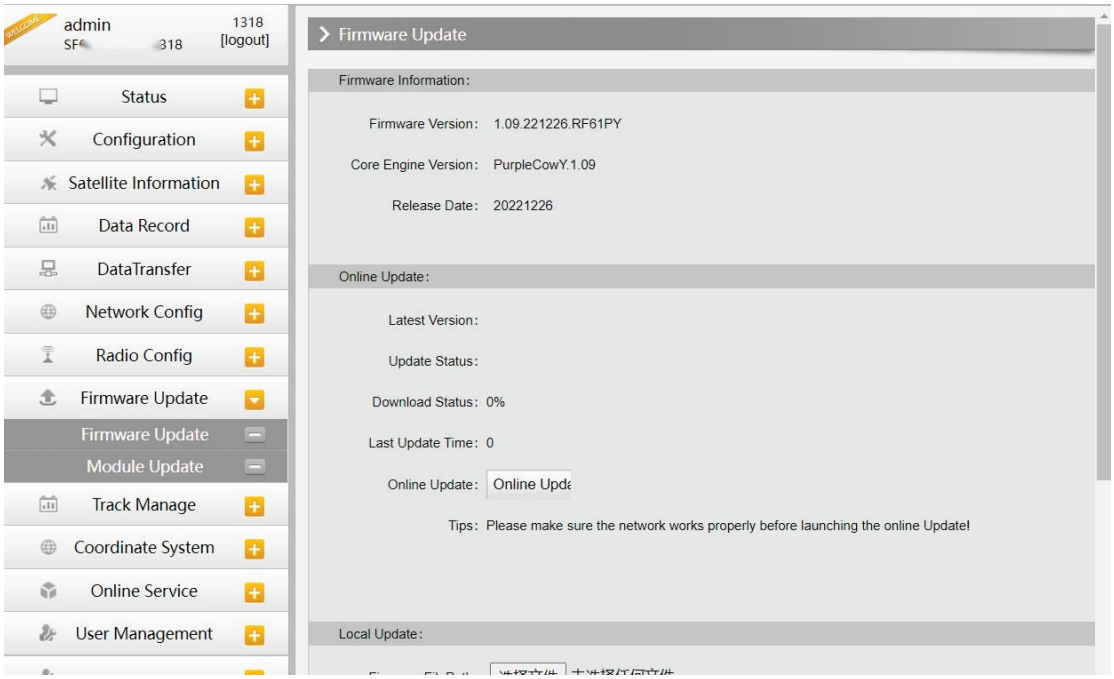


§4.4.8 Firmware Update

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

Firmware Update

This page displays all the information of the firmware installed on Insight V2, and allows updating the latest firmware for receiver. To get the latest firmware, please contact SOUTH technician.

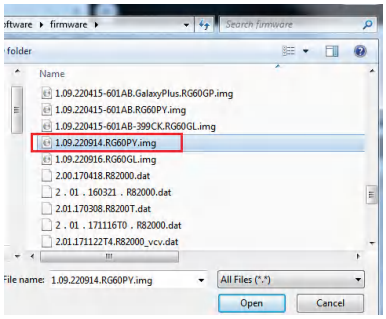


Online Update: Insight V2 supports updating the firmware online anytime if there is something updated or optimized.

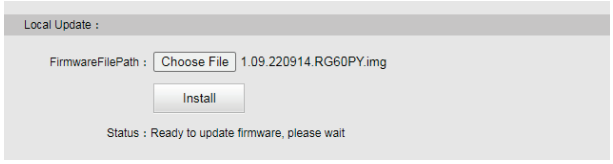
Local Update: Update the latest firmware using a firmware file.

How to upgrade the firmware with Local Update

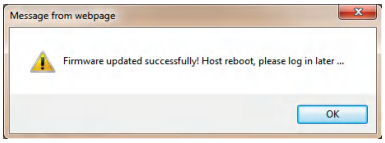
a) Click on "Choose File" button to load firmware file (Please take in mind that the firmware file is ended with **PY.img** as its extension name).



b) And then click "Installation" button to start upgrading.



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



SPECIAL REMIND: Insight V2 DOES NOT support updating the firmware with the help of INstar anymore. Updating the firmware for Insight V2 shall be done on Web UI.

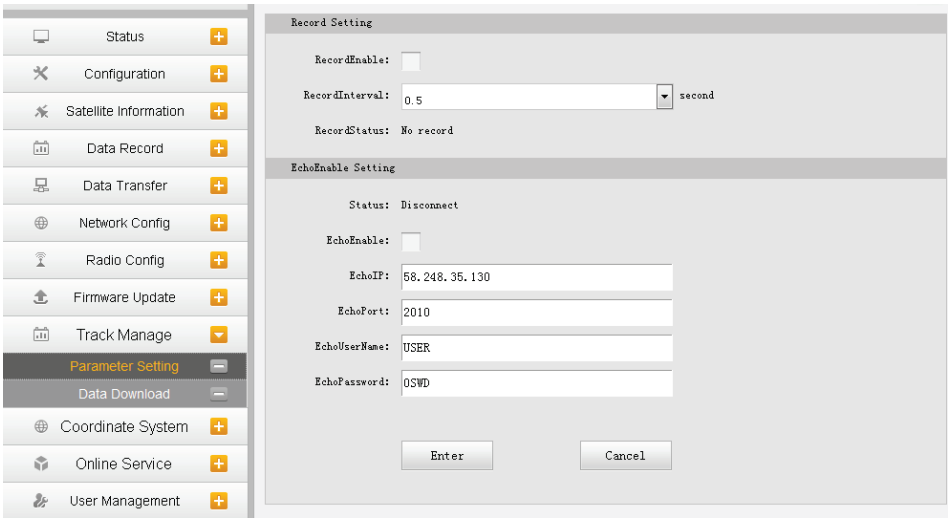
Module Update

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

§4.4.9 Track Manage

V2 now supports recording the track while doing measurements, and uploading the data onto the server.

Parameter Setting

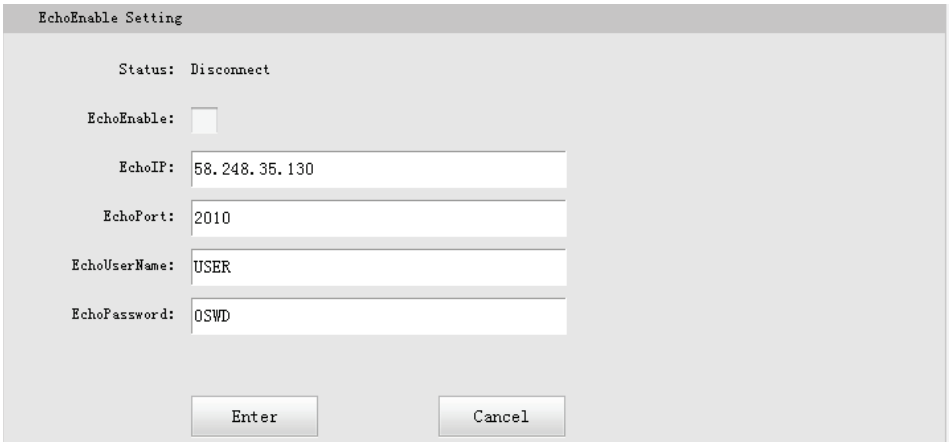


Record Setting

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

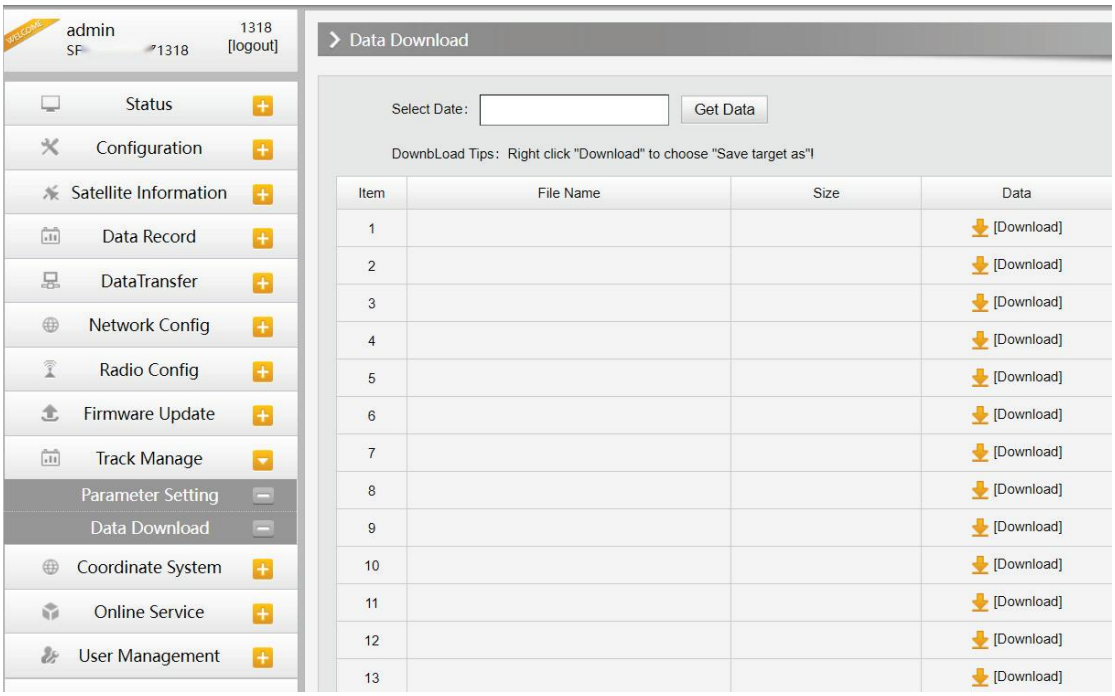
EchoEnable Setting

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



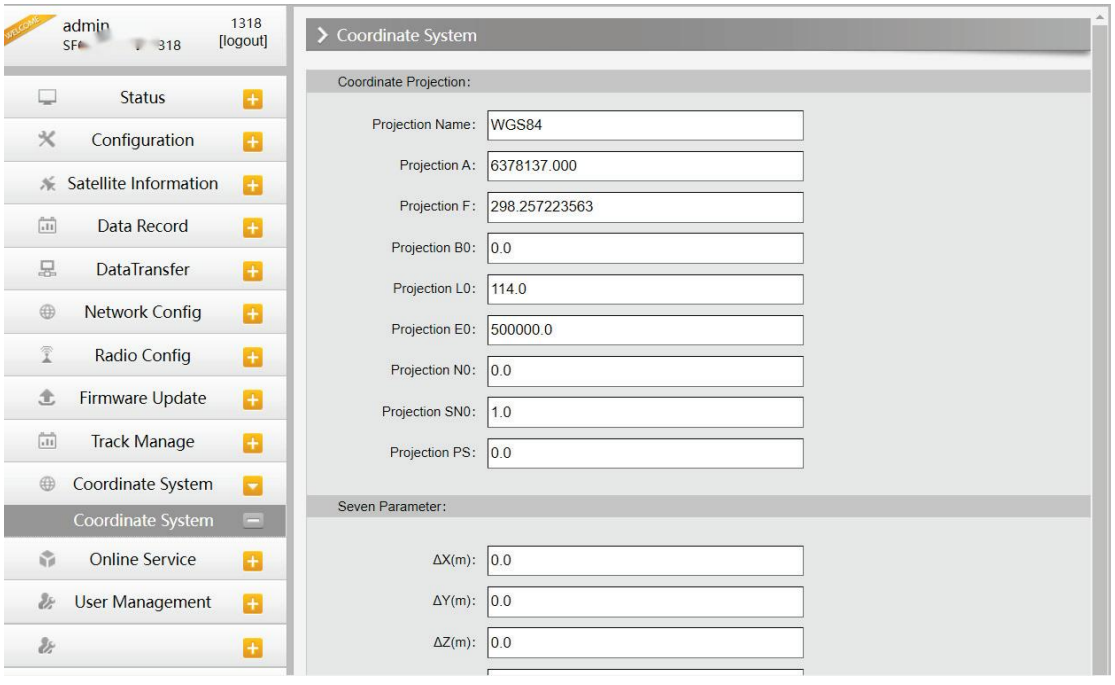
Data Download

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 on that day; then choose the files and click download button.



§4.4.10 Coordinate System(reserve)

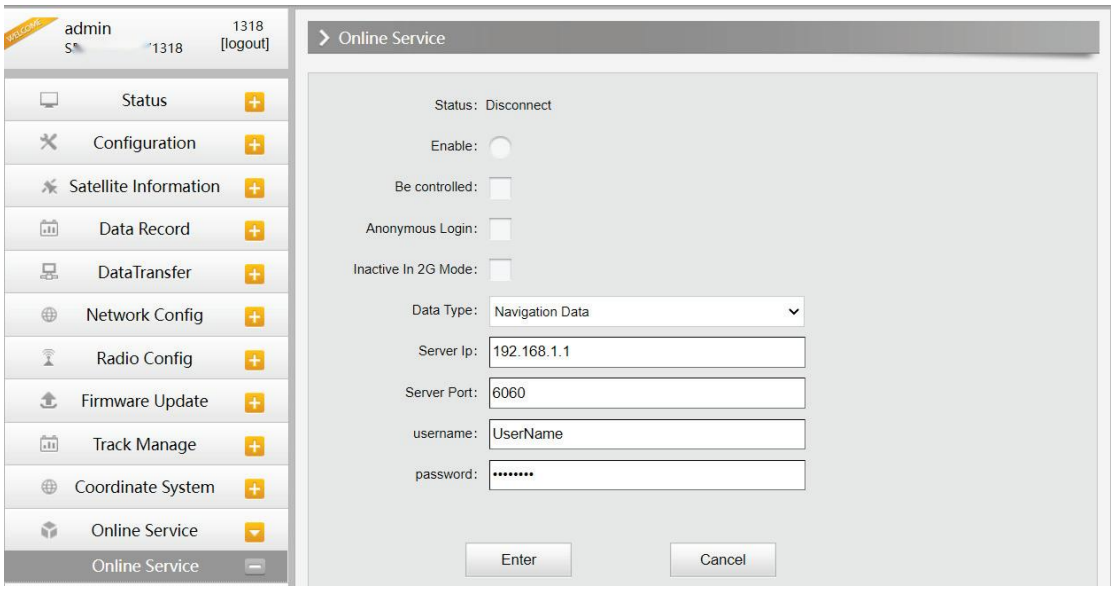
V2 allows users to set the local coordinate system on internal Web UI management. The instrument would output the local coordinates according to this coordinate system.



§4.4.11 Online Service(reserve)

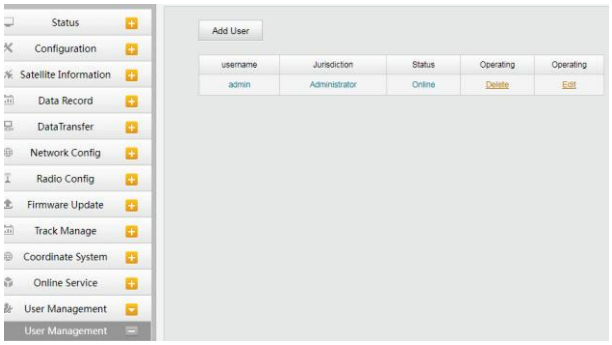
This function is to upload the data onto a server in real time, including Navigation data, raw

observation data, correction data, SIC observation data and open SIC observation data.



§4.4.12 User Management

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

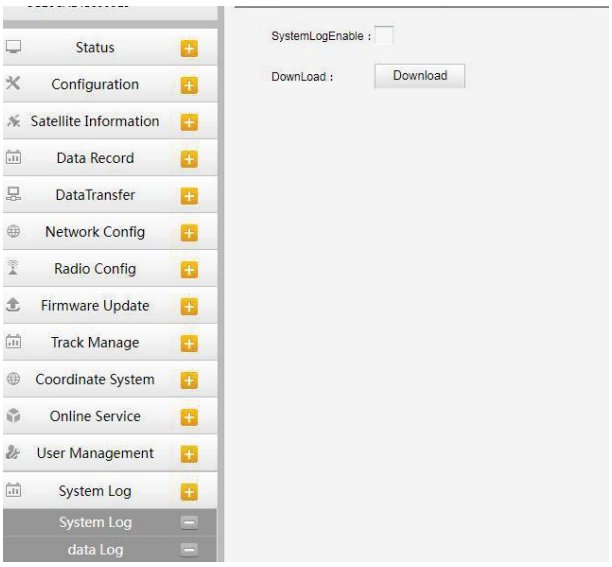


§4.4.13 System log

System log

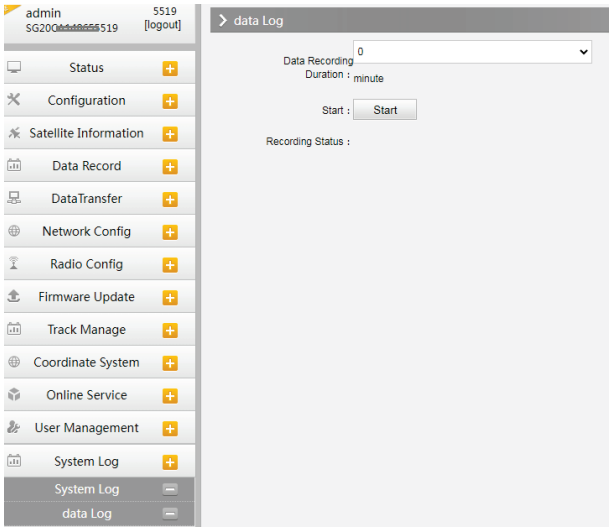
On this page, users can download the system log of the receiver (the log can help to backtrack the working status of the receiver).

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



Data log

On this page, users can record data and choose a duration.



Appendix A Insight V2 Technical Specifications

Positioning Features	**Signal Tracking**	1000 channels BDS:B1I,B2I,B3I,B1C,B2a,B2b GPS: L1,L2,L5 GLONASS:G1, G2, G3 Galileo:E1,E5a,E5b,E6C,E5 AltBoc SBAS:L1C/A,L5 QZSS:L1C/A,L2C,L5,L1C,L1-SALF IRNSS:L5 L-Band
	GNSS Features	Positioning output rate: 1Hz ~ 20Hz Initialization time: <10 seconds Initialization reliability: > 99.9% All constellations available Reliable carrier wave tracking technology improves accuracy and provides high-quality raw data Dynamic positioning technology adapts to various environmental changes
Positioning Precision	**Code Differential GNSS Positioning**	Horizontal: 0.25 m + 1 ppm RMS Vertical: 0.50 m + 1 ppm RMS SBAS differential precision: typical<5m 3DRMS
	GNSS Static	Horizontal: ±（2.5mm+0.5×10^{-6}D） Vertical: ±（5mm+0.5×10^{-6}D） （D is the measured baseline length）
	Real-time Kinematic (Baseline<30km)	Horizontal: ±（8mm+1×10^{-6}D） Vertical: ±（15mm+1×10^{-6}D） （D is the measured baseline length）
IMU+GNSS	**AR stakeout precision**	Typical precision: 2cm
	Tilt Survey	Built-in IMU sensor supports tilt measurement by correcting coordinates according to the tilt direction and angle.
	IMU Refresh Rate	200HZ
	Tilt Angle	0° ~ 60°
	IMU Tilt Compensation	1.8 meters pole; RMS: 8 mm + 0.7 mm/°tilt （tilt is the tile angle ）
Interactive Interface	**Operating System**	Linux
	Button	Power Button
	Indicators	Kolida: 4 indicators + power indicator (at the bottom): satellite indicator,

		Bluetooth indicator, data indicator and power on indicator. SOUTH/Sanding/Ruide/TianYu: 3 indicators + power indicator (at the bottom): Bluetooth indicator, data indicator and power on indicator.
	Web UI	Built-in Web UI management platform supports Wi-Fi or USB connection to monitor the working status and configure the device。
	Voice Prompt	iVoice intelligent voice prompt Default support Chinese, English, Korean, Russian, Portuguese, Spanish and Turkish.
Hardware	**Size**	131mm*80mm
	Weight	800g
	Material	Magnesium alloy
	Temperature	Operating temperature: –45 °C to +75 °C Storage temperature: –55 °C to +85 °C
	Humidity	100% non-condensing
	IP Grade	IP68
	Shock	Withstand 2 meters fall with the pole
Electrical Features	**Power Supply**	7-20V DC, over-voltage protection
	Battery	Internal 6800mAhLi-ion battery; 7.2V; 18 hours for rover-Bluetooth mode.
AR Stakeout	**Pixel**	2 mega-pixel
	Angle	75°
Communication	**I/O Port**	Type-C connector Radio antenna connector
	Radio	Internal radio Frequencies: 410-470MHz Protocol: Farlink, Trimtalk450s, SOUTH, HUACE, Hi-target
	Bluetooth	BT4.2（BR/EDR）
	NFC	Passive: accepts but does not transmit
WIFI	**Support**	802.11b/g/n
	WIFI Hot-spot	It can broadcast WIFI hot-spot for any intelligent devices to access and configure. Data controllers and other intelligent devices can communicate data with the receiver through WIFI
	WIFI Data-link	The receiver can link to WIFI. By WIFI, it can transmit and receive data.
Data Storage/ Transmission	**Storage**	4GBSSD, various sampling intervals, up to 20Hz raw data collection
	Transmission	Support USB, FTP, HTTP
	Data Format	Static data format: STH, Rinex2.01, Rinex3.02 and etc. Differential format: RTCM 3.0, RTCM 3.2 GPS output data format: NMEA 0183, PJK plane coordinate, SOUTH Binary code

		Network model support: VRS, FKP, MAC, support NTRIP protocol
Sensor	**Temperature**	Built-in temperature sensor, temperature monitor technology, adjusts the receiver temperature in real time

Appendix B Key Component Information

Item	Model	Manufacture	Key Performance Index
OEM board	K803S	Shanghai Sino GNSS Technology Co. LTD	1000 channels
GNSS antenna	PM232	Shenzhen Kinvey communication Technology Co. LTD	Dual-band

Appendix C 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: $e=\sqrt{\frac{a^2-b^2}{b^2}}$ 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: $f=\frac{1}{a}(a-b)=1-\sqrt{(1-e^2)}$

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.

Appendix D FCC WARNING

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

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

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

If this equipment does cause harmful interference to radio or television reception,
which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different
from that to which the receiver is connected.

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

To maintain compliance with FCC’s RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 45cm the radiator your body: Use only the supplied antenna.