



INNO 8

USER MANUAL

Version 1.0

SOUTH SURVEYING & MAPPING TECHNOLOGY CO., LTD

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Chapter 1 Preface

Read this chapter, you will have a brief knowledge of SOUTH Company and INNO8 measurement system.

§1.1 Introduction

Welcome to SOUTH Surveying Instruments 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//>

This manual takes the new INNO8 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.

Visual Positioning

INNO8 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, INNO8 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 and HAS: Keep working in remote areas with no CORS network coverage

INNO8 can receive B2b signal of BDS GEO satellites(Asian Pacific area), and E6- B signal from GALILEO. After waiting 20 min in open environment, INNO8 can achieve 10-20cm horizontal accuracy and 20-40cm vertical accuracy.

Color Round Touch Screen: Easy operate like a smart watch

HD 1.39 inches color LCD touch screen with high brightness and low power consumption is more suitable for field work, which is convenient and, efficient to complete touch 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

INNO8 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 INNO8, 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

INNO8 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.

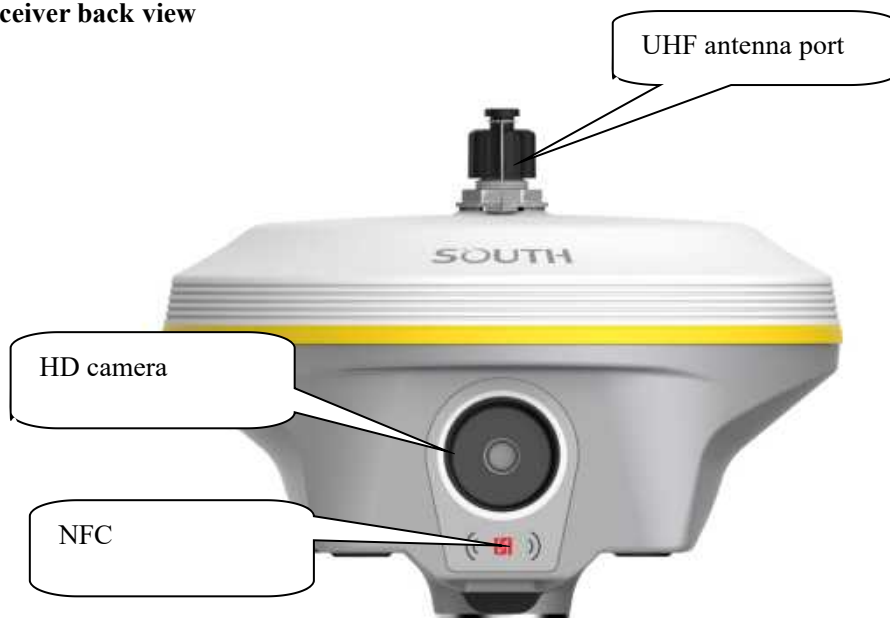
Chapter 2 INNO8 receiver introduction

§2.1 Receiver components

Receiver front view



Receiver back view



Receiver bottom view

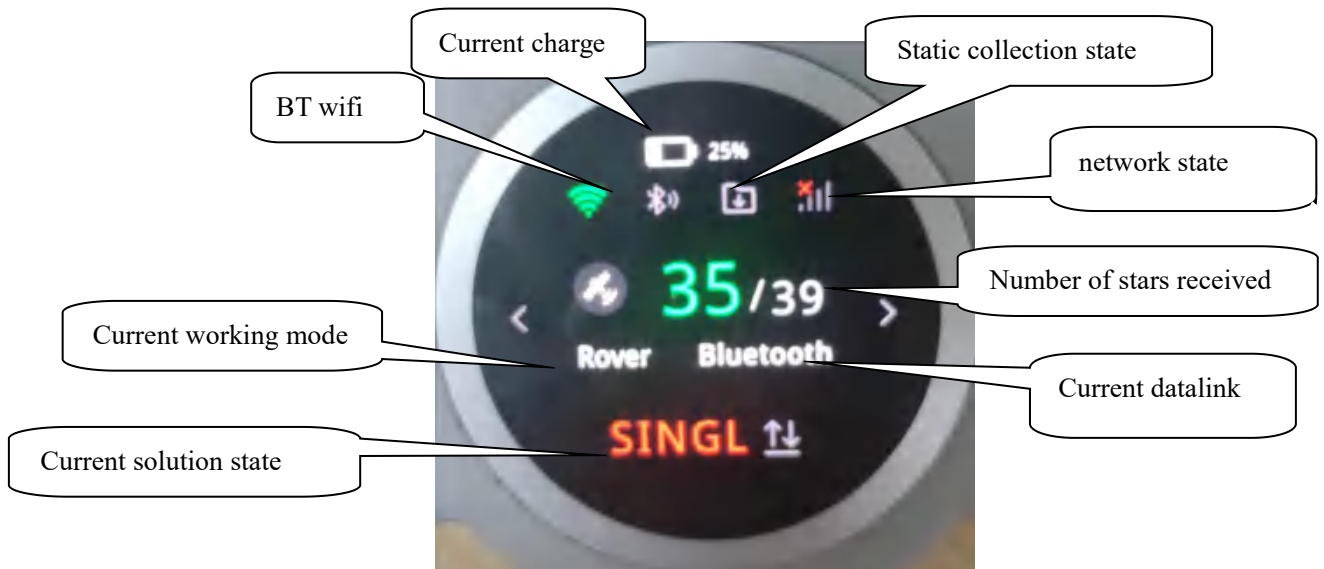
- **type-c port:** for static data downloading, OTG (for external storage) and charging.
- **5-Pin port:**
 - 1) For external power supply
 - 2) For export data, debug and configure receiver
- **power indicator light :** Displays the current battery, with one bar representing 25% charge
- **SIM card slot:** When using GSM/CDMA/4G and other networks, the chip is inserted upward into the phone card

§2.2 Receiver touch screen menu

§2.2.1 Main display interface

The receiver can be operated from touch screen. By swiping the screen, receiver can be configured.

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



The LCD display is divided into main interface, first-level menu and second-level menu.

In the primary menu and the secondary menu, slide up to return to the main interface.

In decline in any menu can choose shutdown and restart.

§2.2.2 Main menu

Main menu: by swiping screen right or left.



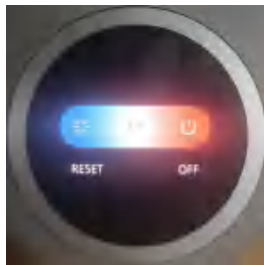
[Receiver information]

[Work mode],

[Set Datalink],

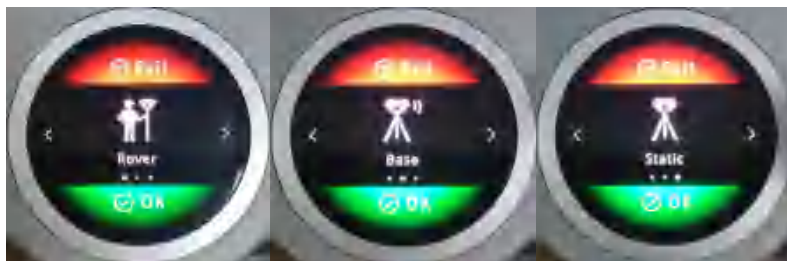
[System Setup],

The shutdown and restart menu is displayed in the drop-down list



§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



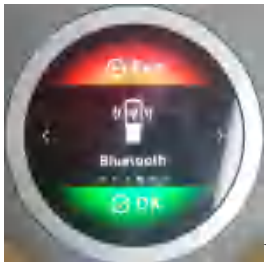
Cellular network (via SIM card) as datalink



External radio as datalink



Dual transmit (inbuilt radio and cellular network)



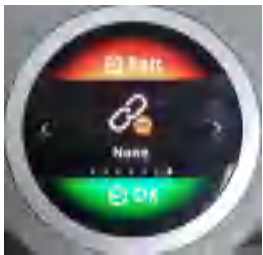
Bluetooth datalink (also called controller network as datalink)



WIFI datalink

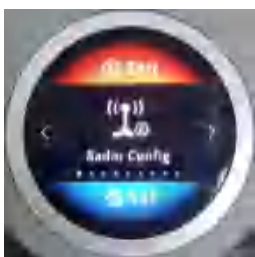


Intelligent datalink



No datalink

§2.2.5 System Setup



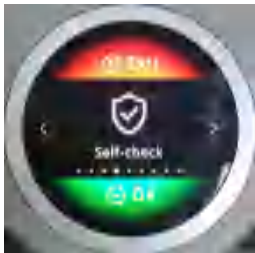
Radio Config



GSM/GPRS Config



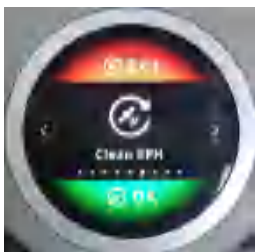
WIFI Config



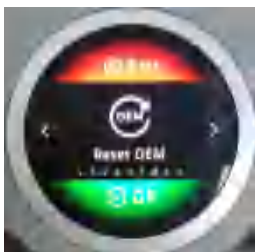
Self-check



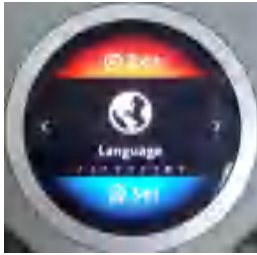
Factory Default



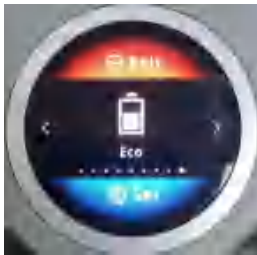
Clean EPH



Reset OEM



Language



Eco

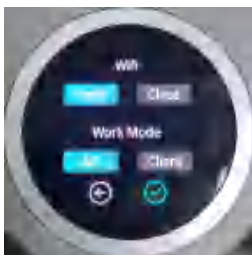
Radio Config



Data and Air baud rate: Normally, it is recommended to take default air baud rate. If need to change it, please make the same change for both base and rover receiver. More air baud rate, more data can be transmitted per second.

Radio Channel and protocol: Normally, it is recommended to take default protocol (Farlink). If need to change it, please make same change for both base and rover receiver.

WIFI Config



[WIFI work mode: AP/ Client]

AP mode: the receiver will generate hotspot so that your computer or mobile phone can

connected to it and visit receiver's WEB UI.

Client mode: with the receiver's inbuilt network module, it can connect other WIFI hotspot to access to internet so that the WIFI datalink can be used.

Note: suggest to close WIFI client mode if there is no need to use WIFI datalink. By default, it is set as AP mode.

§2.3 Hardware Operation

Power on

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

Press the power button for few seconds (around 10 seconds), the instrument completes initializing along with voice prompt about the working mode (for example, "Rover, internal radio mode"). After a while, instrument starts to track satellites.

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

Self-check

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 INNO8 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 20 seconds and pass over the foregoing states (power off, mode selection, self-check, USB mode setting), INNO8 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

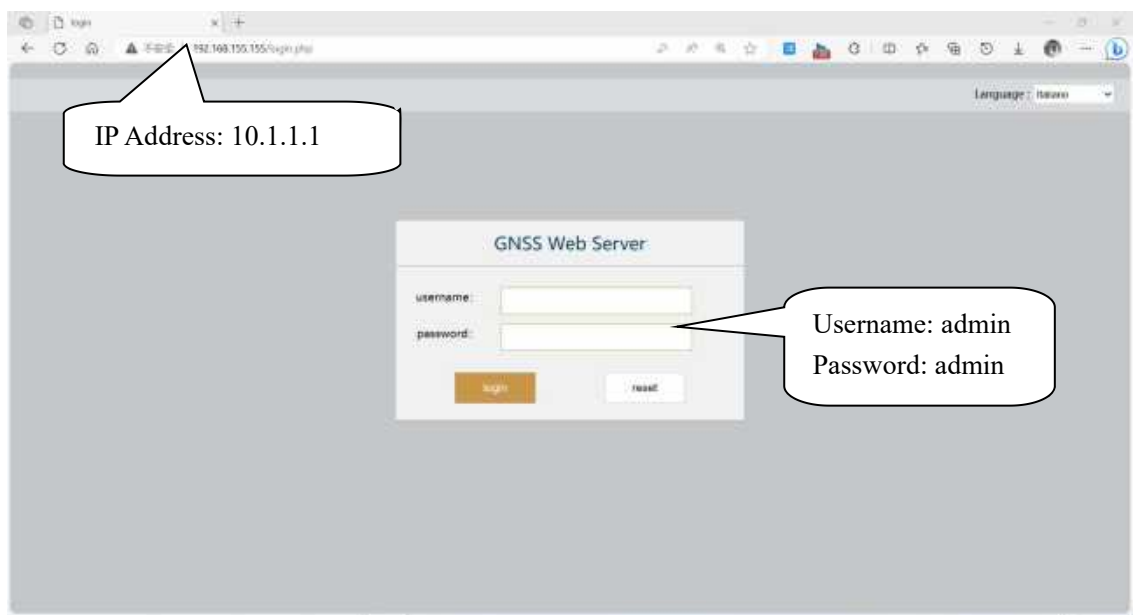
Because of using the smart embedded Linux operating system and SOUTH intelligent cloud technology, the web UI allows users to configure and monitor the status of INNO8 in real-time. The accessing way is not only by WiFi connection, but also can be USB mode.

§3.2 Access by WiFi

The WIFI hotspot is default broadcasted by INNO8, 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 browser, on the login interface, apply “admin” for the username and password.

For example, search the WIFI hotspot broadcasted by a INNO8 receiver using a laptop PC, choose the WIFI hotspot and click on connect button to establish the connection without password.

Run IE browser 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.



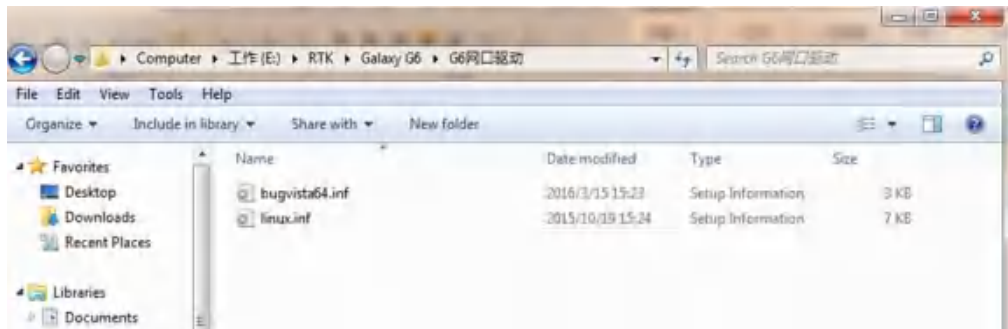
§3.3 Access by USB

On this mode, the Type-C USB port of INNO8 must work as an Ethernet port, then internal web UI shall be accessed via USB cable connection with computer.

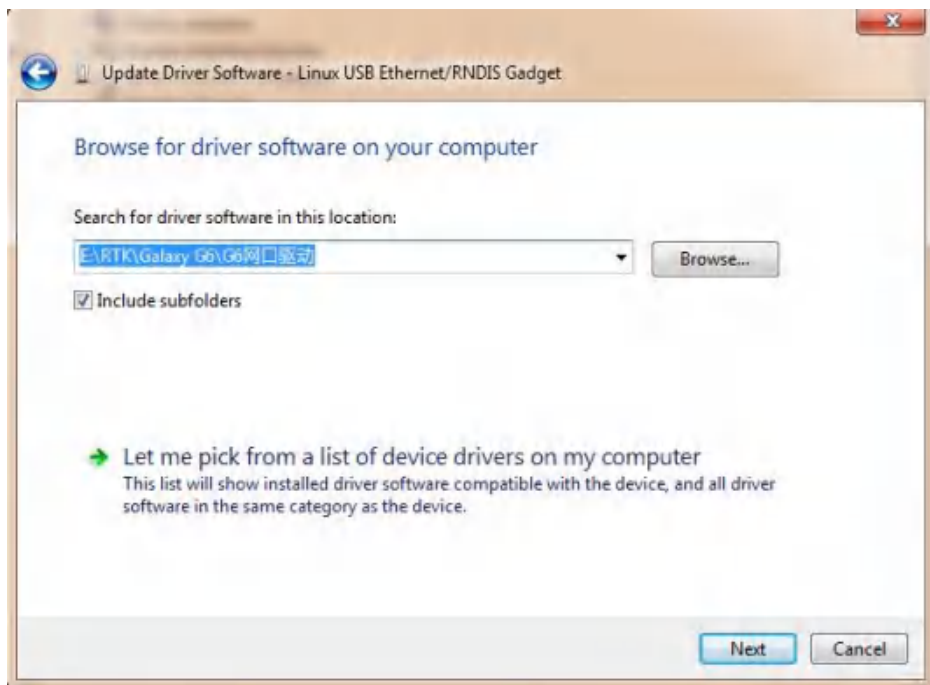
First of all, a corresponding driver is required to install to the computer, then this function could be activated.

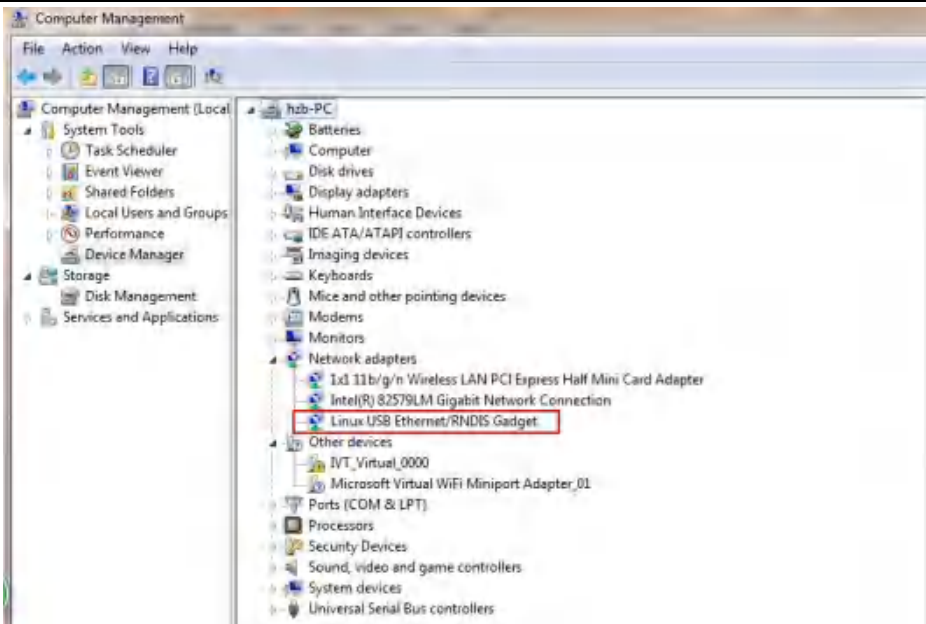
Due to different operating system is installed on computer, the drivers should be applied to a

suitable one. The file `bugvista64.inf` is applied to 64bit operating system, and `linux.inf` is for 32bit operating system.



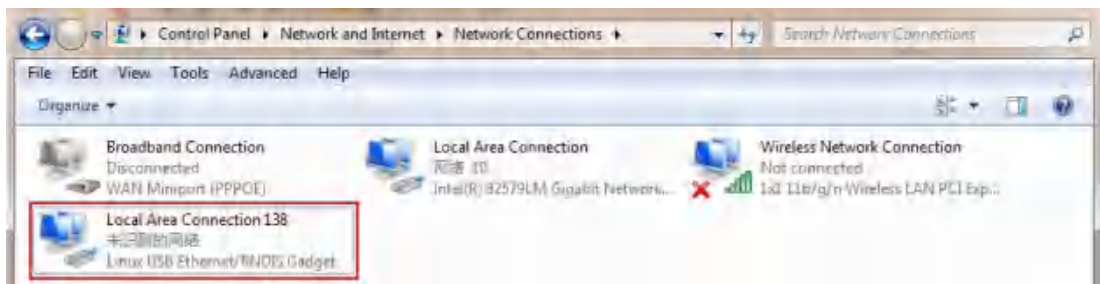
Choose the folder which contains the drivers





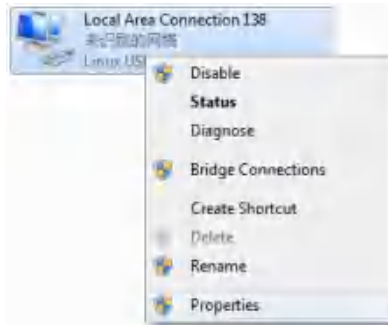
NOTE: The driver can be downloaded from official website automatically or please contact with us for more supports.

If the driver has been successfully installed, the USB port of INNO8 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 INNO8 receiver to computer via USB network interface.

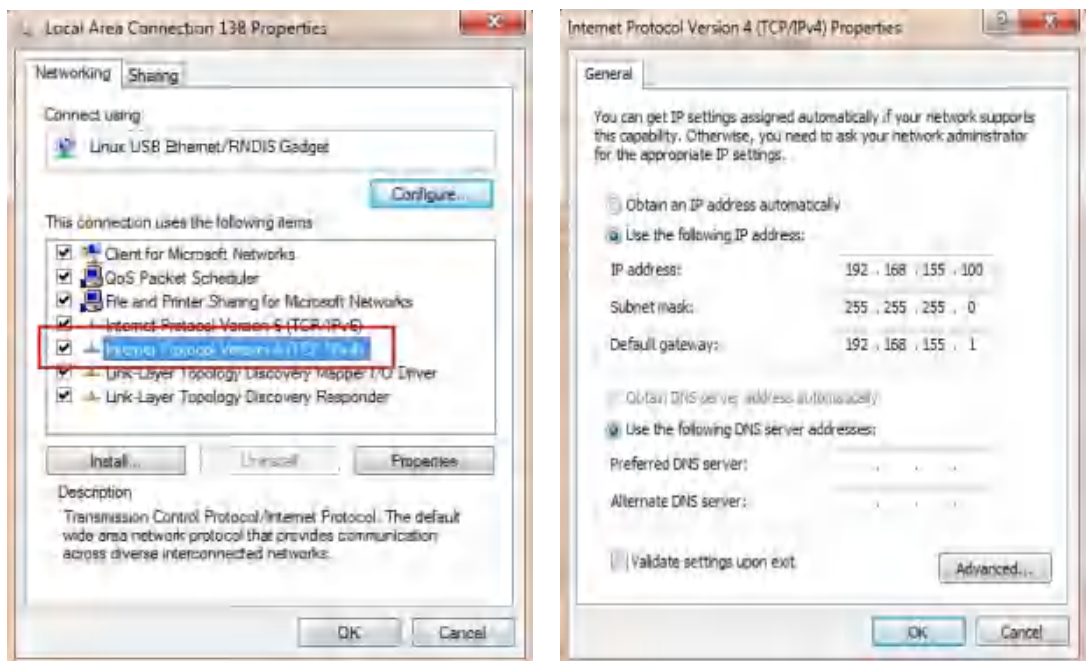


However, sometimes the computer cannot detect the receiver by USB network interface because there is something wrong with acquiring IP automatically, therefore, we need to do something to avoid such problem, that is to set a fixed LAN IP for the connection:

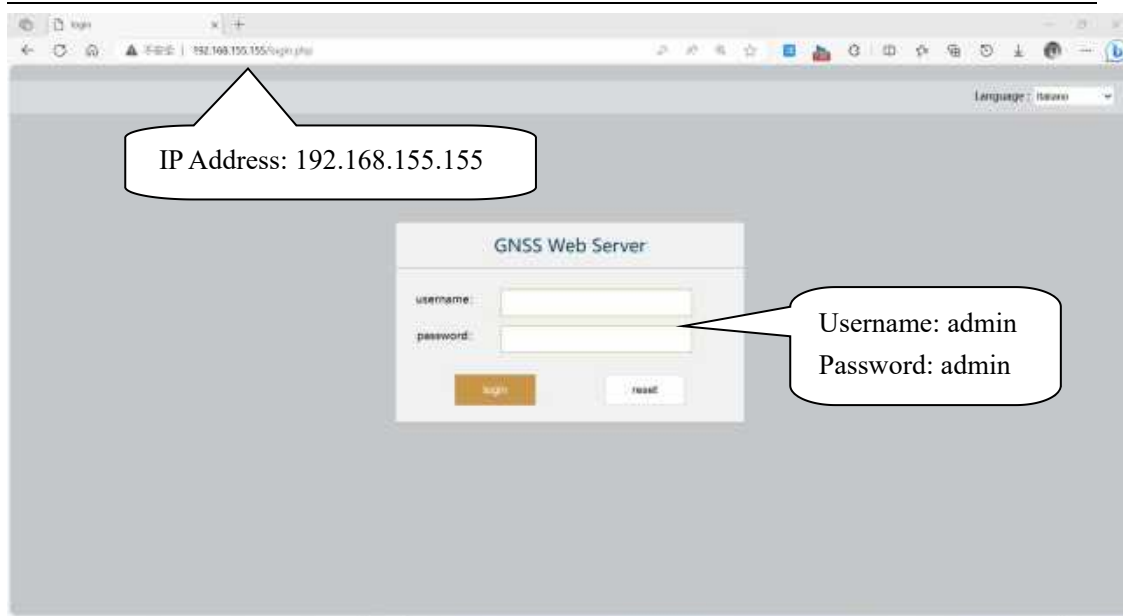
Right click on the local area connection which newly generates, choose properties to call out the local area connection properties window.



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.

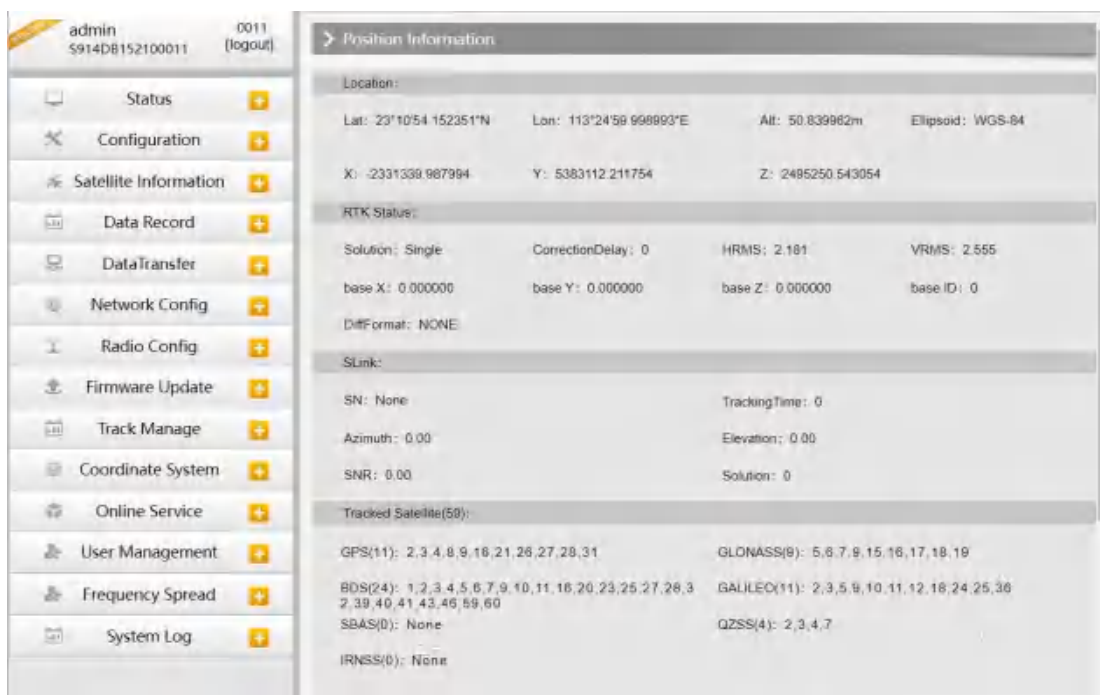


Run IE browser on computer and input the **default IP (192.168.155.155)** into address bar, after a while, the system login interface is refreshed, then apply **“admin”** for username and password to login.



§3.4 Web UI main interface

After login the Web UI management of INNO8 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

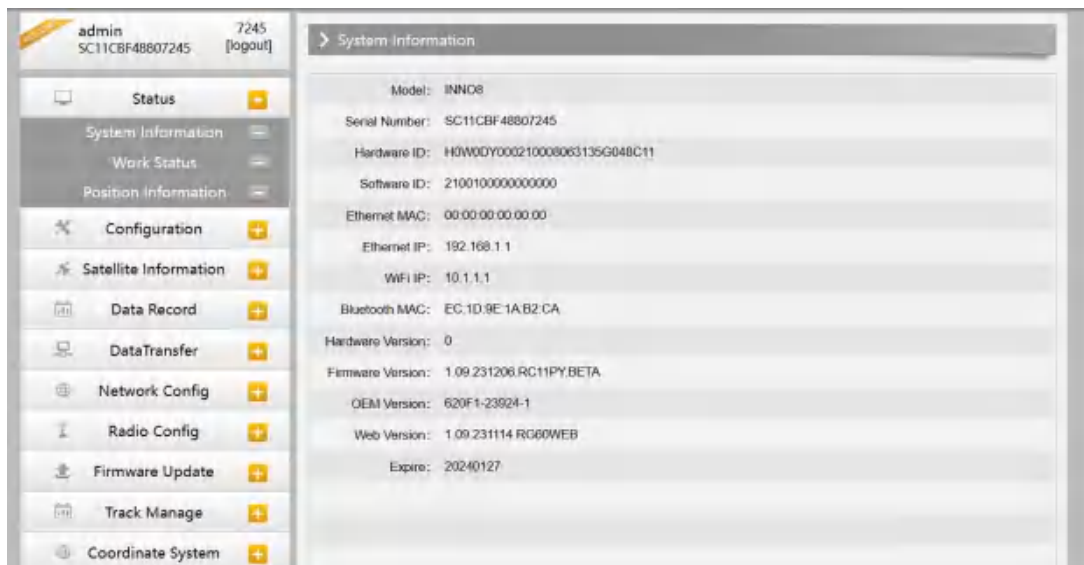
Ref	Component	Description
	Status	Positioning information, satellite tracking and the others will be displayed in this page
	Configuration	It contains registration for receiver, base configuration, antenna configuration, satellite configuration, receiver configuration and system configuration.
	Satellite 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 for INNO8
	Online Service	Upload data onto a server in real-time
	User Management	Add and manage the Web UI users
	Frequency Spread	Frequency spread analysis
	System Log	System and data log

§3.4.1 Status

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

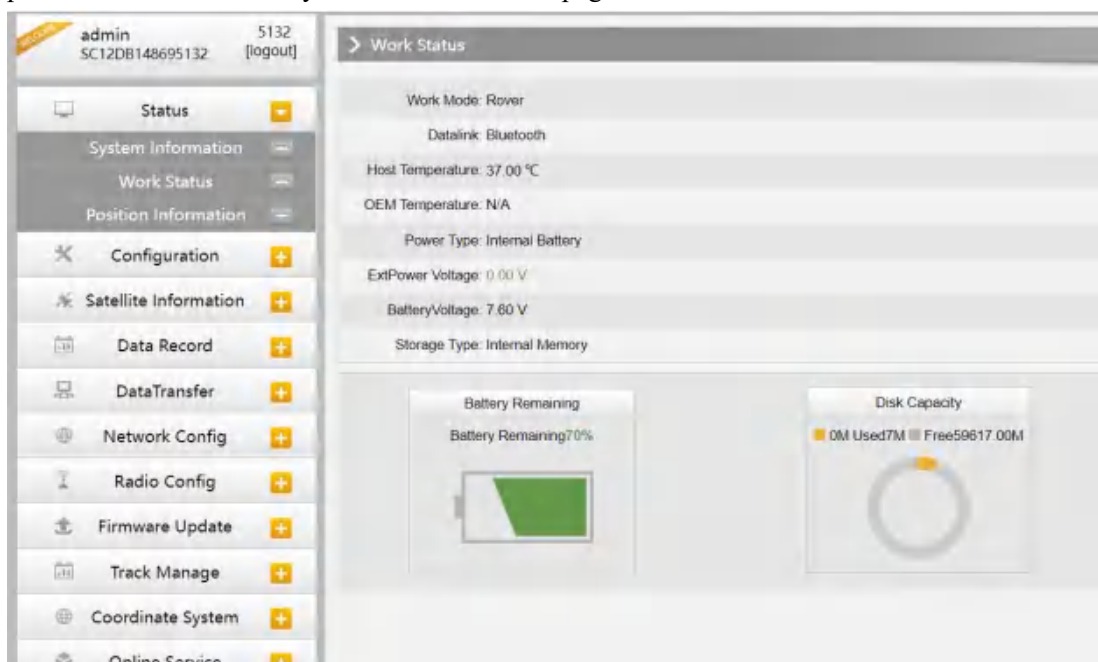
System Information

In this page, all the information of INNO8 is displayed such as serial number, hardware ID, MAC address, firmware version and so on.



Work Status

The physical state of INNO8 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

The screenshot shows the INNO8 web interface. The top header displays the user 'admin' with ID '5914DB152100011' and a 'logout' link. The left sidebar is a navigation menu with icons and labels for various system functions. The main content area is titled 'Position Information' and displays the following data:

Location:			
Lat: 23°10'54.144880"N	Lon: 113°24'59.998855"E	Alt: 51.173820m	Ellipsoid: WGS-84
X: -2331339.830113	Y: 5383112.715794	Z: 2495250.457581	

RTK Status:			
Solution: Single	CorrectionDelay: 0	HRMS: 2.057	VRMS: 2.501
base X: 0.000000	base Y: 0.000000	base Z: 0.000000	base ID: 0
DiffFormat: NONE			

SLink:	
SN: None	TrackingTime: 0
Azimuth: 0.00	Elevation: 0.00
SNR: 0.00	Solution: 0

Tracked Satellite(60):	
GPS(12): 2, 3, 4, 8, 9, 16, 18, 21, 26, 27, 28, 31	GLONASS(9): 5, 6, 7, 9, 15, 16, 17, 18, 19
BDS(24): 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 16, 20, 23, 25, 27, 28, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 46, 59, 60	GALILEO(11): 2, 3, 5, 9, 10, 11, 12, 18, 24, 25, 35
SBAS(0): None	QZSS(4): 2, 3, 4, 7
IRNSS(0): None	

Used Satellite(32):

§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 INNO8 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.

The screenshot displays the INNO8 web interface. On the left is a sidebar menu with options: Status, Configuration (expanded), General Config, Base Setup, Antenna Setup, Satellite Tracking, Receiver Operation, System Setup, Receiver Security, Satellite Information, Data Record, DataTransfer, Network Config, Radio Config, Firmware Update, Track Manage, Coordinate System, Online Service, and User Management. The main content area is divided into two sections. The 'Register' section shows a Serial Number (S914DB152100004), a Code (FD49ACABD599FC1E6793A6C0BC89E2C72E), an ExpiredDate (20240221), an OnlineRegistration dropdown (OnlineRegi), and an OEMRegisterCode (0). Each of these fields has a 'Register' button next to it. The 'Mode Setting' section contains several dropdown menus: Work Mode (Rover), Datalink (Bluetooth), and Radio Router (None). Below these are several checkboxes: Radio Transfer, RTK Record, xFIEnable, 1PPS, WiseLinkRoute, and EVENT. At the bottom of this section is an EVENT Polarity dropdown (Negative).

If the code of INNO8 has expired or is going to be run out, please provide the serial number of your INNO8 for us to apply for another available code, then input the code into the blank or register the receiver online.

This is a close-up of the 'Register' section from the previous screenshot. It shows the Serial Number (S914DB152100011), a Code (F7CA9F4AF3992A8854BEED753F8518E9D80), an ExpiredDate (20240215), an OnlineRegistration dropdown (OnlineRegi), and an OEMRegisterCode (0). Each field is followed by a 'Register' button.

INNO8 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 INNO8.

Mode Setting:

Work Mode: Rover

Datalink: Radio

Radio Router: None

Radio Transfer: ☐

RTK Record: ☐

xFillEnable: ☐

1PPS: ☒

WiseLinkRoute: ☐

EVENT: ☐

EVENT Polarity: Negative

BDSPPP: Disable

Enter Cancel

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.

Radio

None

Radio

Network

External

Dual

Bluetooth

WiFi

IntelligentDataLink

Radio Route: This feature is used to transfer the correction which from the reference station to the other rover by radio, the rovers will have the same reference coordinates. This is in the case of working in some places where there is poor signals from reference station or there is only a SIM card for a few rovers. It is able to use internal radio or connect an external radio to transfer the correction. This feature is only available on Rover mode.

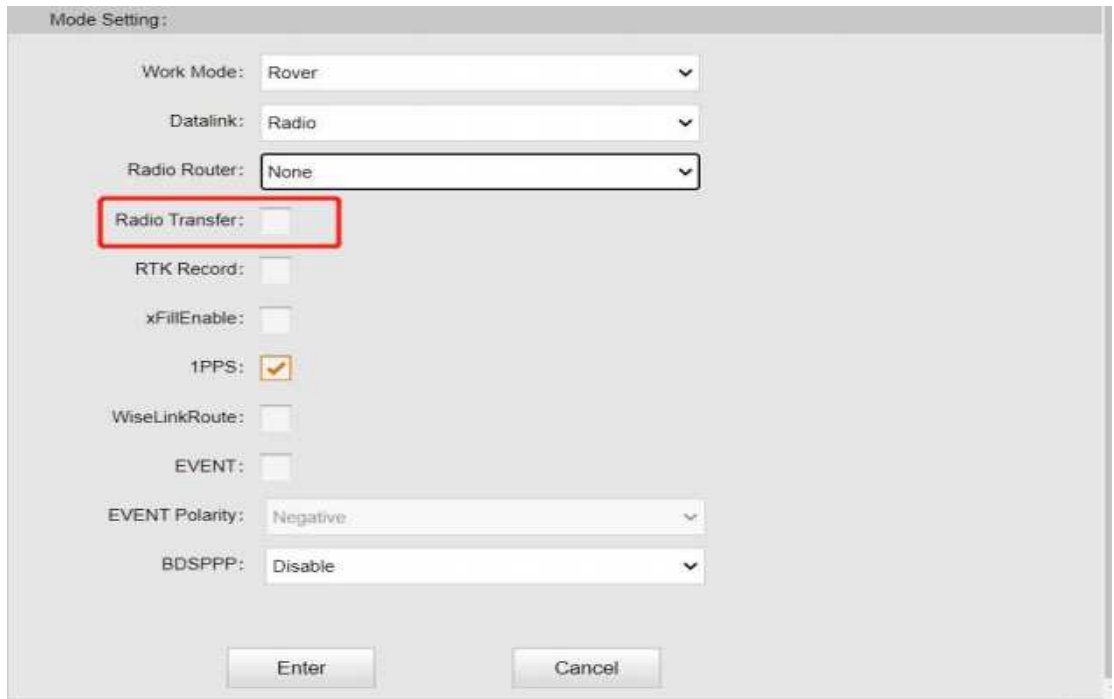
None

None

Inner Radio Router

External Radio Router

RadioTransfer: This is the function that INNO8 is able to transfer the correction from Base station to the other rovers with the internal UHF, definitely, INNO8 can work as a radio transfer (radio repeater).



Mode Setting:

Work Mode: Rover

Datalink: Radio

Radio Router: None

Radio Transfer: ☐

RTK Record: ☐

xFillEnable: ☐

1PPS: ☒

WiseLinkRoute: ☐

EVENT: ☐

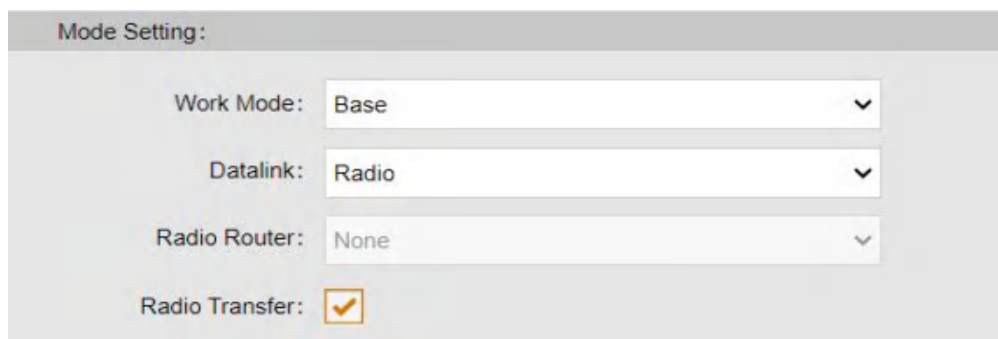
EVENT Polarity: Negative

BDSPPP: Disable

Enter Cancel

Operation:

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



Mode Setting:

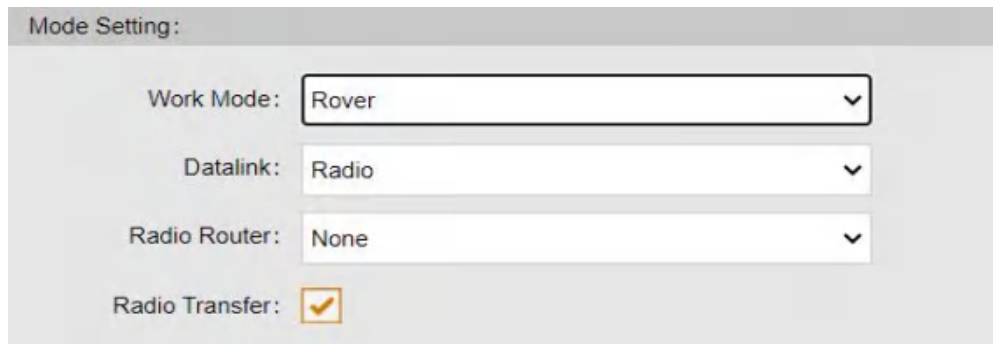
Work Mode: Base

Datalink: Radio

Radio Router: None

Radio Transfer: ☒

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



Mode Setting:

Work Mode: Rover

Datalink: Radio

Radio Router: None

Radio Transfer: ☒

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 INNO8 keep the centimeter-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.

Base Setup

When INNO8 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)

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

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

Antenna Setup

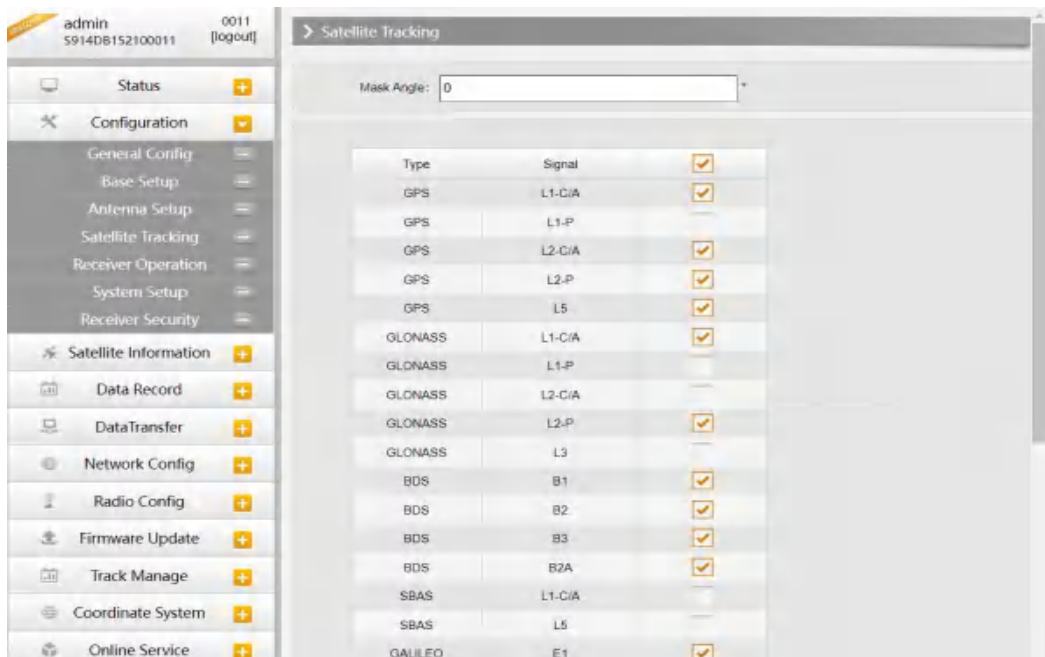
The antenna parameters are configured in this page including the antenna height, measuring method.

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.

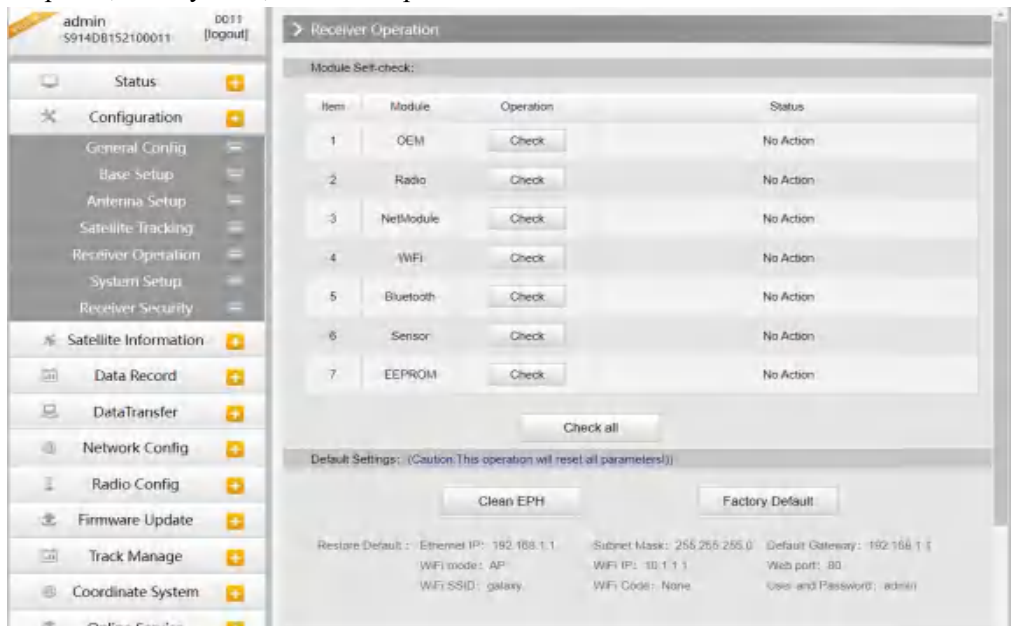
Satellite Tracking

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 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 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 receiver 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.

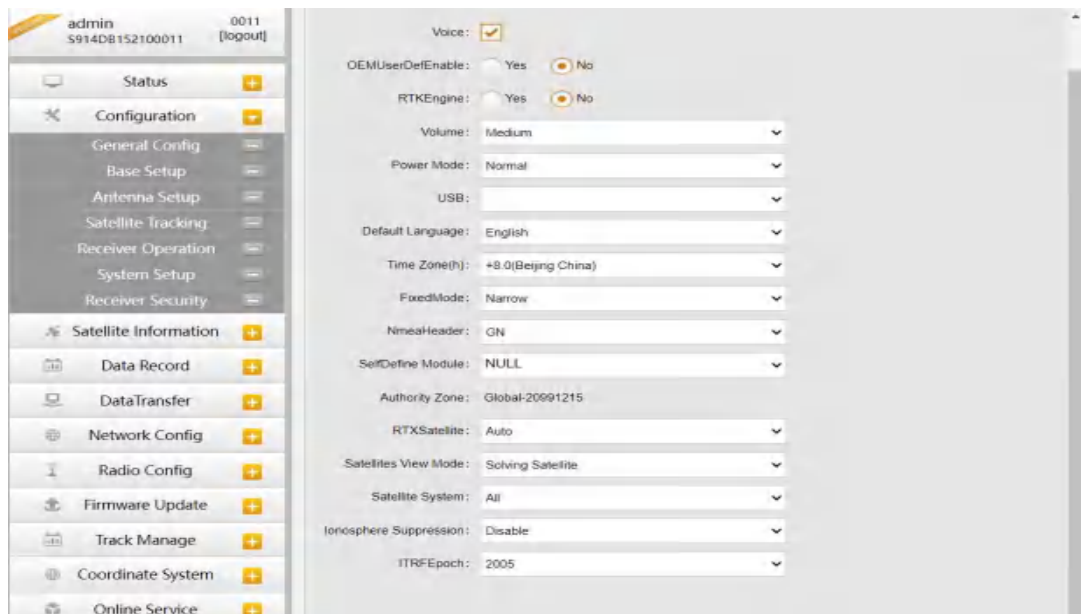
Power Off: Click this button to power off the receiver.

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 INNO8, uncheck it to turn off the voice guide.

OEMuserdefEnable: check “No” for INNO8.

RTKEngine: check “No” for INNO8.

Voice Volume: Define the voice volume for INNO8’s speaker.

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

USB: Now INNO8 supports the USB mode and Network interface at the same time through the usb type-c cable.

Default Language: Configure the default language for INNO8 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 INNO8.

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.

Authority Zone: Default-20231127

Authority Zone: Global-20991215

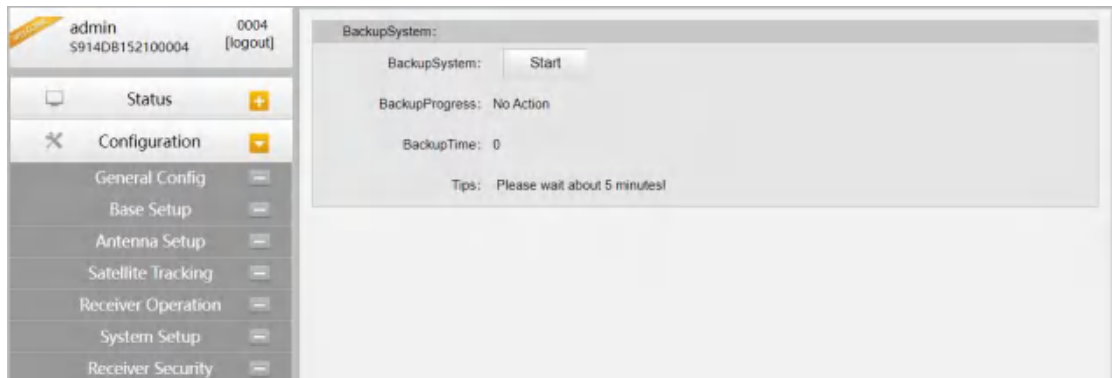
Satellites View Mode: There are two methods, Solving Satellite and Common Visible Satellite.

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

Ionosphere Suppression: 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.

SN	Type	Elevation	Azimuth	L1SNR	Code	L2SNR	Code	L3SNR	Code	Status
2	GPS	8.12	180.83	39.00	CA	33.00	P	0.00	-	In Use
3	GPS	4.13	215.07	33.00	CA	33.00	P	37.00	I	In Use
4	GPS	81.03	296.92	46.00	CA	46.00	P	49.00	I	In Use
7	GPS	5.75	312.49	30.00	CA	0.00	-	0.00	-	In Use
8	GPS	58.83	212.97	45.00	CA	47.00	P	49.00	I	In Use
9	GPS	35.17	302.11	44.00	CA	43.00	P	45.00	I	In Use
16	GPS	41.10	28.18	45.00	CA	37.00	P	0.00	-	In Use
21	GPS	13.89	173.41	41.00	CA	35.00	P	0.00	-	In Use
26	GPS	26.25	51.80	41.00	CA	40.00	P	40.00	I	In Use
27	GPS	74.77	51.19	48.00	CA	46.00	P	50.00	I	In Use
28	GPS	10.90	118.74	38.00	CA	40.00	P	41.00	I	In Use
31	GPS	39.61	106.02	44.00	CA	40.00	P	0.00	-	In Use
6	GLONASS	33.74	232.72	37.00	CA	0.00	-	0.00	-	In Use
7	GLONASS	36.28	294.23	49.00	CA	46.00	P	0.00	-	In Use
9	GLONASS	30.83	330.10	46.00	CA	46.00	P	0.00	-	In Use
10	GLONASS	4.46	294.69	33.00	CA	0.00	-	0.00	-	In Use
15	GLONASS	3.26	80.54	26.00	CA	24.00	P	0.00	-	In Use
16	GLONASS	32.42	36.97	46.00	CA	44.00	P	0.00	-	In Use
18	GLONASS	34.93	56.22	46.00	CA	44.00	P	0.00	-	In Use

Skyplot

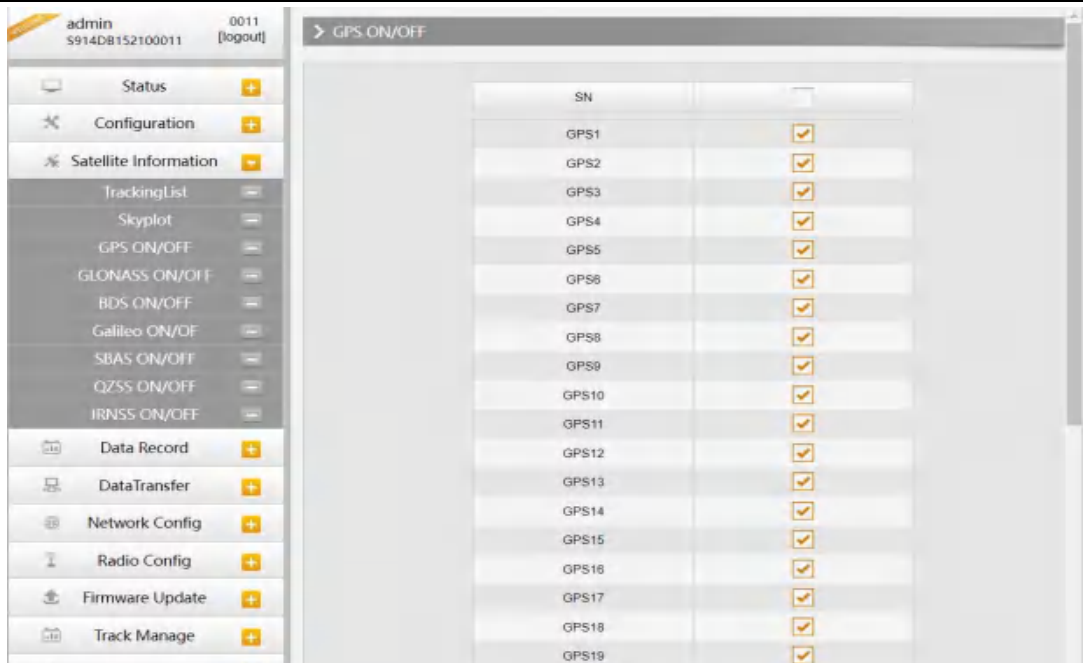
In this page, all the tracking satellites are shown on the skyplot, this let users intuitively view and know where the current position of satellite is.



GPS on/off

For all the running GNSS constellations or the augmentation system, INNO8 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 INNO8 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 INNO8.

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

Data Format: Here are 3 options to selected for INNO8 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 INNO8 to delete the previous data files automatically if the memory is full.

Format: Click this button to format the internal memory for INNO8.

Recording Mode: Here are 2 options to configure INNO8 to record raw data automatically or not if it achieves the sampling conditions.

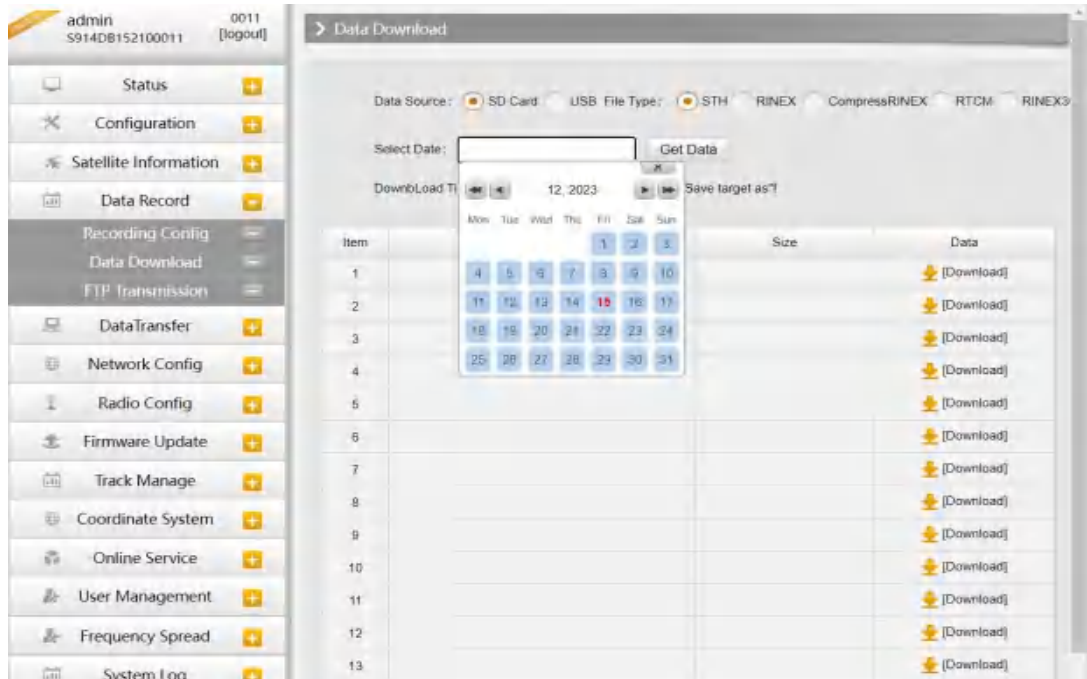
Once Record Enable: to set a Timer for static recording, for example if set 5 minutes, then the receiver will only record 5 minutes, after that receiver will stop record static data.

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

Data Download

This page provides the data files to download.

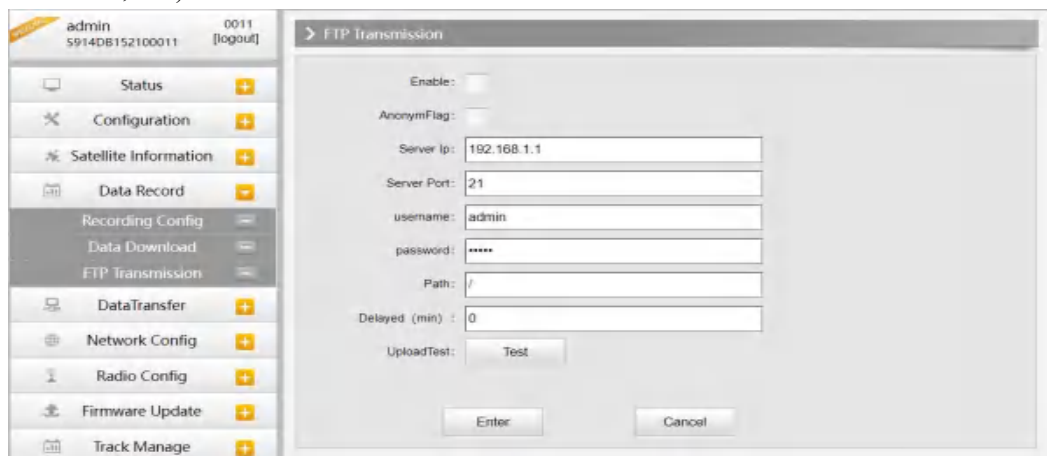
Choose the storage where the static data recorded, and file type, then click on the blank of “Select Date” to choose what date the data was recorded and click “Get Data” button, all the files recorded in the date you choose will show in the table, tap download button to download the data files.



FTP Transmission

FTP is a file transfer protocol.

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

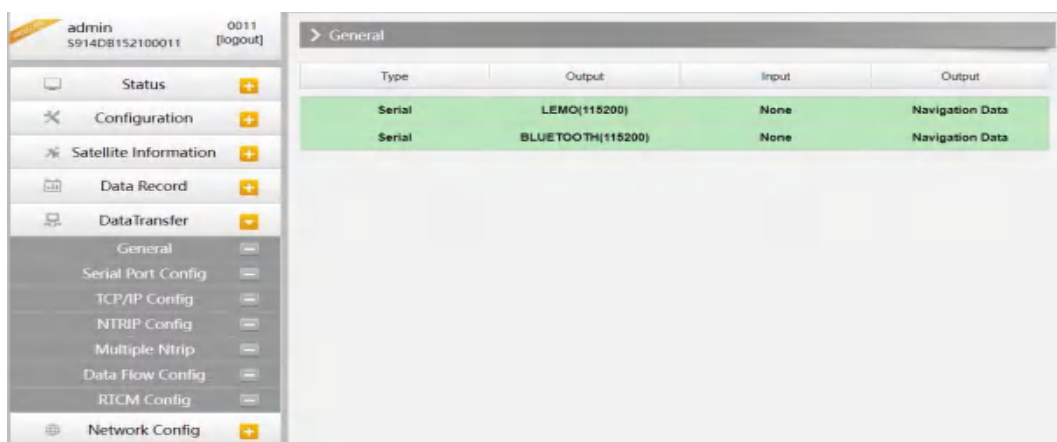


§3.4.5 Data Transfer

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

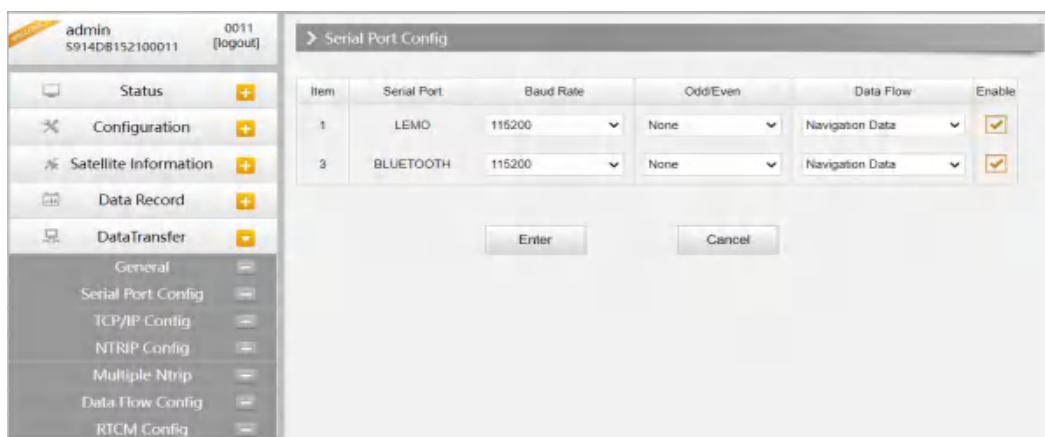
This page shows the service condition and the output contents of the ports, if the port item display in green, that means the port is being used, and the port is not used while the item display in red.



Type	Output	Input	Output
Serial	LEMO(115200)	None	Navigation Data
Serial	BLUETOOTH(115200)	None	Navigation Data

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.



Item	Serial Port	Baud Rate	Odd/Even	Data Flow	Enable
1	LEMO	115200	None	Navigation Data	☒
2	BLUETOOTH	115200	None	Navigation Data	☒

Enter Cancel



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.

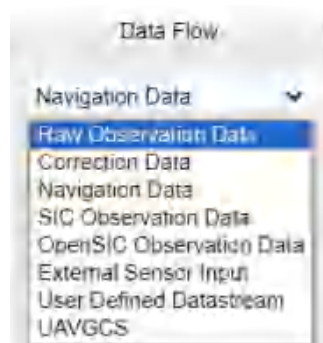
SIC Observation Data: This is the user-defined format observation data from SOUTH.

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.

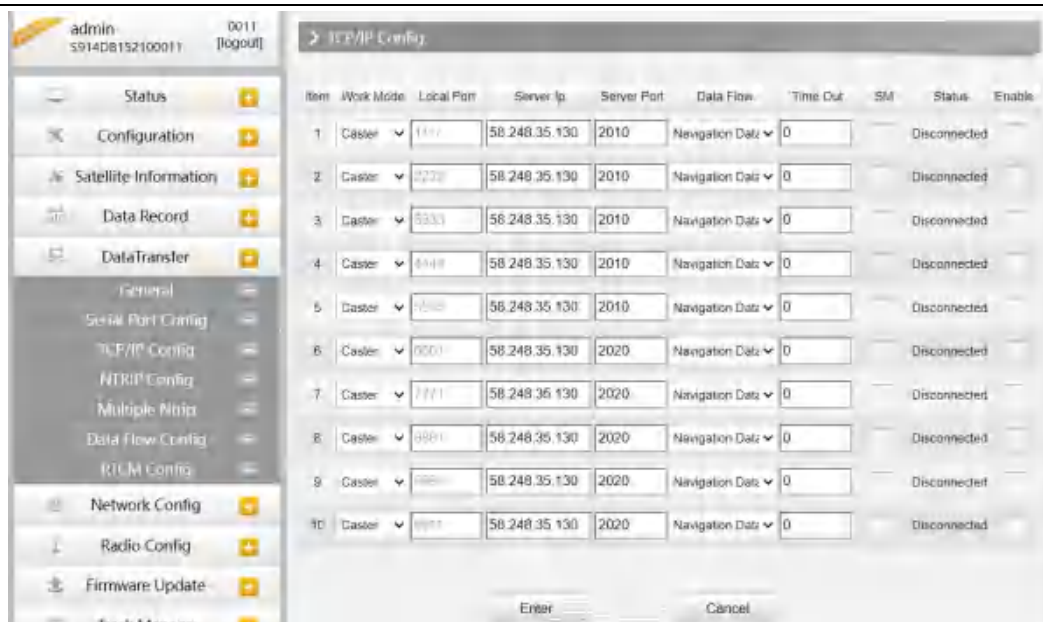


TCP/IP Config

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.

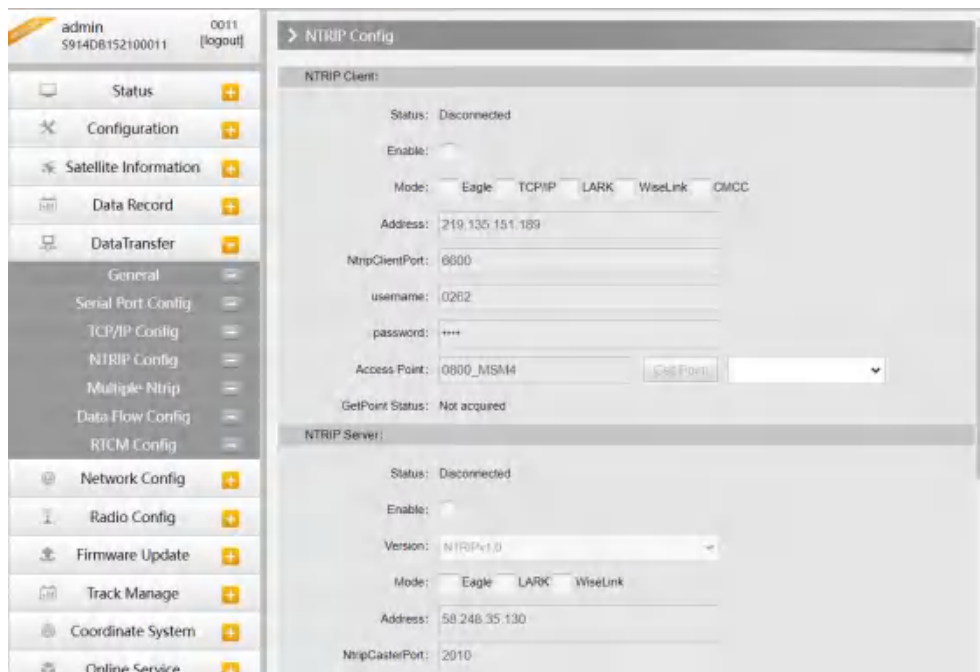
Caster: If this working mode is selected, INNO8 will be a client to upload the data to a specify server if it connects to the internet by WIFI or GPRS connection with SIM card inserted. Input the specified IP and port for server, and the data format what is uploaded. Then users are able to see the uploaded data on server.

Server: INNO8 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 INNO8 through the IP from receiver.



NTRIP Config

This is used to configure the NTRIP performance while receiver is going to connect to internet. INNO8 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

Item	NtripVersion	Server ip	Port	username	password	MountPoint	DataFlow	Time Out	Status	Enable
1	NTRIPv2.C	192.168.1.1	1110	0	0	0	Raw Observ	0	Disconnected	
2	NTRIPv2.C	192.168.1.1	2220	0	0	0	Raw Observ	0	Disconnected	
3	NTRIPv2.C	192.168.1.1	3330	0	0	0	Raw Observ	0	Disconnected	
4	NTRIPv2.C	192.168.1.1	4440	0	0	0	Raw Observ	0	Disconnected	
5	NTRIPv2.C	192.168.1.1	5550	0	0	0	Raw Observ	0	Disconnected	
6	NTRIPv2.C	192.168.1.1	6660	0	0	0	Raw Observ	0	Disconnected	
7	NTRIPv2.C	192.168.1.1	7770	0	0	0	Raw Observ	0	Disconnected	
8	NTRIPv2.C	192.168.1.1	8880	0	0	0	Raw Observ	0	Disconnected	
9	NTRIPv2.C	192.168.1.1	9990	0	0	0	Raw Observ	0	Disconnected	
10	NTRIPv2.C	192.168.1.1	9900	0	0	0	Raw Observ	0	Disconnected	

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

Navigation Data:

GGA: OFF GSA: OFF GSV: OFF GST: OFF
 ZDA: OFF BPQ: OFF PJK: OFF GLL: OFF
 RMC: OFF VTG: OFF HDG: OFF GRS: OFF
 TRA: OFF GSK: OFF

SIC Navigation Data:

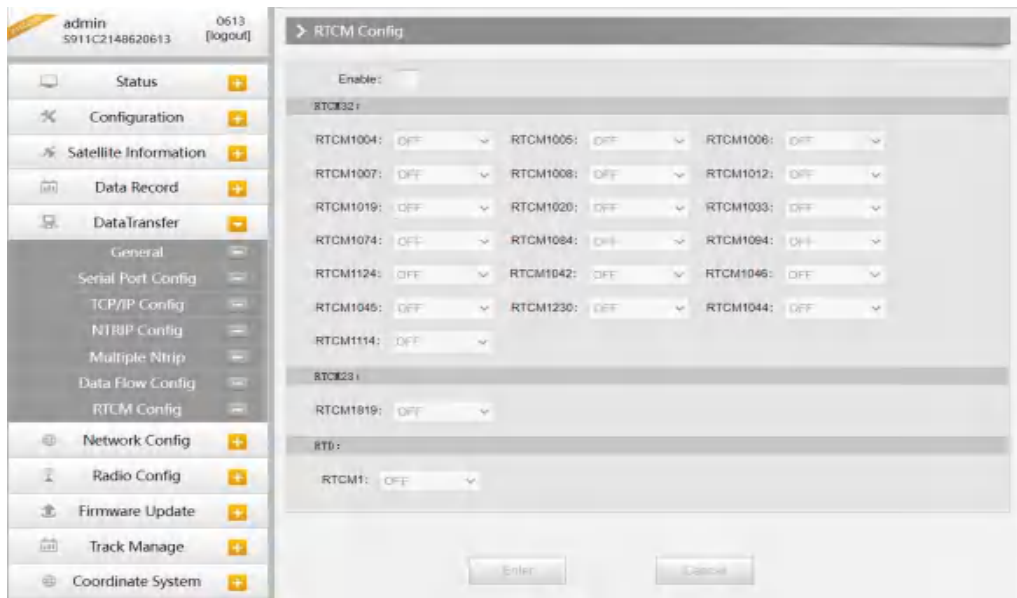
PST: 1 GSI: 5 BSI: 10 TPI: OFF
 VCV: OFF STA: 30 DEV: WhenChanged AAT: OFF
 REC: OFF DAL: 10 EDP: OFF SLB: OFF
 TRA: OFF PJK: OFF AVR: OFF TCM: OFF
 SDF: OFF

Raw Observation Data:

Output Interval: 1 s
 GPS Ephemeris: WhenChanged
 GLONASS Ephemeris: WhenChanged
 BDS Ephemeris: WhenChanged
 GALILEO Ephemeris: WhenChanged

RTCM Config

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



§3.4.6 Network Config

The “Network Config” is able to configure the ways and the contents for internet access of New INNO8 plus. GSM/GPRS Config, CSD Config, WIFI Config, Bluetooth Config, Port Forwarding, Router and Network Testing are under the list of Network Config

GSM/GPRS Config

In this page, all the information of receiver under GPRS mode will be displayed including the hardware information and dialing status.

Status: The dialing status and hardware information are displayed in this field that users can intuitively to view the signal of network, module model and the IMEI number of the module.

Parameter Config: The parameters of SIM card are input in this field including APN, assigned username and password, dial mode.

admin 0002
S914DB152100002 [logout]

GSM/GPRS Config

Status:

Signal:

Module Mode: SC20

Module IMEI: 862968048824242

SIM IMEI: 460041667515276

SIM Card Status: SIM is Ready

Registration Status: Regist Success

Connection Type: LTE

PPP Dial Status: Connected

IP Address: 10.33.8.170

Parameter Config:

Enter:

APN:

APN User Name:

APN Password:

Connect Type:

Dial Mode:

SMS Config

On this configuration dialog, input a phone number into the blank, New INNO8 plus will send text

message onto the phone which number is written.

admin 0002
S914DB152100002 [logout]

SMS Config

Status:

Signal:

SIM Card Status: SIM is Ready

Registration Status: Regist Success

Parameter Config:

SMS Enable: ☐

SMS Report: ☐

* SMS Report Number:

* Phone Number:

White List:

WIFI Config

This is mainly used on the WIFI configuration for INNO8, there are AP mode and Client mode for optional.

AP: This is used to enable the WIFI hotspot for INNO8 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 for INNO8, 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.

The screenshot displays the 'WIFI Config' interface. At the top, there's a header with 'admin', 'S914DB152100011', and '0011 [logout]'. The left sidebar lists various system functions. The main panel is titled 'WIFI Config' and includes the following settings:

- Enable:** A checked checkbox.
- Work Mode:** Radio buttons for 'AP' (selected) and 'Client'.
- AP_SSID:** A text field containing 'SOUTH_0011'.
- AP_Password:** A text field containing 'southgrss.com.cn'.
- AP_Encode:** A dropdown menu set to 'Open'.
- AP_Channel:** A dropdown menu set to '7'.
- DHCP IP Range:** Three radio button options:
 - 192.168. [] 0/255.255.255.0(Default)
 - 172.16. [] 0/255.255.255.0(Default)
 - 10. 1 1 0/255.255.255.0 (Selected)
- Buttons:** 'Enter' and 'Cancel' buttons at the bottom.

Client:

This option enables INNO8 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 INNO8 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 INNO8 successfully connects to the WIFI, there will be an LAN IP address generated by INNO8.

ClearSSID: Click this button to clear the SSID list.

admin 0011
S914DB152100011 [logout]

WiFi Config

Enable: ☒

Work Mode: ☐ AP ☒ Client

Client_SSID: southgrss Scan

password: southgrss.com.cn

Encode: WPA2

DHCP: ☒

IP Address: 0 0 0 0

Subnet Mask: 255 255 255 0

Default Gateway: 0 0 0 0

Status: Uninit

Signal:

Clear SSID List: This action will clear all connection records, please be careful!

Tips: Reboot the receiver after changing wifi work mode from AP to Client!

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.

admin 0011
S914DB152100011 [logout]

Bluetooth Config

Bluetooth Config:

Enable: ☒

Bluetooth MAC: B4 ED D5 56 C9 CF

Discoverable: ☒

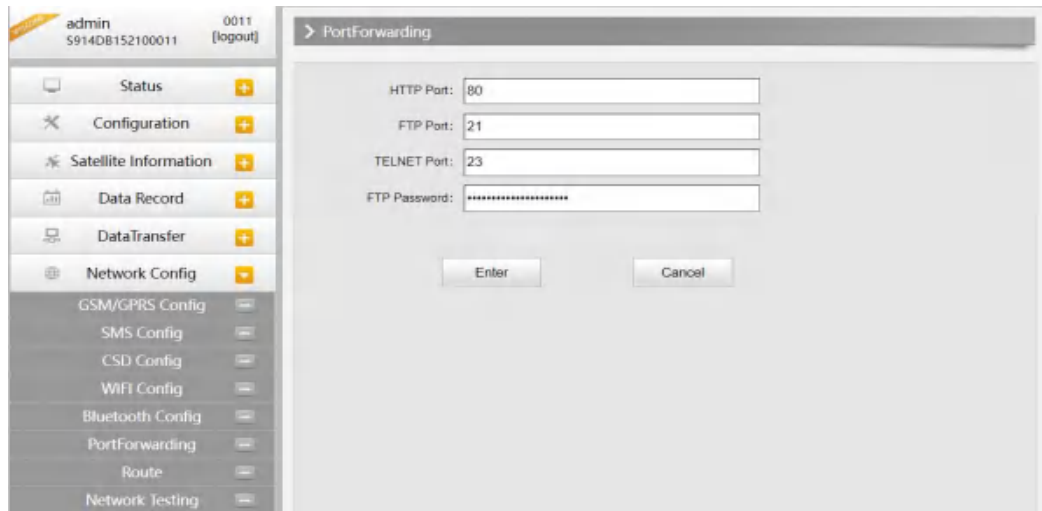
PIN Code: 0

Connected Device:

Item	Device Mac	RFComm Channel	Device Name	Disconnect Action
1				Disconnect
2				Disconnect

Port Forwarding

This page is mainly used to view and configure the internet transmission port for INNO8, customize and debug receiver.



The screenshot shows the 'PortForwarding' configuration page. On the left is a sidebar menu with options: Status, Configuration, Satellite Information, Data Record, DataTransfer, Network Config, GSM/GPRS Config, SMS Config, CSD Config, WIFI Config, Bluetooth Config, PortForwarding, Route, and Network Testing. The main area is titled 'PortForwarding' and contains the following fields:

- HTTP Port: 80
- FTP Port: 21
- TELNET Port: 23
- FTP Password: *****

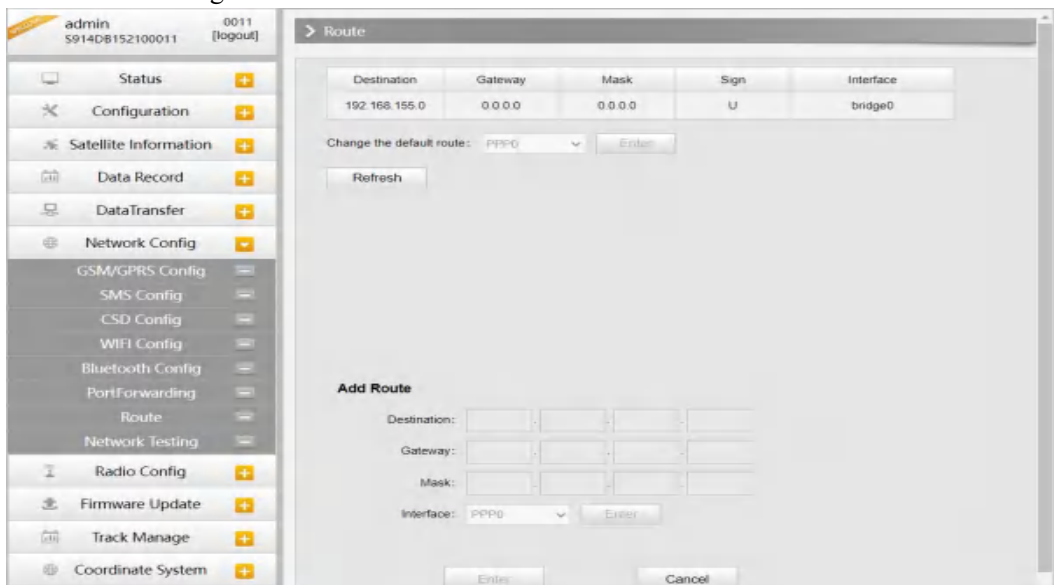
At the bottom of the main area are 'Enter' and 'Cancel' buttons.



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.



The screenshot shows the 'Route' configuration page. The sidebar menu is the same as in the previous screenshot. The main area is titled 'Route' and contains the following elements:

- A table with the following data:

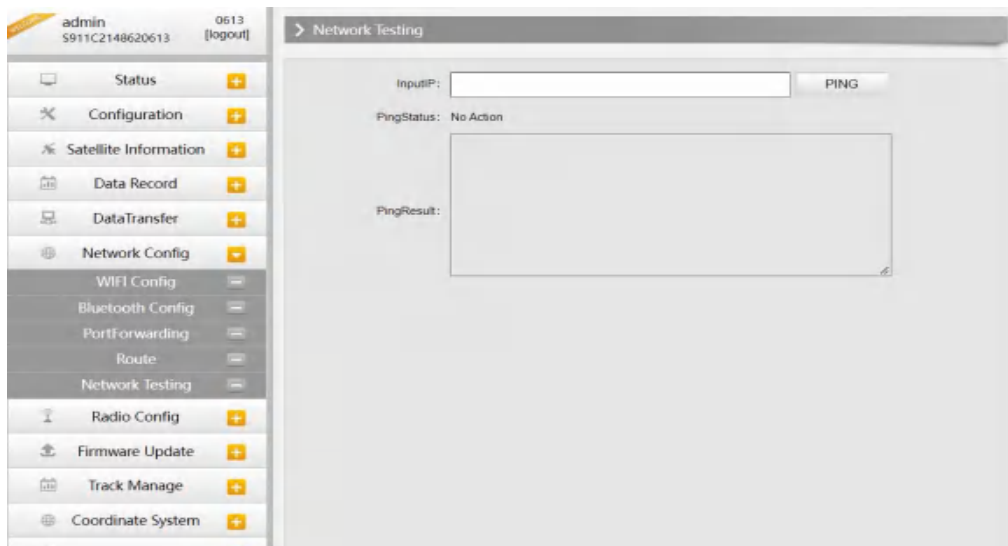
Destination	Gateway	Mask	Sign	Interface
192.168.155.0	0.0.0.0	0.0.0.0	U	bridge0
- 'Change the default route: PPP0' with an 'Enter' button.
- A 'Refresh' button.
- 'Add Route' section with input fields for:
 - Destination: [] [] [] []
 - Gateway: [] [] [] []
 - Mask: [] [] [] []
 - Interface: PPP0 (dropdown) with an 'Enter' button.
- 'Enter' and 'Cancel' buttons at the bottom.



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.

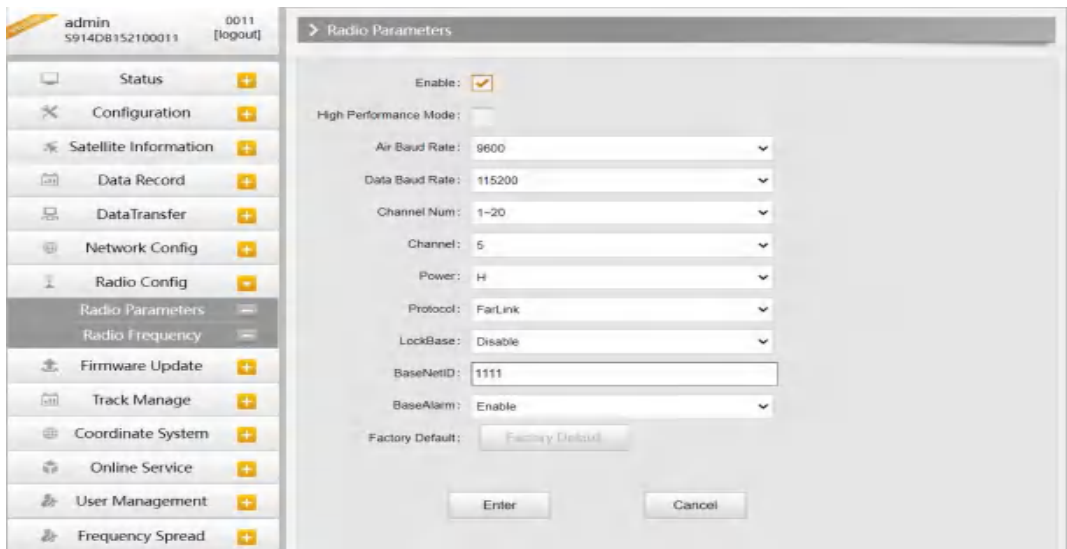


§3.4.7 Radio Config

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 INNO8.



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 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.

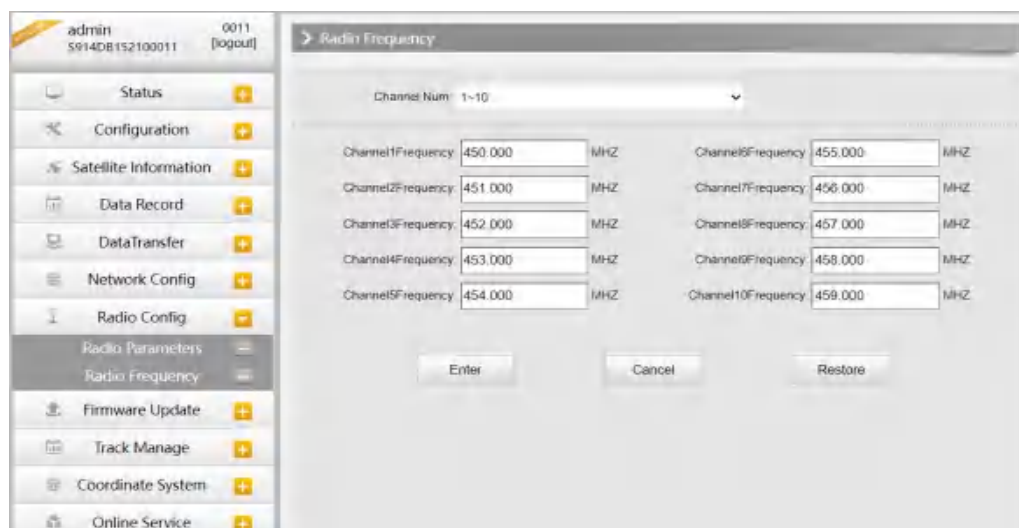
BaseAlarm: If Base receiver moves(by some unexpected reasons), rover will receive a notification about the base movement.

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

Radio Frequency

For INNO8, 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 INNO8, and allows to update the latest version firmware for receiver. To get latest version firmware please contact with SOUTH technician.



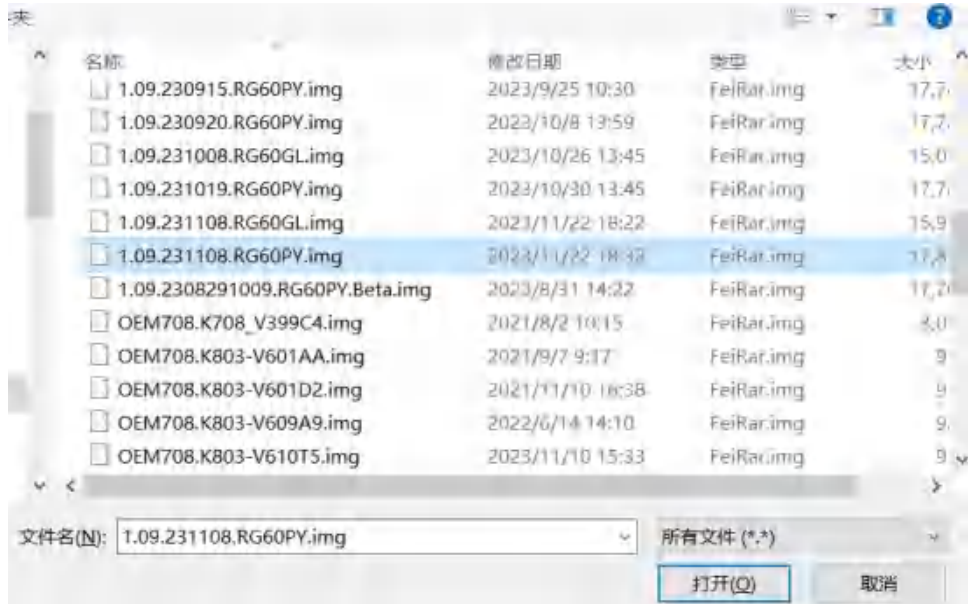
Online Update: INNO8 supports to update the firmware online anytime if there is something

update or optimized.

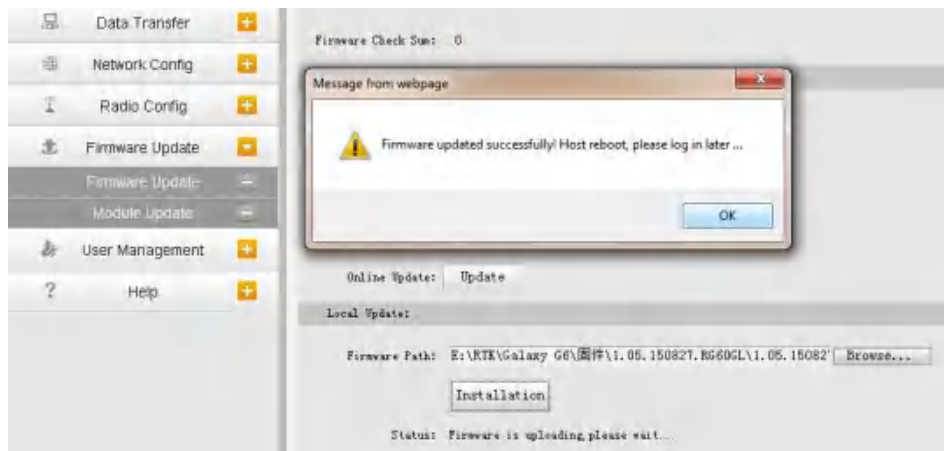
Local Update: Update the latest firmware by using a firmware file.

How to upgrade the firmware with Local Update

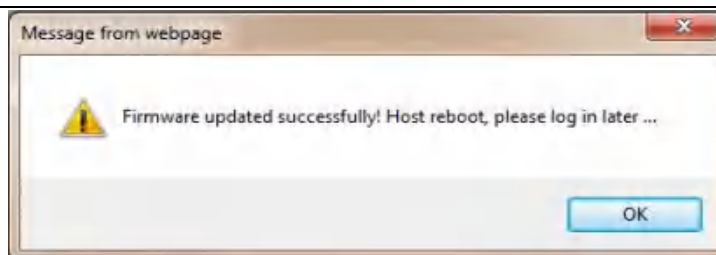
- a) Click on “Browse” button to load firmware file (Please take in mind that the firmware is ended with .img as the extension name).



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



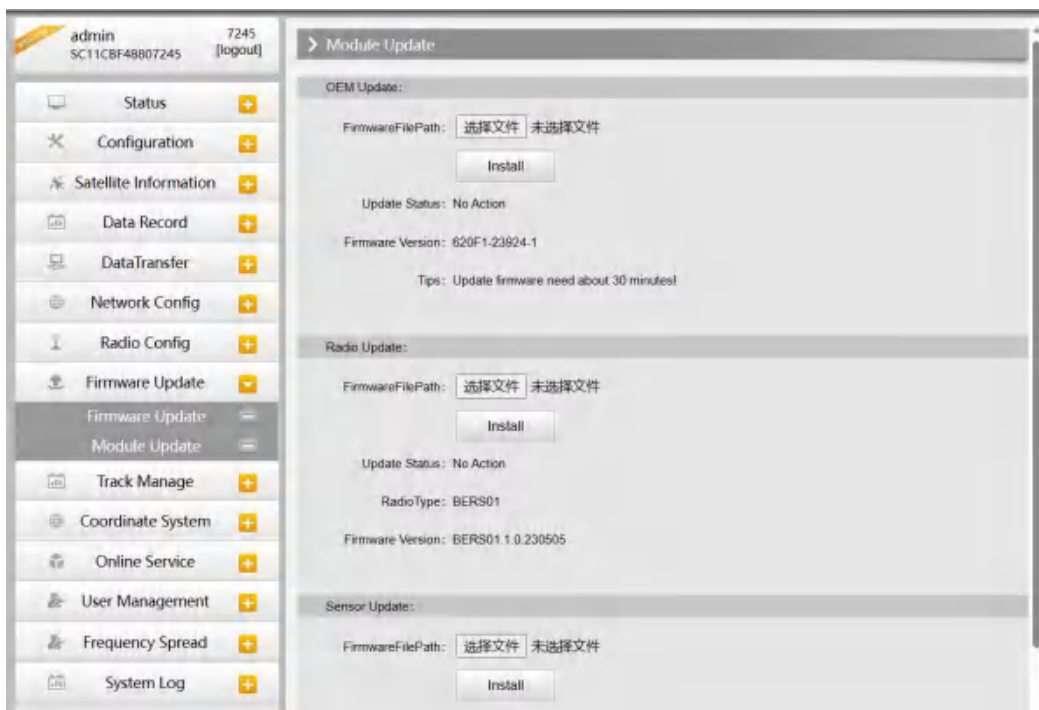
- c) After the firmware is completed upgrading, a dialog will appear saying “Firmware updated successfully! Host reboot, please log in later...”, then the receiver will restart automatically.



SPECIAL REMIND: INNO8 doesn't support to update the firmware with the help of INstar program any more, in the future, update the firmware for INNO8 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

INNO8 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.

Echo Setting:

Status: **Disconnected**

Enable: ☐

Service Protocol: **OFF** ▼

Server Ip: **58.248.35.130**

Server Port: **2010**

username: **USER**

password: **PSWD**

Enter **Cancel**

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.

admin S9140B152100011 0011 [logout]

Data Download

Select Date: Get Data

Download Time: 12, 2023 Save target as: 1

Item	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Size	Data
1					1	2	3		[Download]
2	4	5	6	7	8	9	10		[Download]
3	11	12	13	14	15	16	17		[Download]
4	18	19	20	21	22	23	24		[Download]
5	25	26	27	28	29	30	31		[Download]
6									[Download]
7									[Download]
8									[Download]
9									[Download]
10									[Download]
11									[Download]
12									[Download]
13									[Download]
14									[Download]
15									[Download]

§3.4.10 Coordinate System(reserve)

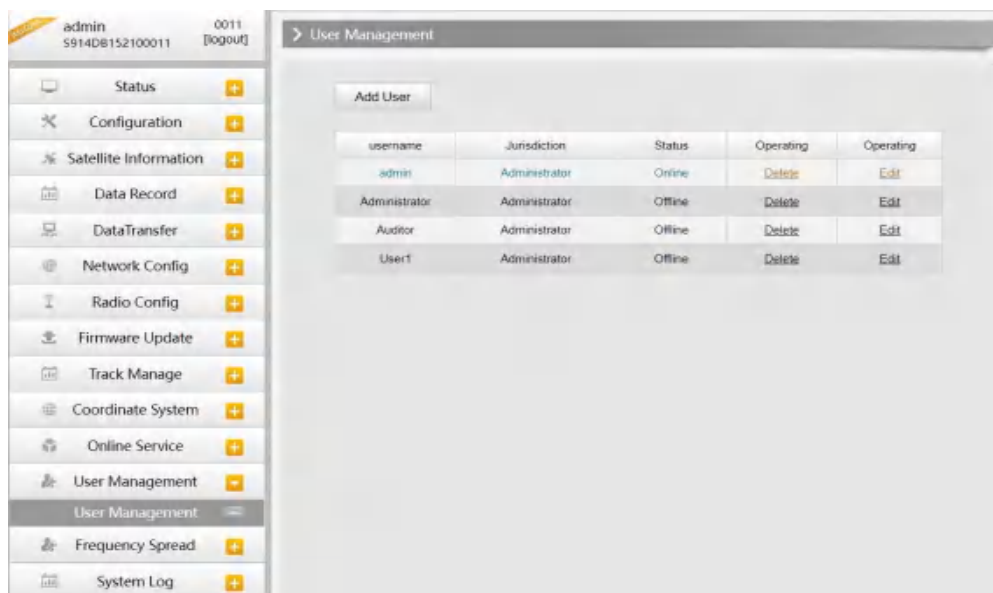
INNO8 allows users to setup the local coordinate system on internal web UI management. The instrument would output the local coordinates according to this coordinate system.

§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.

§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.

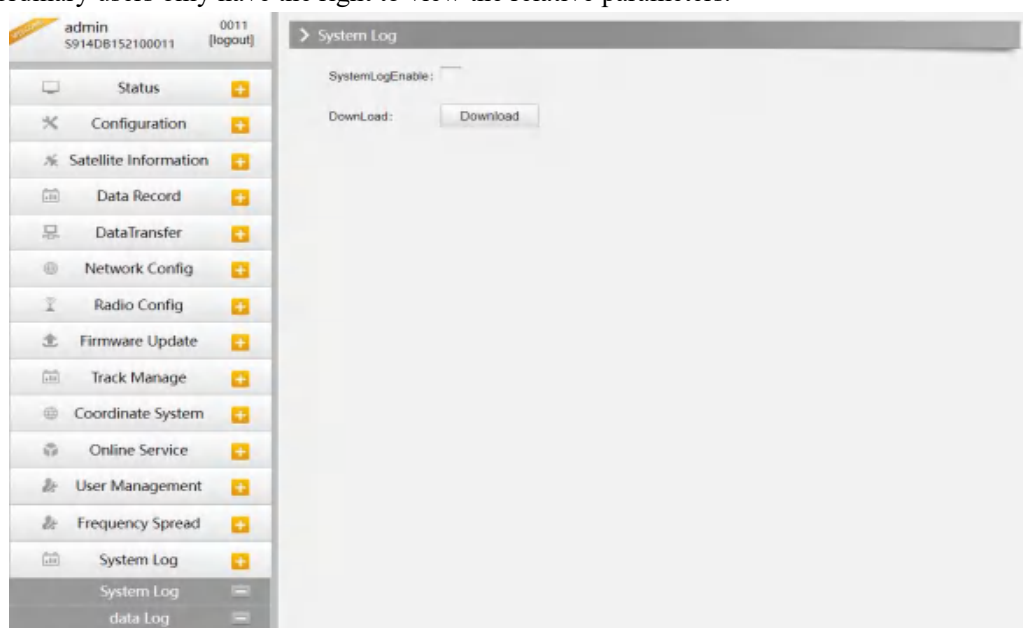


§3.4.13 System log

System log

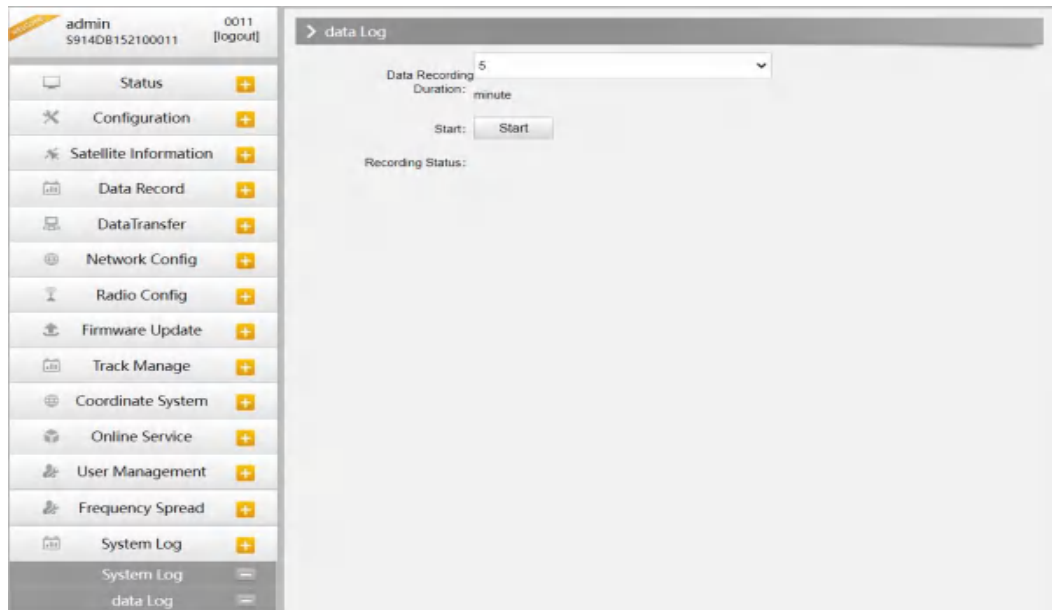
In this page, users can download the system log book of receiver (the log book can help to backtrack the working status of receiver).

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

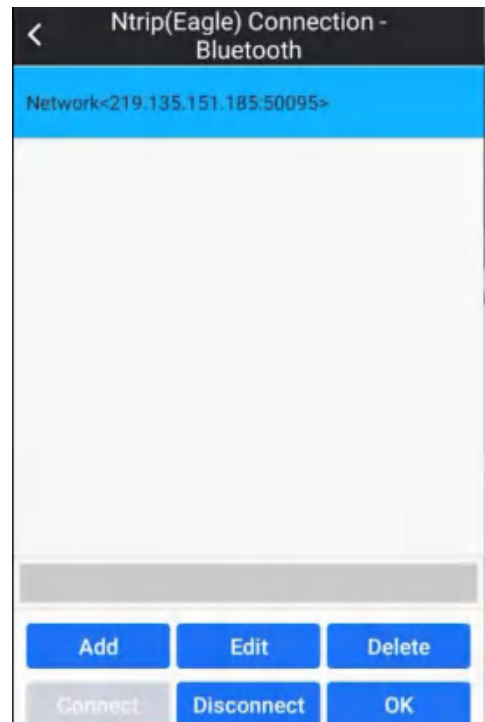
§4.1 AR Stakeout

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.

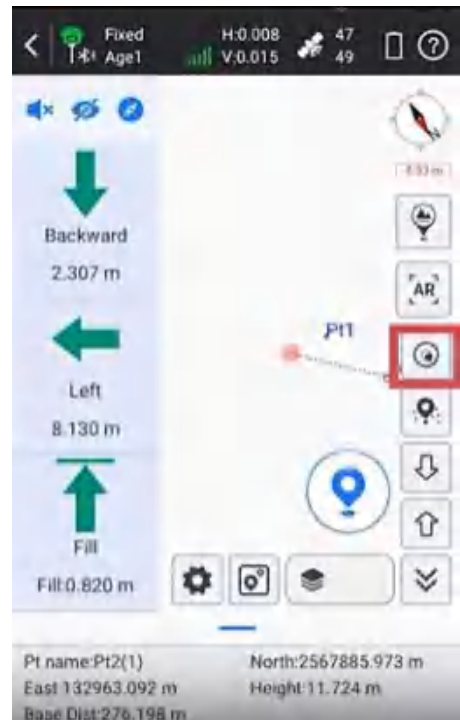
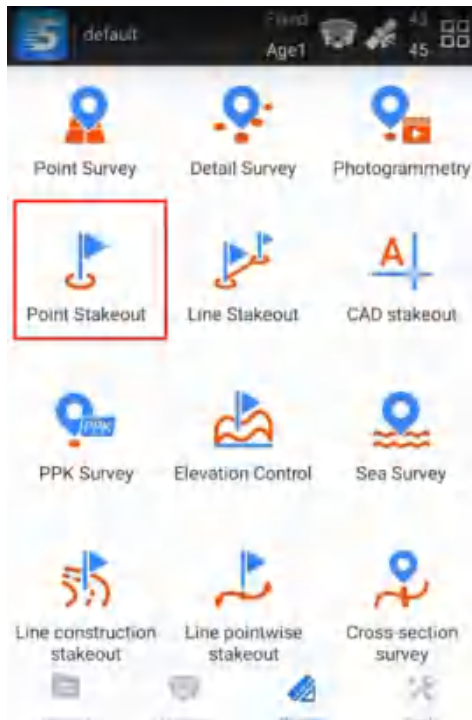
This function must be tilt survey initialization. After completing the tilt survey initialization, select the point to be lofted, click the [AR] icon on the right side of the screen, and then lofted according to the direction and position displayed on the interface. (Note that the direction of the device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

Detailed steps:

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

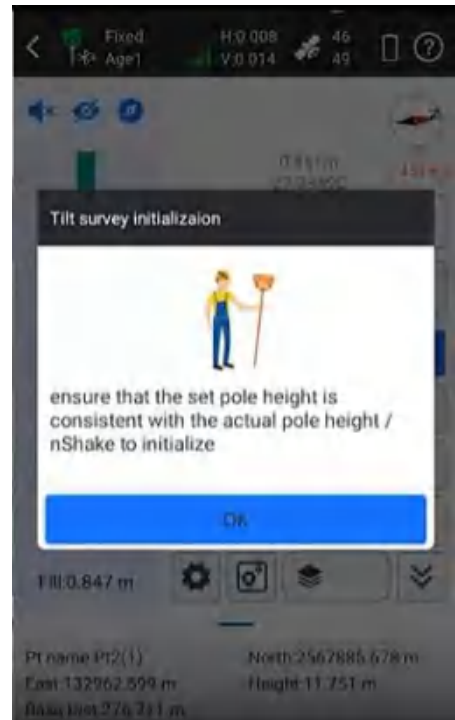
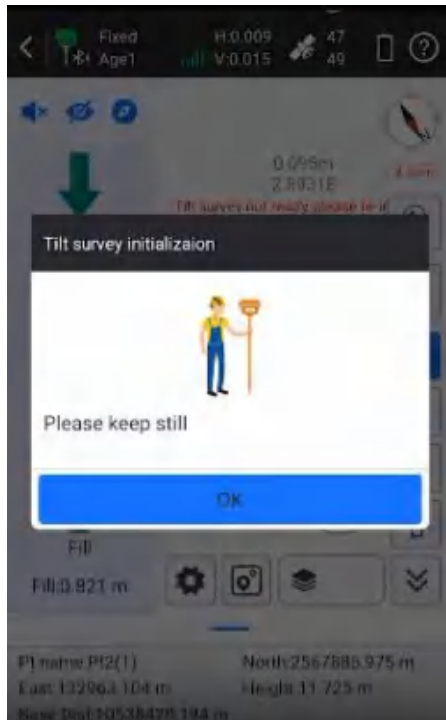


2) Click the "Point stakeout" function, select a point and turn on the tilt survey function. Shake the device as prompted to initialize the tilt survey. (Note that the pole height is consistent with the actual pole height)



3) After the initialization page is displayed, perform initialization as prompted. After the

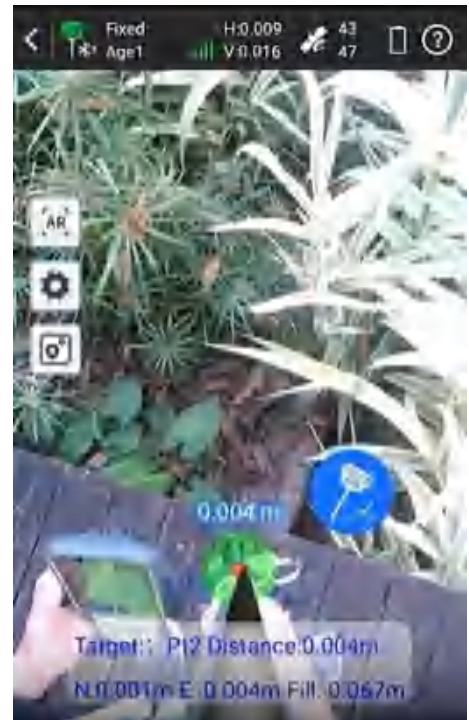
initialization succeeds, the tilt measurement icon is displayed as follow.



4) Click the AR icon to realize the real scene lofting.



5) Follow the arrow guide to find the target point easily.



§4.2 Photogrammetry

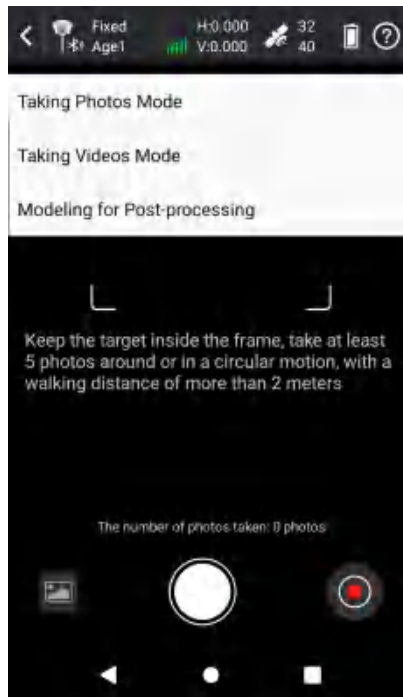
INNO8 visual positioning broadens the scope of RTK applications through the synergistic integration of photogrammetry and RTK positioning technologies. With an 8-megapixel camera, “Fast” IMU and the latest positioning algorithm, INNO8 is adept at capturing and processing images or videos to derive precise 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. INNO8 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: 'Taking 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.

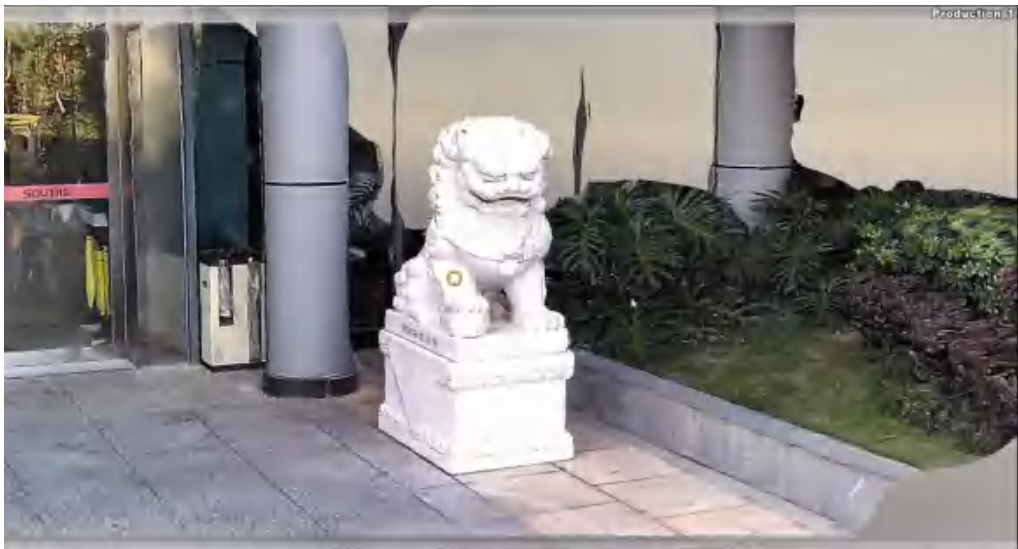


SOUTH's 3D modeling technology are fully utilized and transformed in INNO8. The results of image measurements by INNO8, can be seamlessly integrated with data outcomes from UAV.

UAV surveys often face challenges of data gaps, leading to incomplete model outcomes. In such cases, surveyors can use INNO8 to collect image data on the ground and incorporate it into aerial survey data as a supplement, thereby enhancing the overall model outcome.



UAV Survey for SOUTH building, Lion statue detail lost



INNO8 scan the Lion statue



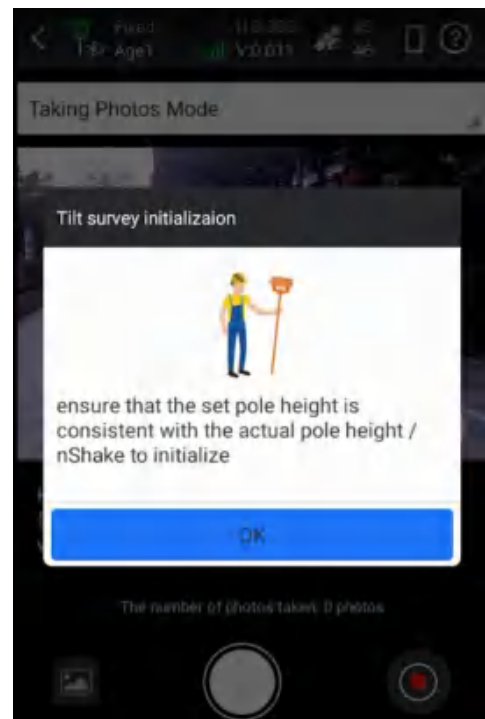
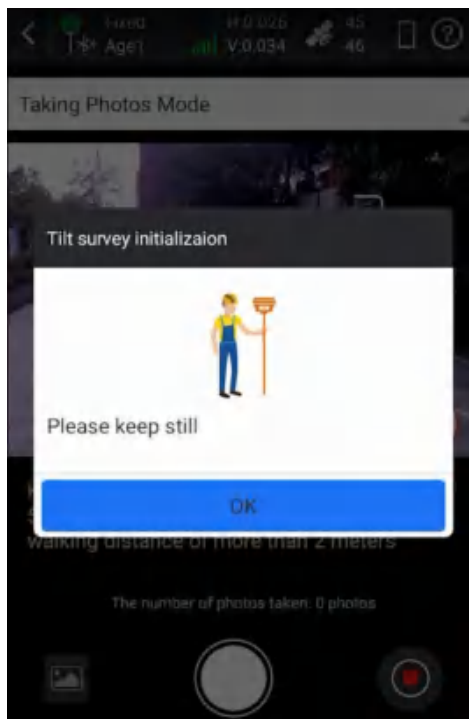
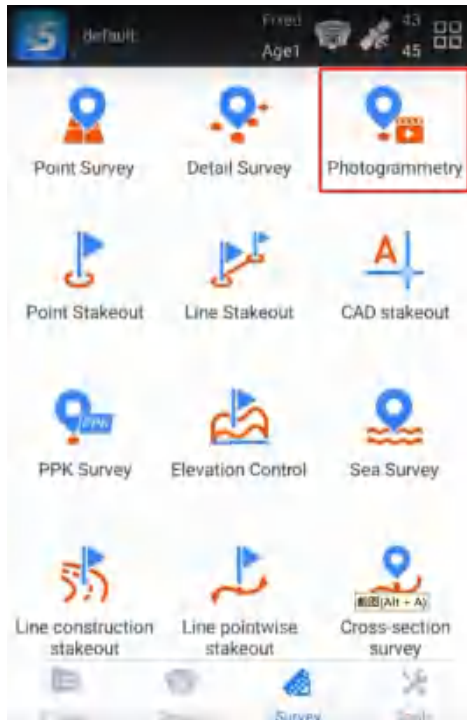
INNO8 scan the Car

Detailed steps:

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

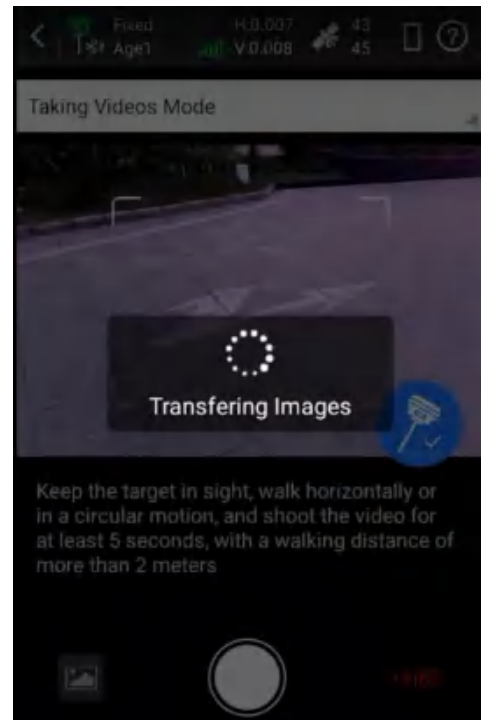


2) To enter photogrammetry, this function needs to be combined with the tilt survey function. If the tilt survey function is available, shake the device as prompted to initialize the tilt survey. (Note that the pole height is consistent with the actual pole height)

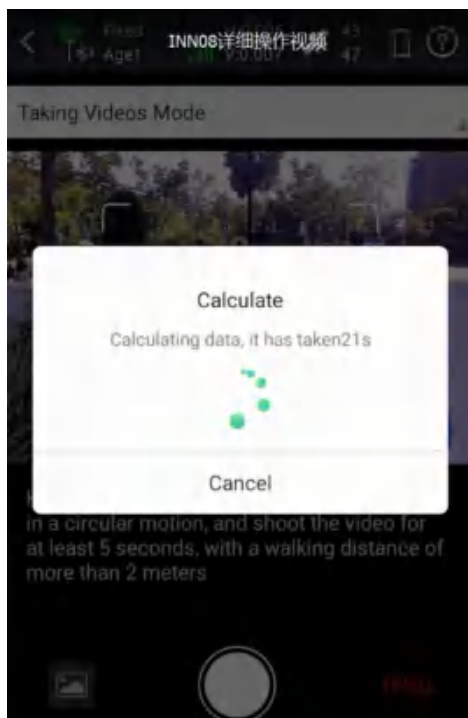


3) There are three modes for you to choose from: 'Takin Photos Mode', 'Taking Videos Mode' and 'Modeling for Post-processing'. Use 'Taking Videos Mode', click to start shooting, keep the target to be measured in sight, walk horizontally or in a circular motion to shoot video for at least 5 seconds, and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

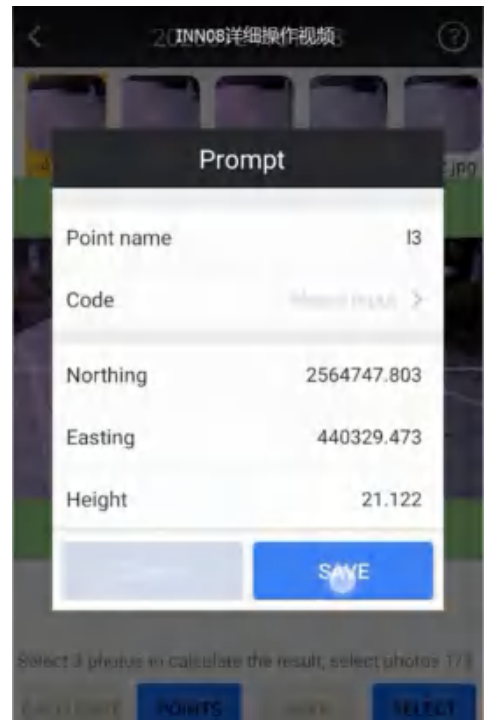
progress: The picture taken by the device is being transferred to the controller)



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



Chapter 5 Accessories

§5.1 Instrument Case



The instrument case for INNO8 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

INNO8 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 INNO8 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.



Appendix A INNO8 technical specifications

Specifications

GNSS Performance	Signal Tracking(1598)		Signal Tracking(1698)		Signal Tracking(1780)	
	1598 channels GPS: L1, L1C, L2C, L2P, L5 GLONASS: L1C/A, L1P/L2C/A, L2P/L3 BDS: BDS-2: B1I, B2I, B3I, BDS-3: B1I, B3I, B1C, B2a, B2b* GALILEO: E1, E5A, E5B, E5C, E6C* SBAS(WAAS/MSAS/EGNOS/GAGAN): L1* IRNSS: L5* QZSS: L1, L2C, L5* MSS L-Band: BDS-PPP, Galileo HAS		1698 channels GPS: L1, L1C, L2C, L2P, L5 GLONASS: G1, G2, G3 BDS: B1I, B2I, B3I, B1C, B2A, B2B* GALILEO: E1, E5A, E5B, E6C* SBAS(WAAS/MSAS/EGNOS/GAGAN): L1C, L1A* NavIC/IRNSS: L5* QZSS: L1, L2C, L5* MSS L-Band: Reserve		1780 channels GPS: L1C/A, L1C, L2C, L2P, L5 GLONASS: L1C/A, L2C/A, L2P, L3CDMA BDS: B1I, B1C, B2I, B2a, B3 GALILEO: E1, E5A, E5B, E5A/B/C, E6 SBAS: EGNOS, WAAS, GAGAN, MSAS, SDOM(L1,L5) Navic: L5 QZSS: L1C/A, L1C, L2C, L5, L6 MSS L-Band: BDS-PPP, Galileo HAS*	
	Other Features Initialization Time: <10s Initialization reliability: >99.99%					
	Code differential GNSS positioning		Static(long observations)		Static	
Positioning Precision	H: 0.25m+1 ppm RMS V: 0.50m+1 ppm RMS		H: 2.5mm+0.1 ppm RMS V: 3mm+0.4 ppm RMS		H: 2.5 mm + 0.5 ppm RMS V: 3.5 mm + 0.5 ppm RMS	
	Rapid static		PPK		RTK(UHF)	
	H: 2.5 mm + 0.5 ppm RMS V: 5 mm + 0.5 ppm RMS		H: 3 mm + 1 ppm RMS V: 5 mm + 1 ppm RMS		H: 8 mm + 1 ppm RMS V: 15 mm + 1 ppm RMS	
	RTK(NTRIP)		RTK initialization time		SBAS positioning	
IMU	H: 8 mm + 0.5 ppm RMS V: 15 mm + 0.5 ppm RMS		Z ~ 8s		Typically<1s 3DRMS	
	BDSPPP		Galileo HAS			
	H: 10cm V: 20cm		H: 20cm V: 40cm			
	Update Rate		Tilt Angle		Initialization Way	
User Interface	200Hz		0-60°		Shake or Walk	
	Keys		Touch Screen		LED	
	Power Key		HD 1.39inches color circle touch screen		Power Indicator	
	Voice Guidance		Language Supported			
Hardware	Supported		Chinese, English, Korean, Russian, Spanish, Portuguese, Turkish, French, Italian			
	Dimension		Weight		Material	
	155mm(B) ~96.5mm(H)		1.2kg		Magnesium aluminum alloy shell	
					Temperature	
Power					Working: -45℃ to +75℃ Storage: -55℃ to +85℃	
	Power Supply		Battery		Humidity	
	6-18V DC overvoltage protection		Built-in 7.4V 1000mAh, PD quick charge protocol, power data collector internet mode>20h		100% non-oxidizing	
					Waterproof/Dustproof Shock/Vibration	
AR Stakeout Camera					IP66 standard, Withstand 2m pole drop onto the cement ground naturally	
	Pixel		Visual Angle		Pixel	
	2M		75°		8M	
					Visual Positioning Camera	
Communication						
	I/O Ports		Radio		WIFI	
	Type C 5 PIN LEMO port		Frequency range: 410-470MHz Protocol: F4T1K, SOUTH, TrimTalk, Hi-Target, HUACE Radio router, Radio repeater		802.11b/g/n Support AP mode and Client mode	
	Cellular Network		NFC		BT	
Data Storage/Transmission	4G LTE, 3G WCDMA, 2G GPRS, GSM		Automatic pair between receiver and controller (controller requires NFC wireless communication module)		Bluetooth 4.0 standard, Bluetooth 2.1+EDR	
	Storage		Data Formats			
	84GB SSD internal storage Automatic cycle storage Support external USB storage The customizable sample interval is up to 50Hz		Static data format: STH, Rinx2 01, Rinx3 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 mode support: VRS, FKP, MAC, fully support NTRIP protocol			

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.

RF Exposure Information

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 50cm between the radiator and your body.