

GALAXY G9

Technician Manual

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Chapter Ⅰ Preface

Read this chapter, you will have a brief knowledge of SOUTH Company and GALAXY G9 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//

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This manual is about G9, 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: *D*ual-band (dual-frequency) system static measurements can accurately complete the high-precision deformation observation and photo-control point measurement.

Highway Survey: Quickly complete the encryption of the control points, road topographic mapping, cross-section measurement and profile measurement with EGStar.

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

Data acquisition measurement: **P**erfect 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 and angle calculation.

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

§1.3 Main Features

Intelligent Operating System

New generation of embedded Linux operating system improves RTK performance and work efficiency. It starts and responds faster with its unique core processing mechanism responding to several commands at the same time. Meanwhile, this system is stable enough to keep G9 working for a long time.

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.

Bluetooth

GALAXY G9 is equipped with dual-mode Bluetooth v4.0 standard to connect to other smart devices. It not only enlarges the working range but also makes data communication more stable. In addition, it is compatible with Bluetooth v2.1 standard.

WiFi

As the new feature and technology adapted to G9, it can access internet as its data link, or it can be accessed by other smart devices as a hotspot to configure the receiver.

Advanced UHF module

GALAXY G9 is compatible with current radio protocols in the market, There are three antenna options for the radio frequencies: 410MHz-430MHz, 430MHz-450MHz, 450MHz-470MHz. The antenna is inside the top cover, so G9 needs no external UHF radio antenna.. The new protocol “Farlink” is able to achieve longer distance working range.

4G network module

G9 is packaged with a 4G cellular module, it supports the real-time NTRIP connection and online services. The module is compatible with 3G and 2G network.

Full Constellations Tracking

Equipped with the most advanced GNSS boards, G9 system can track most of the signals from all kinds of running satellite constellations, especially supporting B1, B2 and B3 signals from BeiDou, which can even get position results with only BeiDou signals.

Electronic Bubble & Tilt Compensation

The new IMU module is fast, accurate and stable. The help of tilt compensation enables measuring the point without leveling the receiver.

Intelligent Storage

The raw data includes STH, Rinex2.01 and Rinex3.02. It can be stored in internal memory (16G SSD) or an external USB device (OTG). The configurable sample frequency is up to 20Hz.

NFC Function

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

Chapter Ⅱ Hardware Component

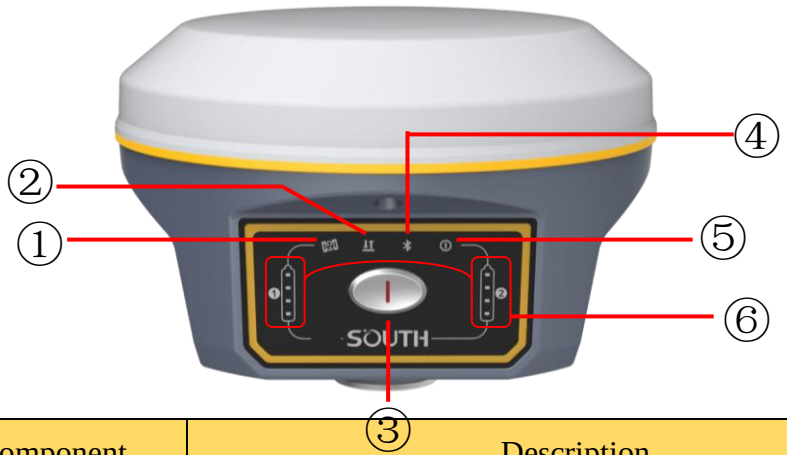
Reading this chapter, you can grasp the components, installation and the function of GALAXY G9 measuring system

The overall appearance of GALAXY G9 is elegant and durable, with the dimensions 154mm(L)×154mm(W)×106mm(H). The bottom of the receiver has commonly used interfaces. It is easy to use combining button control with voice prompt.

G9 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. The antenna is inside the top cover, so G9 needs no external UHF radio antenna. Please choose a suitable antenna for your G9.

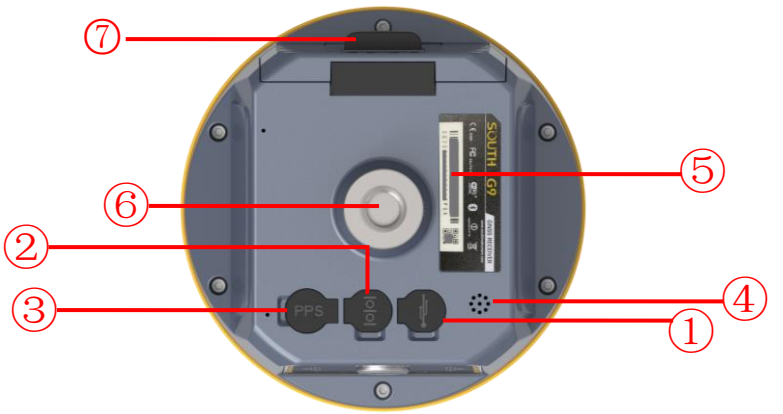


§2.1 Front Components



Ref	Component	Description
①	**Satellites Indicator**	Flashes in green to indicate that the satellites are tracking by 0.2s intervals, repeat every 10s.
②	**Data Indicator**	**UHF mode:** Flashes in red to indicate that the signal is transmitting with the interval in Base mode. Flashes in red twice and then green to indicate that the signal is receiving with the interval in Rover mode. **WiFi:** 1)AP mode, flashes in red to indicate that the receiver is establishing a WiFi connection; 2)Client mode, flashes in green with the signal receiving/transmitting interval when successfully connects. **Static mode:** Flashes by the data sampling interval to indicate the data file is recording.
③	**Power Button**	Power on/off receiver; Switch and confirm working mode; Perform self-check operation.
④	**Bluetooth Indicator**	Glows in blue to indicate that a Bluetooth connection has been established between the controller and receiver.
⑤	**Power Indicator**	Glows in red to indicate that there is enough power for working; Flashing in red means low power.
⑥	**Battery percentage**	Pressing the Power button, those lights will turn on: 4 lights (75%-100%), 3 lights (50%-75%), 2 lights (25%-50%), 1 light (<25%).

§2.2 Bottom Components



Ref	Component	Description
①	**7-pin LEMO port**	1. 7-pin-LEMO port, supports accessing the Web UI interface and the static data transmission of the receiver at the same time.
②	**5-pin LEMO port**	1, As a power port to connect with an external power supply device. 2, As a differential transmission port to connect with an external radio. 3, As a serial port to check data output and debug.
③	**PPS port**	G9 supports PPS output.
④	**Speaker**	Mode setting and working status prompt.
⑤	**SN label**	Serial number as well as Bluetooth ID.
⑥	**Screw hole**	Fix the mainframe to the tribrach or the pole.
⑦	**Battery cover lock**	Press to open the battery housing.

§2.3 Rear components



Dual-battery housing

ChapterⅢ Hardware Operation

§3.1 Power on/off

Power on

Press the power button. After 4 indicators glowing for a 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, the 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 the power button, then the instrument will switch off.

§3.2 Check working 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”).

§3.3 Mode selection

Rover

Press and hold the power button for about 5 seconds and pass over the state of power off (do not release the button even if the instrument says “power off”), then G9 will say “start to set work mode”, at this moment, release the power button, the working mode will be repeated from Rover

to Static on the control panel. When the Bluetooth indicator glows in blue with “Rover” voice prompt, press the power button to confirm.



Base

Press and hold the power button for about 5 seconds and pass over the state of power off (do not release the button even if the instrument says “power off”), then G9 will say “start to set work mode”, at this moment, release the power button, the working mode will be repeated from Rover to Static on the control panel. When the Data indicator glows in red with “Base” voice prompt, press the power button to confirm.



Static

Press and hold the power button for about 5 seconds and pass over the state of power off (do not release the button even if the instrument says “power off”), then G9 will say “start to set work mode”, at this moment, release the power button, the working mode will be repeated from Rover to Static on the control panel. When the Satellite indicator glows in green with “Static” voice prompt, press the power button to confirm.



To check the work mode, press the power button once to hear the present mode from voice prompt.

§3.4 Self-check

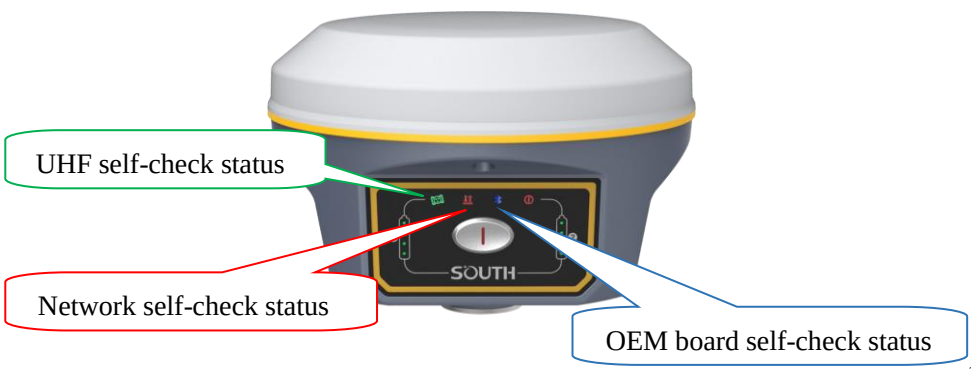
Self-check is a useful operation to simply check the main hardware components if the instrument is abnormal or not working properly.

Press and hold the power button for about 10 seconds and pass over the state of power off and mode selection (do not release the button even if the instrument says “power off” and “start to set work mode”), then G9 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.



§3.5 USB mode

G9 integrates USB disk with network interface. After connecting to the computer through 7-pin USB interface, the user can access the Web UI interface and the internal storage of the receiver at the same time without selecting USB mode. This adjustment makes operation simple and convenient.

§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”), G9 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.

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 G9 in real time. Both WiFi and USB are available to access Web UI.

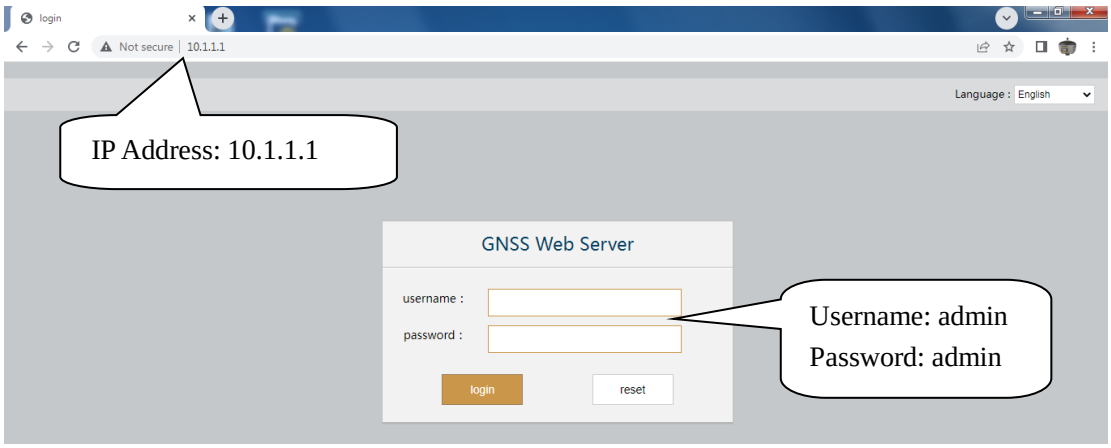
§4.2 Access by WiFi

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 GALAXY G9 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.

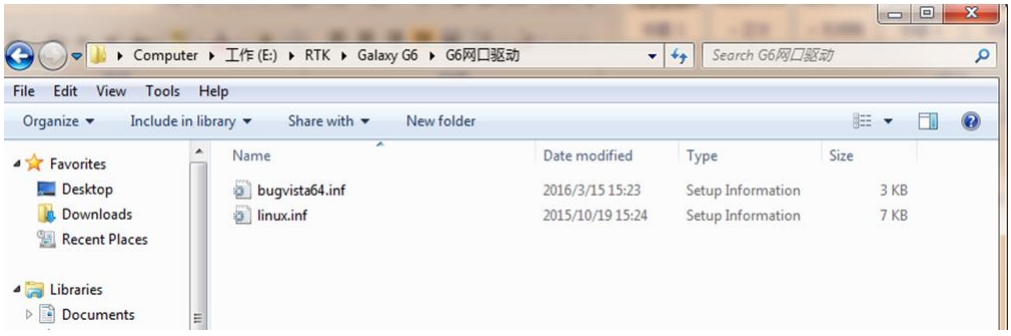


§4.3 Access by USB

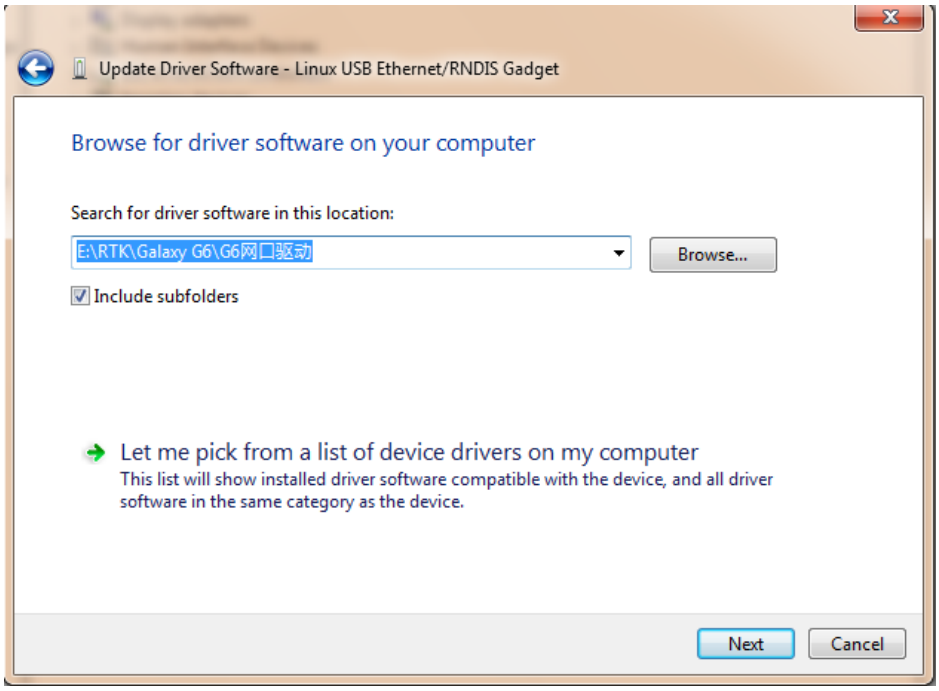
In this mode, the 7-pin USB port USB port of GALAXY G9 must work as an Ethernet port, then internal Web UI shall be accessed via a USB cable connection with the computer.

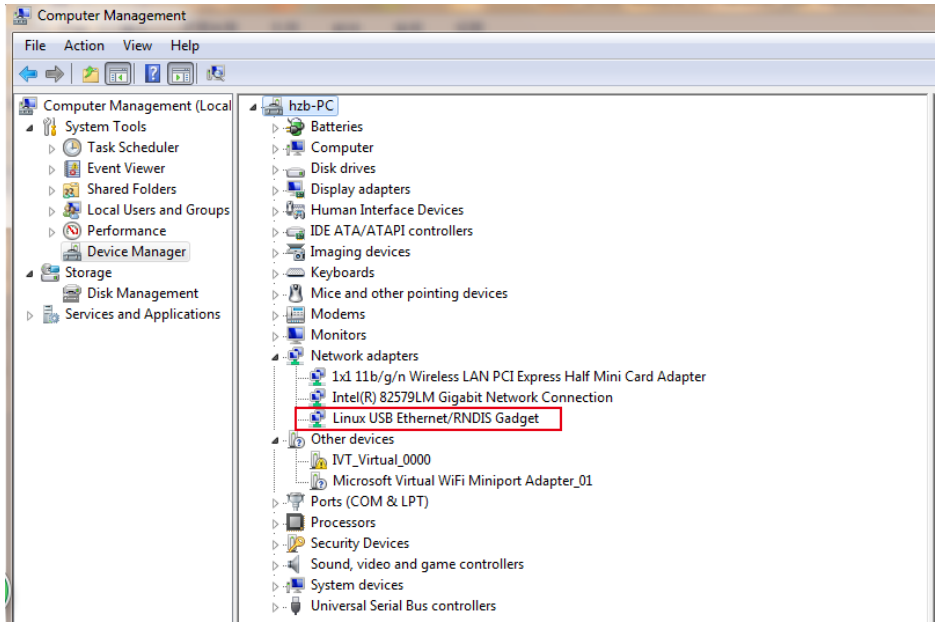
First of all, a corresponding driver is required to install on the computer to activate this function.

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.



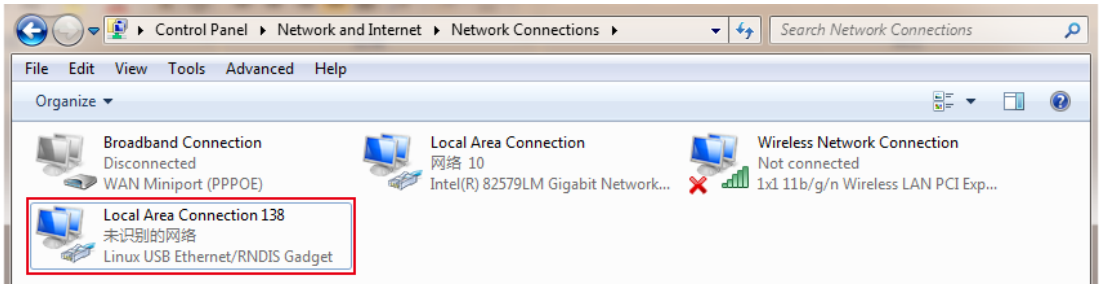
Choose the folder with the suitable driver





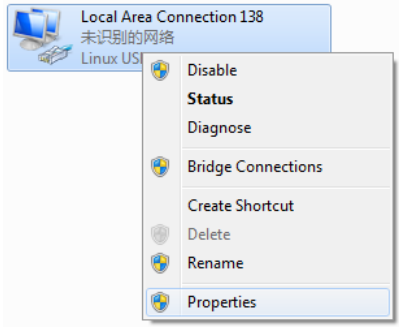
NOTE: *The driver can be downloaded from the official website. You are welcome to contact us if you need more support.*

If the driver has been successfully installed, the USB port of GALAXY G9 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 GALAXY G9 to the computer via USB network interface.

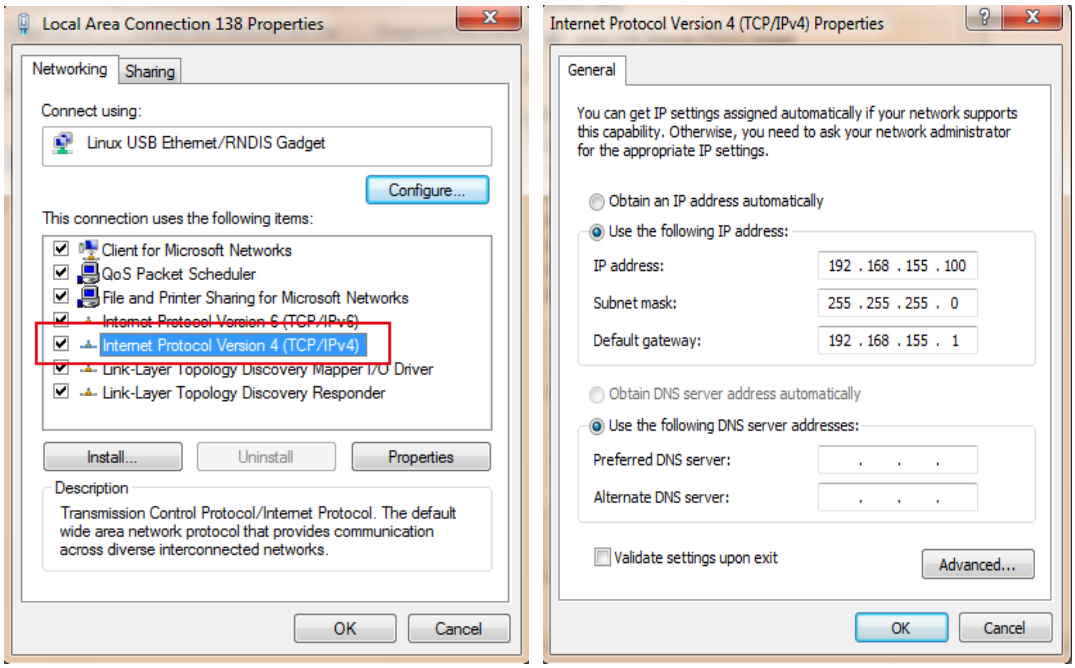


However, sometimes the computer cannot detect the receiver by USB network interface because there is something wrong with acquiring IP; therefore, we need to do something to avoid such problems, that is to set a fixed LAN IP for the connection:

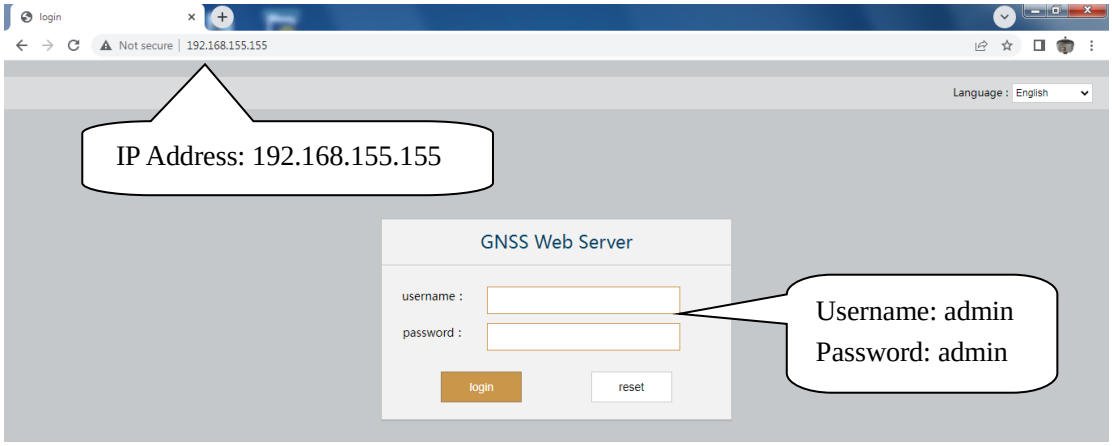
Right click on the local area connection which newly generates and choose properties to call out the local area connection properties window.



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 G9 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

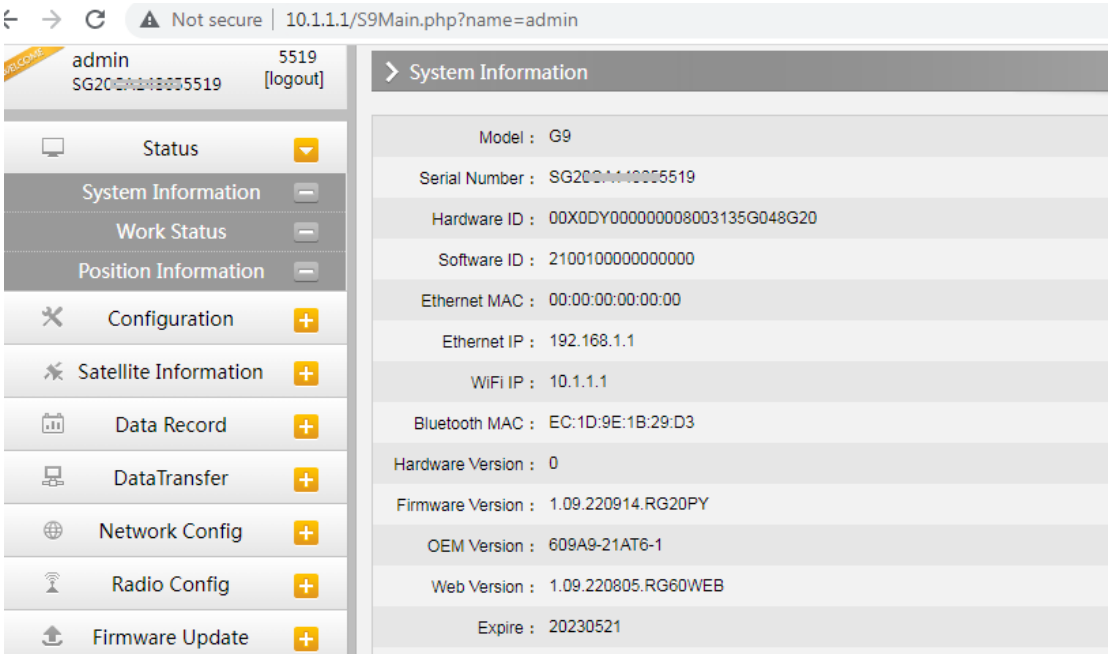
	Firmware Update	It is used to upgrade the firmware for the receiver and each module
	Track Manage	Record track file while doing measurement
	Coordinate System	Setup a local coordinate system for G9
	Online Service	Upload data onto a server in real time
	User Management	Add and manage the Web UI users
	Help	Offers solutions

§4.4.1 Status

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

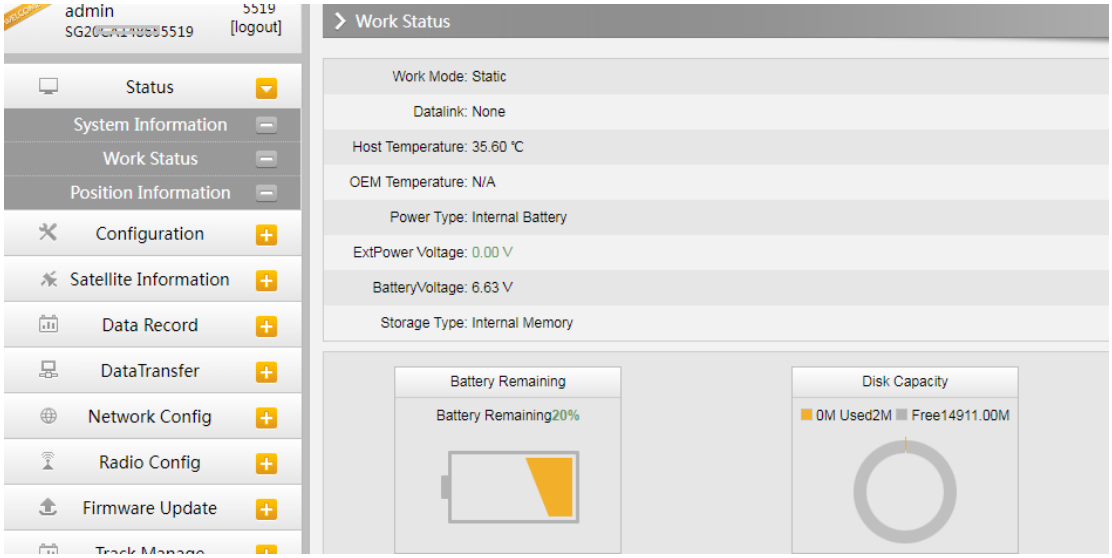
System Information

On this page, all the information about G9 is displayed, such as serial number, hardware ID, MAC address, firmware version and so on.



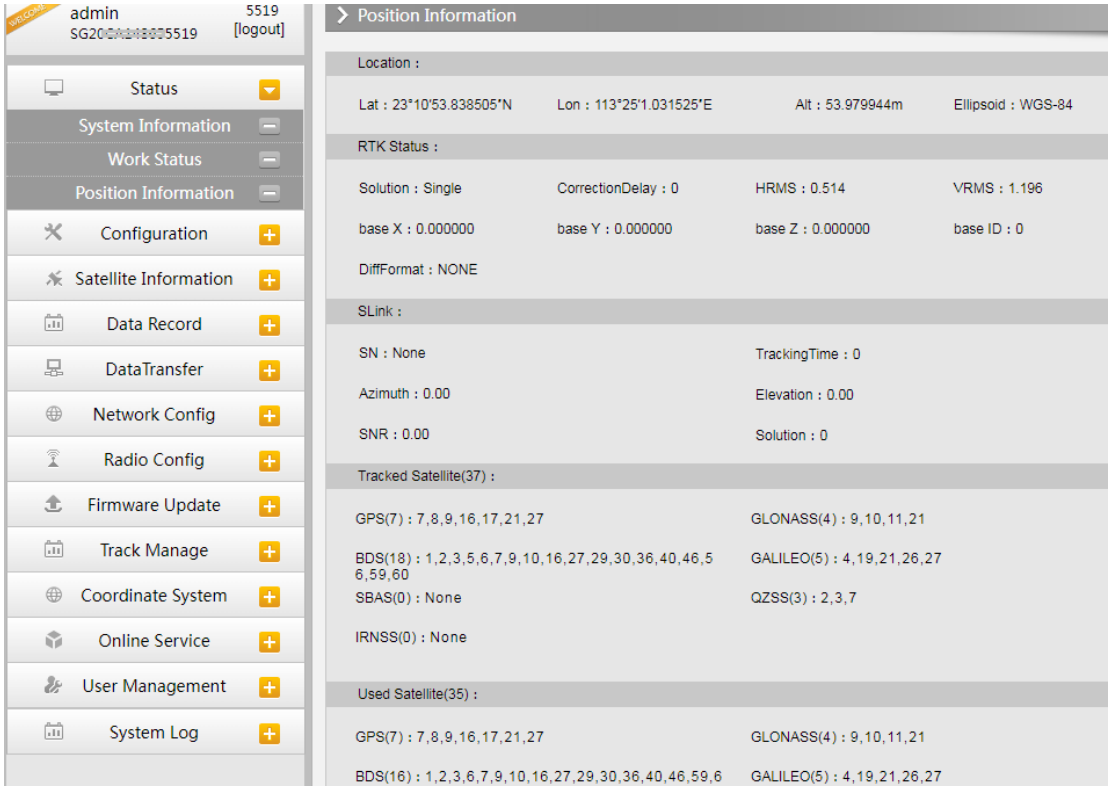
Work Status

The physical state of G9 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

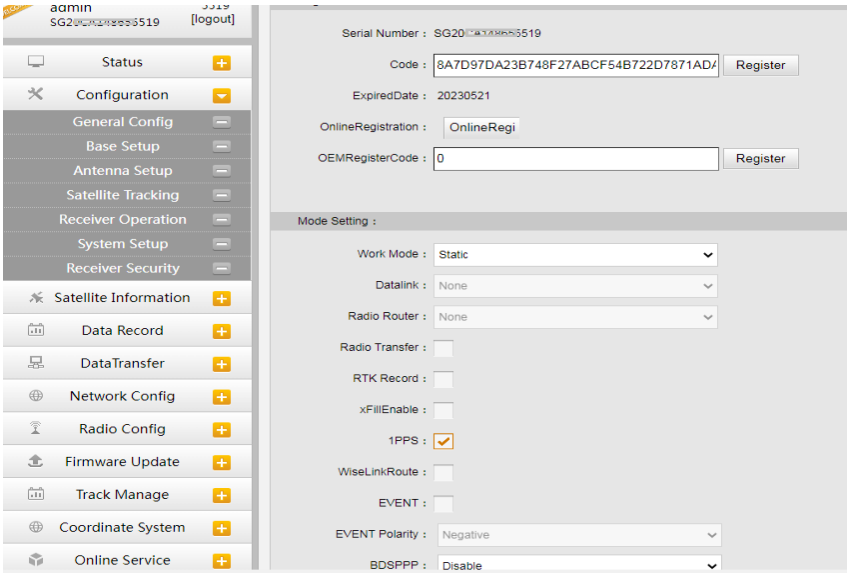


§4.4.2 Configuration

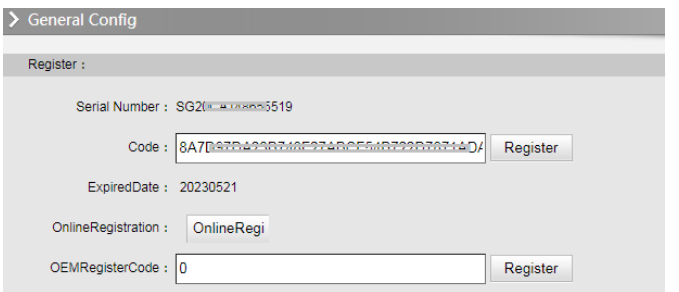
General Config, Base Setup, Antenna Setup, Satellite Tracking, Receiver Operate and Default Language are contained under the Configuration menu. Users are able to configure all kinds of parameters for GALAXY G9 under the Configuration menu, and all the settings will immediately take effect after saving.

General Config

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

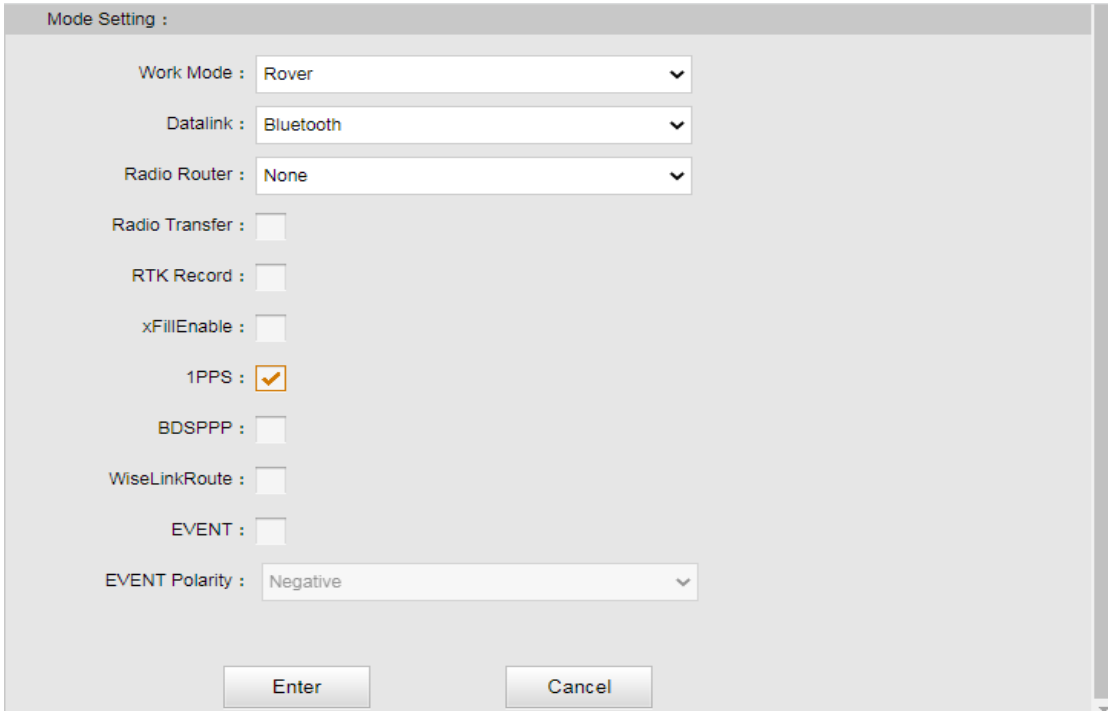


If the code of GALAXY G9 has expired or is ready to expire, please provide the serial number of your G9 for us to apply for another available code, then input the code into the blank or register the receiver online.



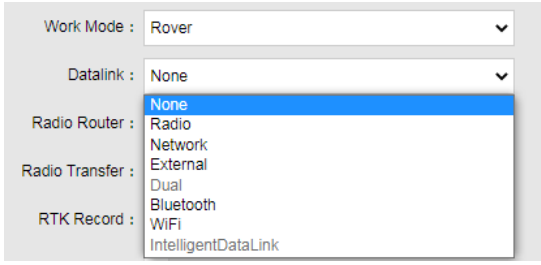
G9 allows users to set work mode and datalink from this Web UI with only a mobile phone or a

tablet through the WiFi hotspot.

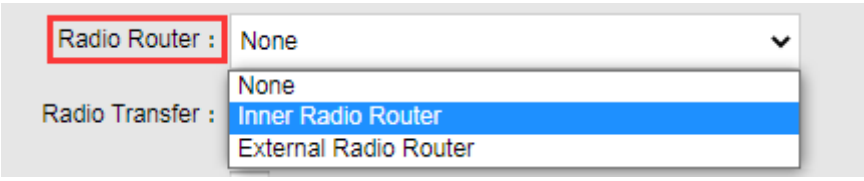


Work Mode: There are "Rover", "Base" and "Static" in this dropdown list

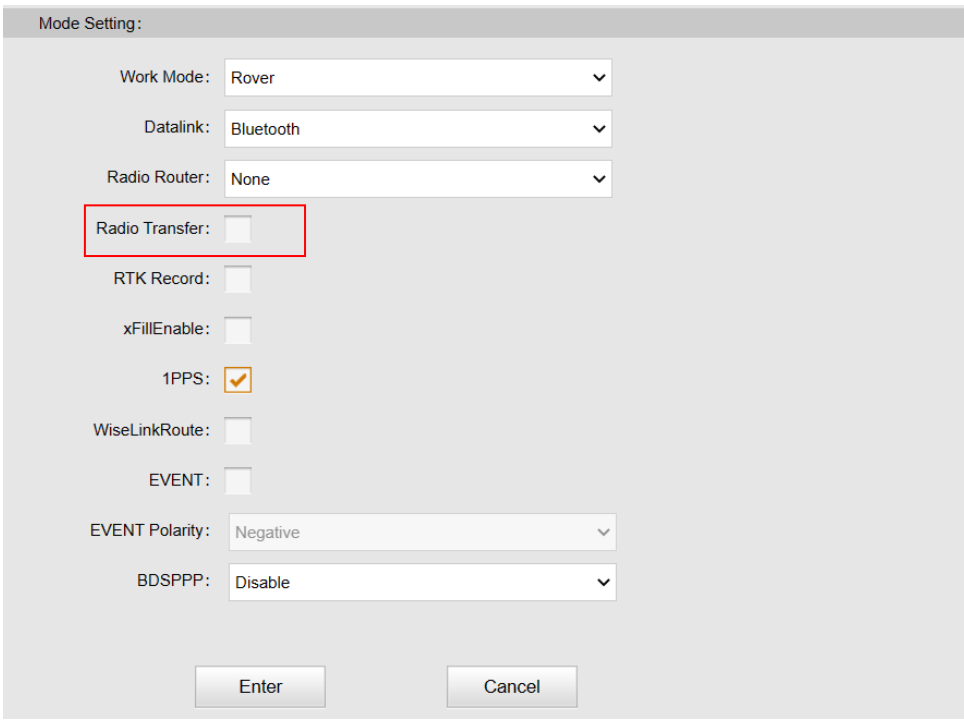
Datalink: Pull down the list and there will be all kinds of options for datalink, such as "Radio", "External", "Bluetooth", "WiFi".



Radio Router: This function requires the Internet from external devices connected through Bluetooth or an internal SIM card. Through the Internet, G9 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.

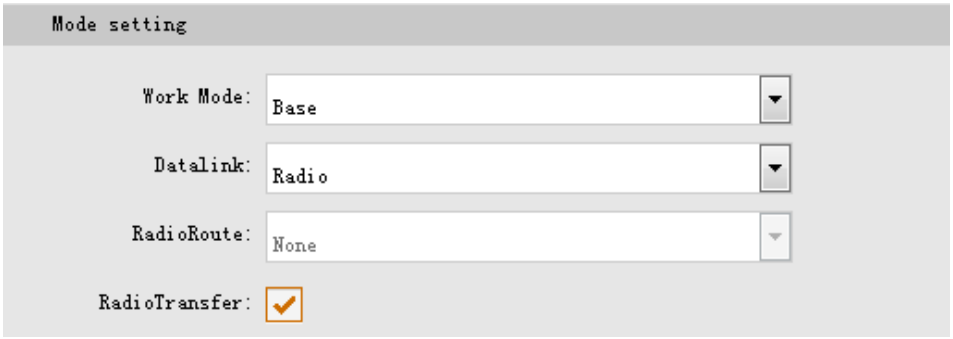


Radio Transfer: This function, also known as Radio Repeater, acquires correction data from the Base station by radio and transfers the data to other rovers by the internal UHF (radio). It is a solution to extend the radio communication range.

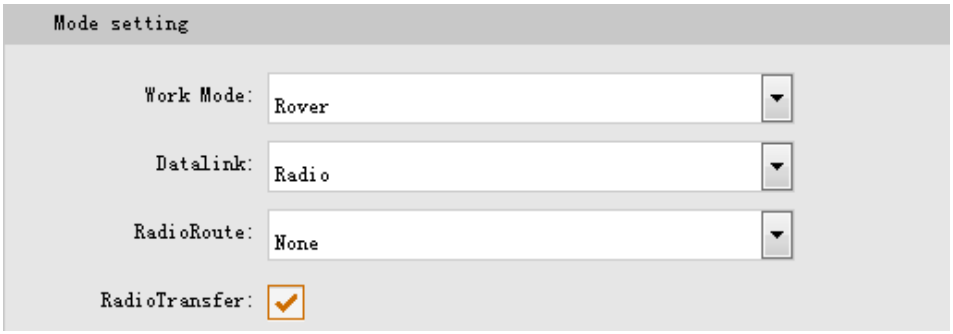


Operation:

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 G9 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

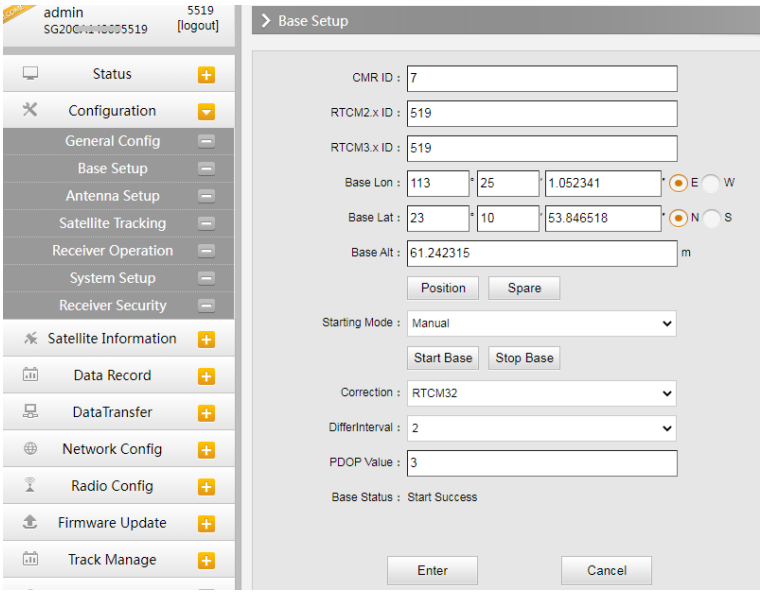
WiseLinkRoute: Receivers use internet first to transmit and receive correction data (a internet server is needed), if lost the internet signals, then receivers will use radio transmit and receive correction data

EVENT: This option is for the EVENT marker input

EVENT Polarity: EVENT input method.

Base Setup

When GALAXY G9 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

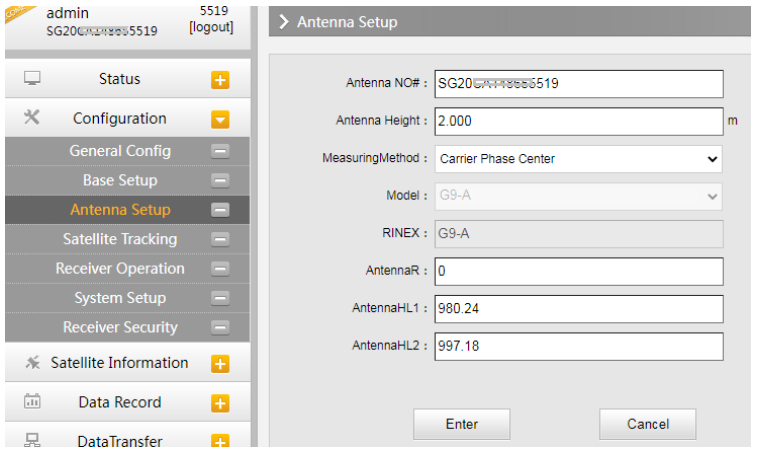
DifferInterval: Base differential transmit interval (seconds/once)

POP Value: This value defines the PDOP limitation.

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

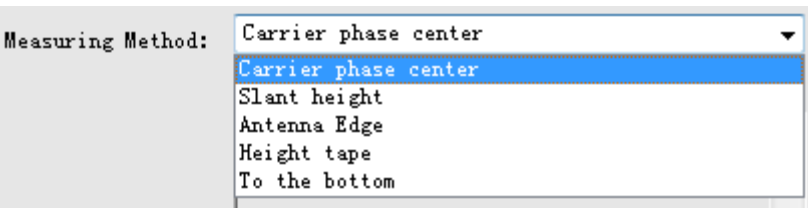
Antenna Setup

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



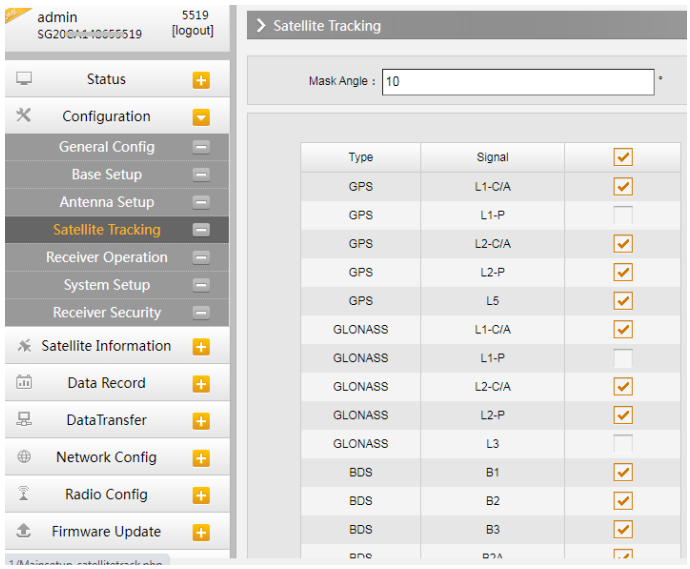
Antenna Height: This is the value for height from ground subjects point to receivers .

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.



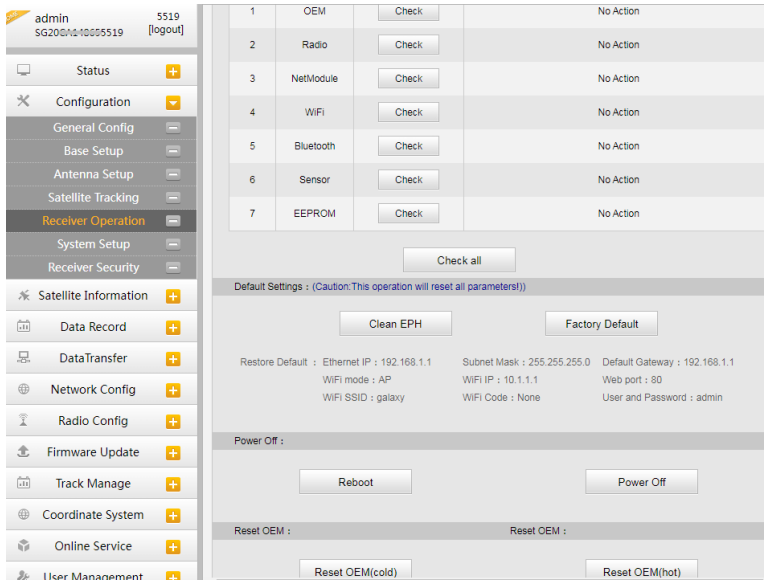
Satellite Tracking

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.

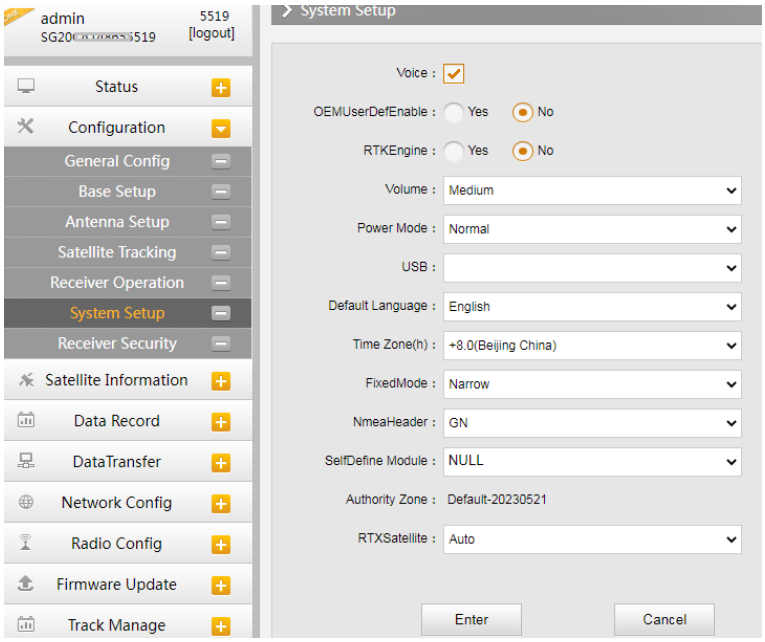
Factory Default: Click this button to bring the receiver back to factory default setting.

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 GALAXY G9, and uncheck it to turn off the voice prompt.
OEMUserDefEnable: Check "No" for G9
RTKEngine: Check "No" for G9
Voice Volume: Define the voice volume for GALAXY G9's speaker.
Power Mode: Configure the receiver to use the power saving mode or not.
USB: Now G9 supports the USB mode and Network interface at the same time through the USB 7-pin cable
Default Language: Configure the default language for GALAXY G9 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 G9
NMEAHeader: Choose the output data header in GN, GP or HE format

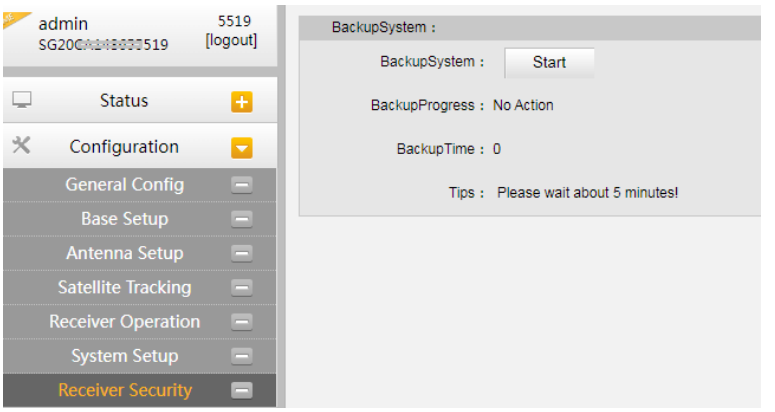
Selfdefin module: To set a user-defined work mode and output mode for receiver. Usually choose NULL

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. G9 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

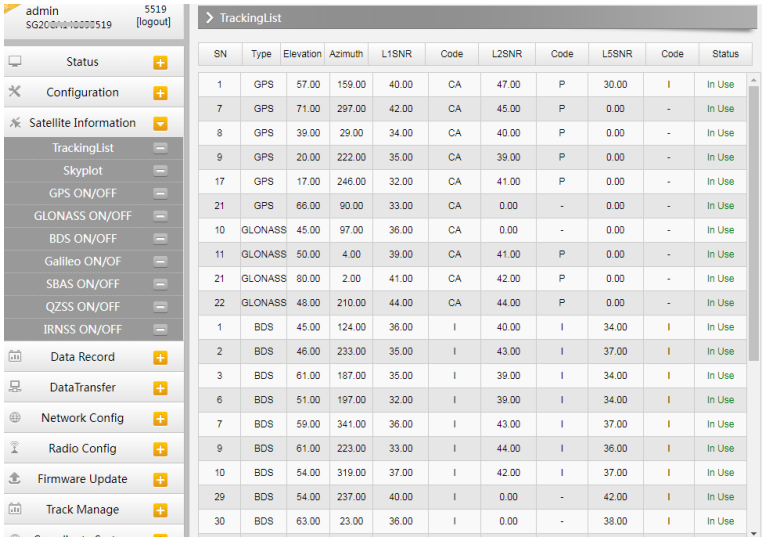


§4.4.3 Satellite Information

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

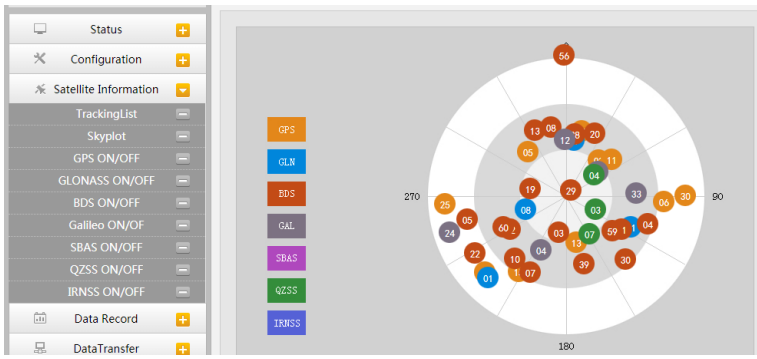
Here is the table to list all current used satellites and the other information about these satellites.



SN	Type	Elevation	Azimuth	L1SNR	Code	L2SNR	Code	L5SNR	Code	Status
1	GPS	57.00	159.00	40.00	CA	47.00	P	30.00	I	In Use
7	GPS	71.00	297.00	42.00	CA	45.00	P	0.00	-	In Use
8	GPS	39.00	29.00	34.00	CA	40.00	P	0.00	-	In Use
9	GPS	20.00	222.00	35.00	CA	39.00	P	0.00	-	In Use
17	GPS	17.00	246.00	32.00	CA	41.00	P	0.00	-	In Use
21	GPS	66.00	90.00	33.00	CA	0.00	-	0.00	-	In Use
10	GLONASS	45.00	97.00	36.00	CA	0.00	-	0.00	-	In Use
11	GLONASS	50.00	4.00	39.00	CA	41.00	P	0.00	-	In Use
21	GLONASS	80.00	2.00	41.00	CA	42.00	P	0.00	-	In Use
22	GLONASS	48.00	210.00	44.00	CA	44.00	P	0.00	-	In Use
1	BDS	45.00	124.00	36.00	I	40.00	I	34.00	I	In Use
2	BDS	46.00	233.00	35.00	I	43.00	I	37.00	I	In Use
3	BDS	61.00	187.00	35.00	I	39.00	I	34.00	I	In Use
6	BDS	51.00	197.00	32.00	I	39.00	I	34.00	I	In Use
7	BDS	59.00	341.00	36.00	I	43.00	I	37.00	I	In Use
9	BDS	61.00	223.00	33.00	I	44.00	I	36.00	I	In Use
10	BDS	54.00	319.00	37.00	I	42.00	I	37.00	I	In Use
29	BDS	54.00	237.00	40.00	I	0.00	-	42.00	I	In Use
30	BDS	63.00	23.00	36.00	I	0.00	-	38.00	I	In Use

Skyplot

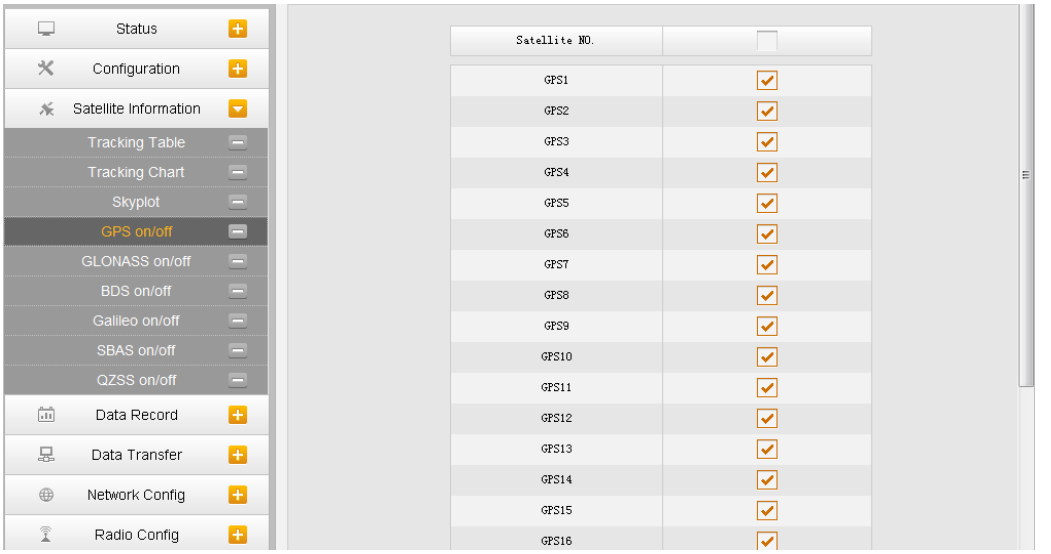
On this page, all the tracking satellites are shown on the skypolt, a intuitively view of the current position of satellites.



GPS on/off

For all the running GNSS constellations or the augmentation system, GALAXY G9 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.



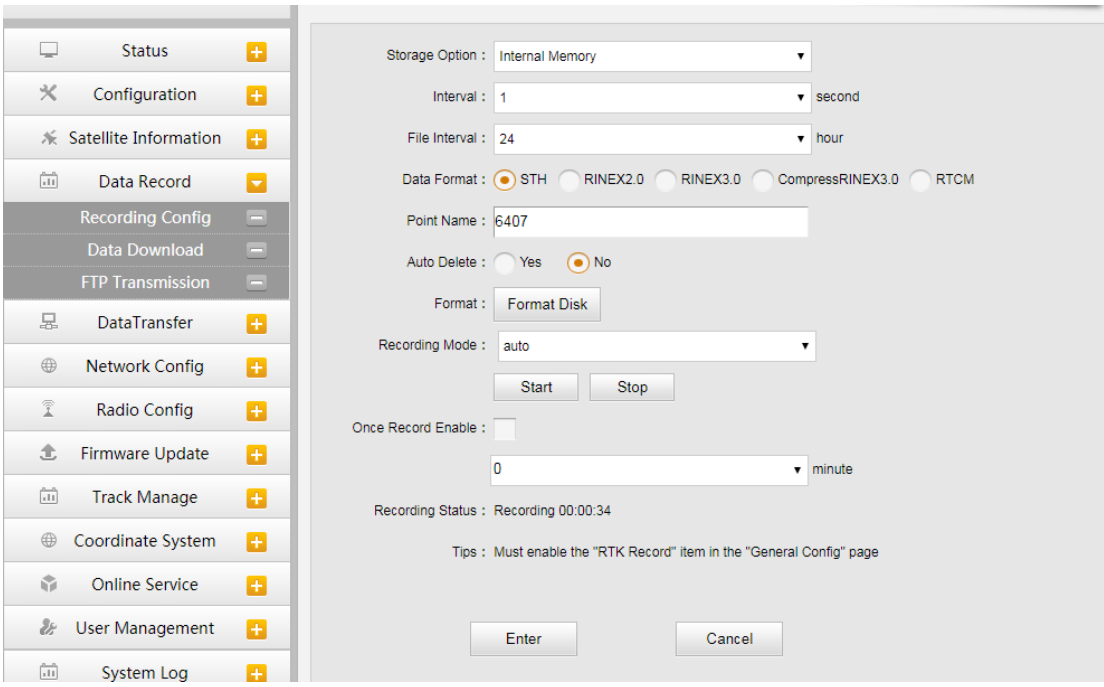
GLONASS on/off: To check and uncheck the satellites for tracking
BDS on/off: To check and uncheck the satellites for tracking
GALILEO on/off: To check and uncheck the satellites for tracking
SBAS on/off: To check and uncheck the satellites for tracking
QZSS on/off: To check and uncheck the satellites 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 GALAXY G9 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 GALAXY G9 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 GALAXY G9.

Recording Mode: Here are 2 options for GALAXY G9 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.

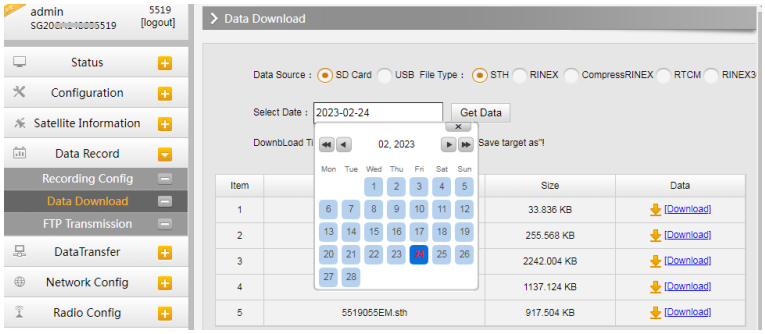
Recording Status: Here shows the status of static data storage(recording time).

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

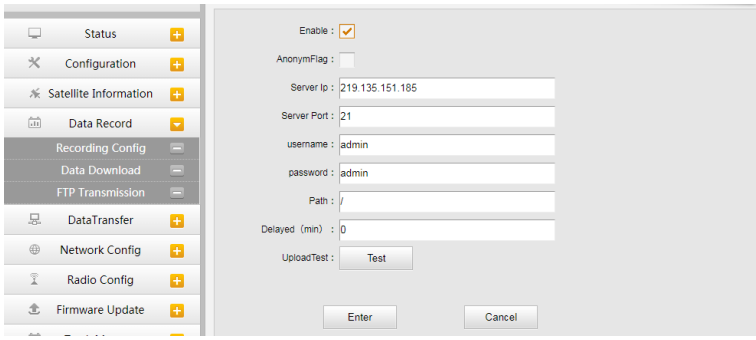
date you choose will show in the table, tap download button to download the data files.



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.)

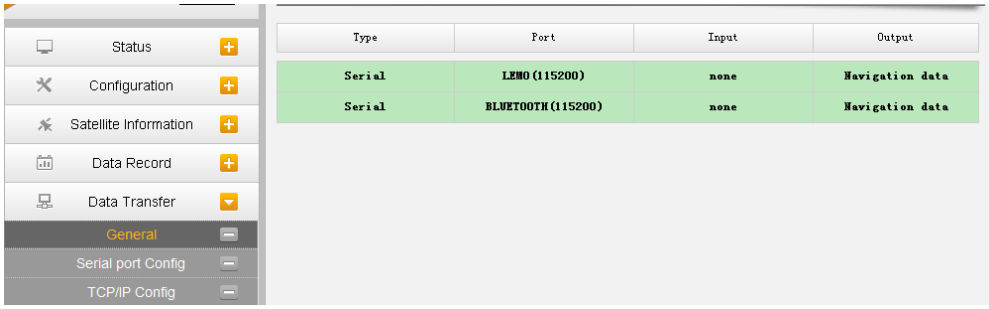


§4.4.5 Data Transfer

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.

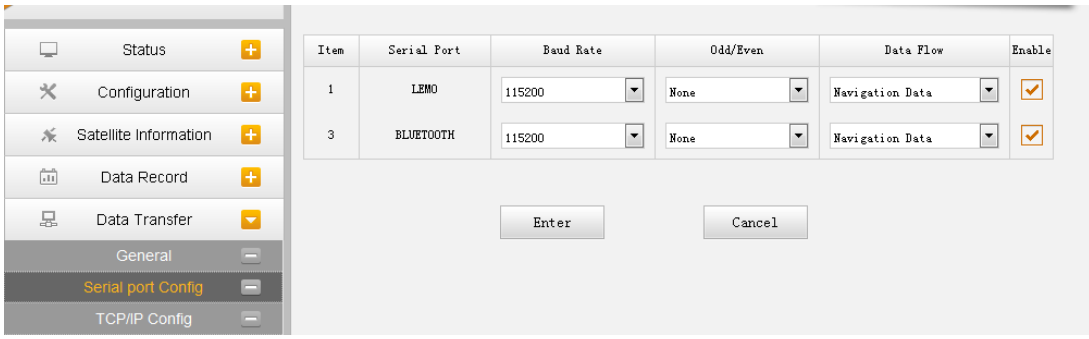
General

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.

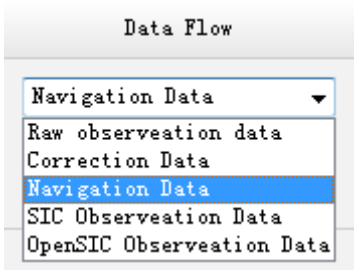
Raw observation data: This is the raw observation data straight from OEM board.

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.

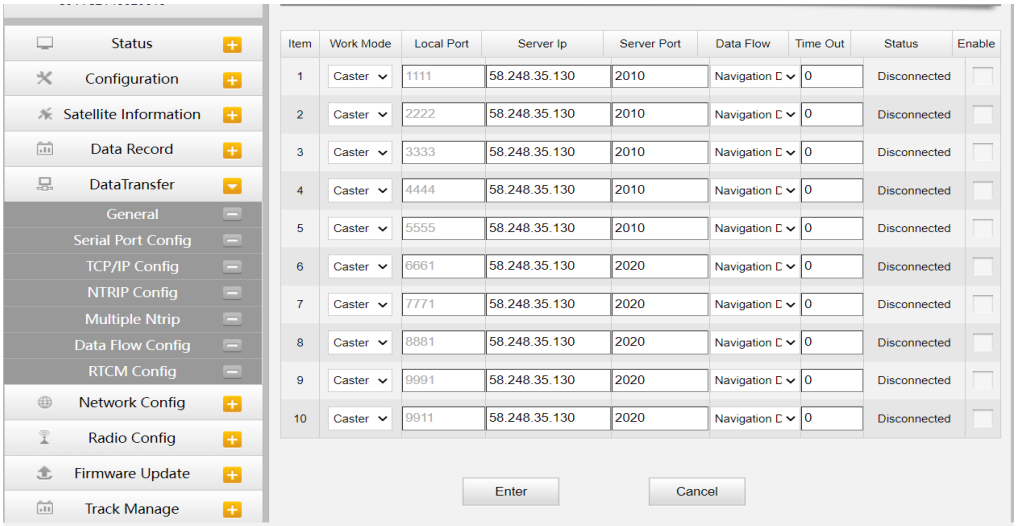


TCP/IP Config

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

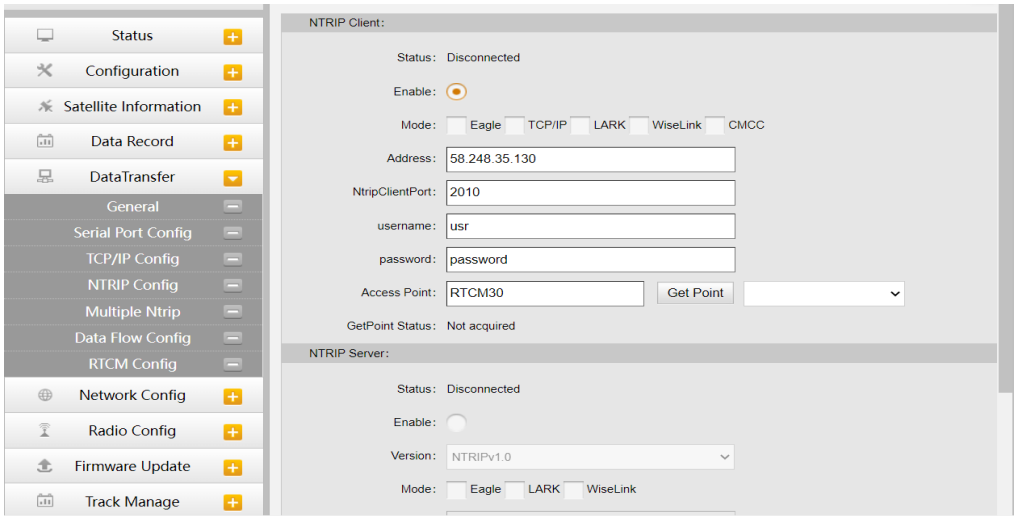
Caster: If this working mode is selected, GALAXY G9 will be a client to upload the data to a specific server when it connects to the internet by WiFi or GPRS connection with SIM card inserted. Input the specific IP and port for server, and decide the data format. Then users can see the uploaded data on server.

Server: GALAXY G9 will upload the data onto internet by the static WiFi if the server is selected, then users can obtain its dynamic data by accessing G9 through the IP.



NTRIP Config

It configures the NTRIP modes when you connect a receiver to the internet. GALAXY G9 supports all NTRIP modes including NTRIP Client, NTRIP Server and NTRIP Caster.



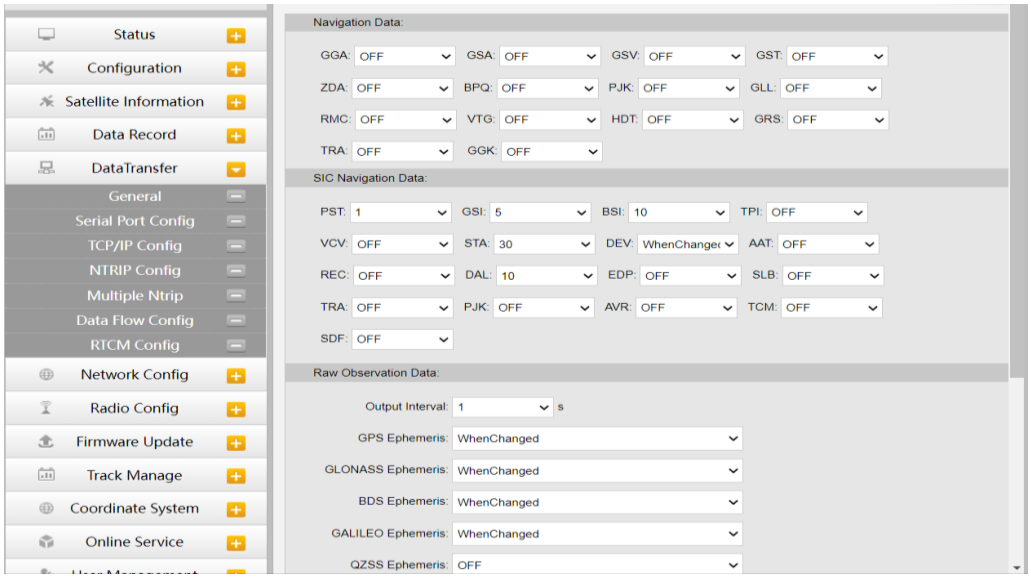
Multiple NTRIP

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

Data Flow Config

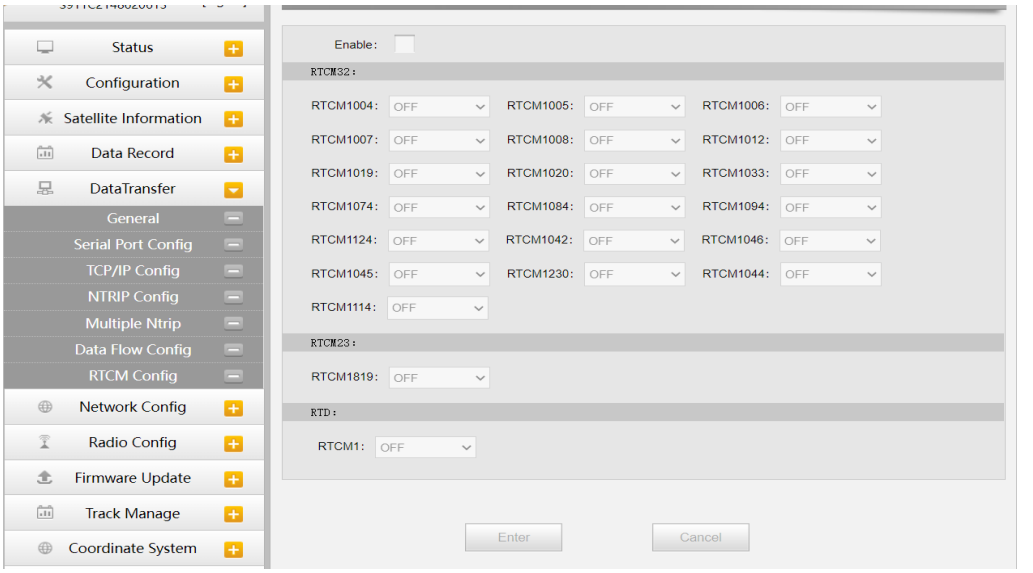
On this page, users can configure the specific contents, the update rate of data flow and which format to output.

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



RTCM Config

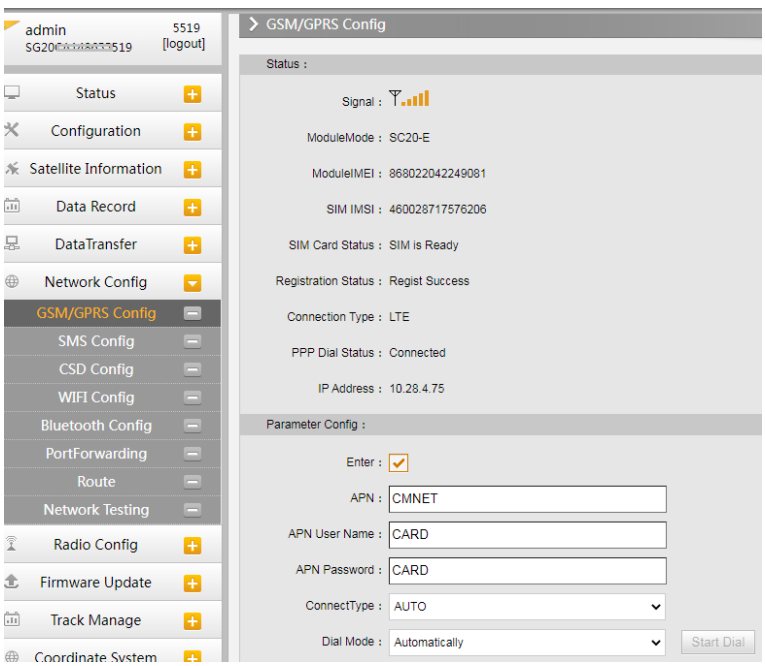
On this page, users can set differential signal formats.



§4.4.6 Network Config

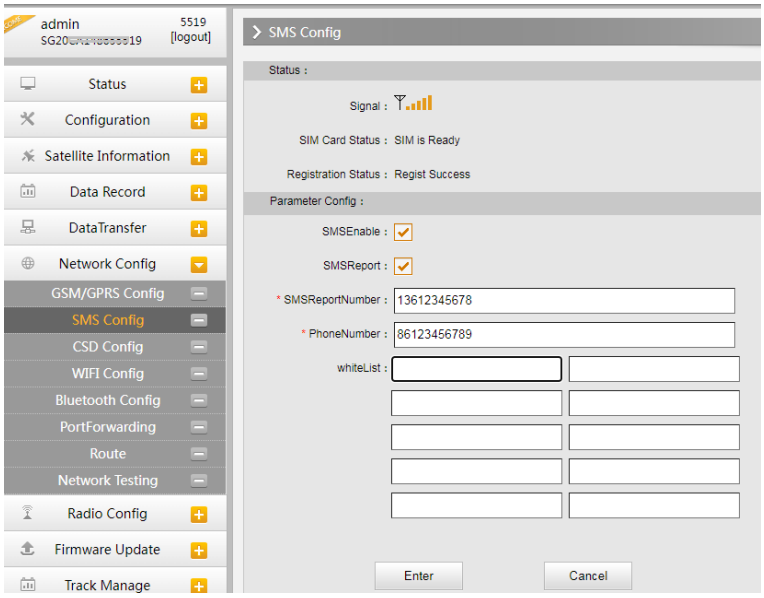
GSM/GPRS config

Check the SIM card cellular signal status, IMEI, connection type, set the APN.



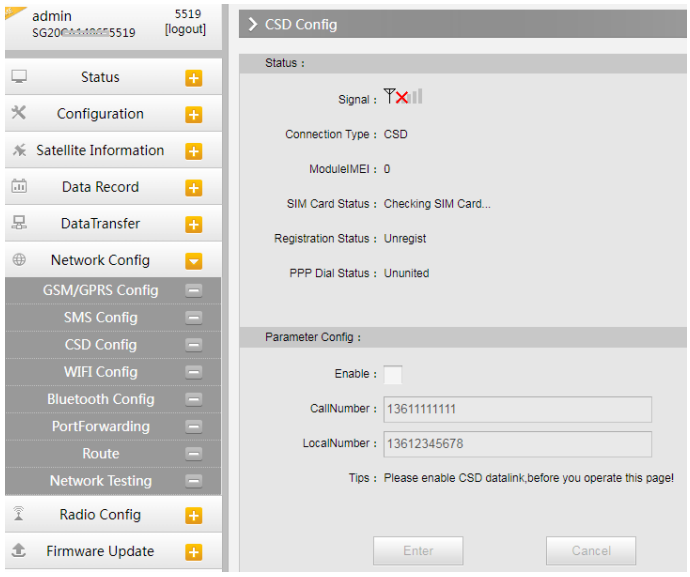
SMS config

Control this G9 via SMS. “SMSReportNumber” is the SIM number that you want to receive the message from G9, “PhoneNumber” is the SIM card number you used on the G9 receiver.



CSD config

Now G9 does not support CSD.



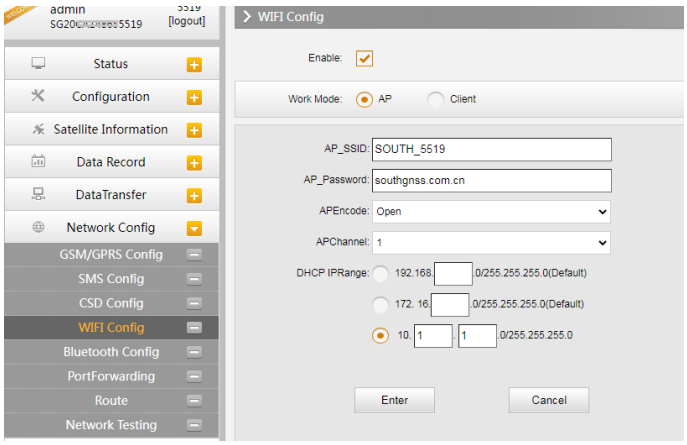
WiFi Config

It configures the G9 WiFi with two mode to choose--AP mode and Client mode.

AP: It enables the WiFi hotspot of GALAXY G9 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 GALAXY G9 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.

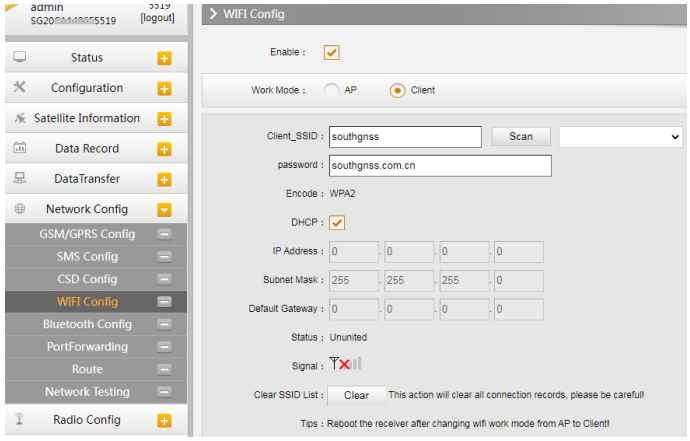
Client_SSID: This is the WiFi hotspot to which GALAXY G9 is going to connect

Scan: Click this button to search available WiFi hotspots.

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

IP fields: If GALAXY G9 successfully connects to the WiFi, there will be an LAN IP address generated by GALAXY G9.

ClearSSID: Click this button to clear the SSID list.

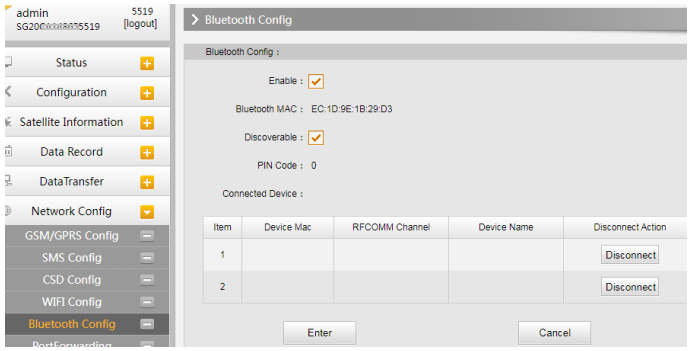


Bluetooth Config

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

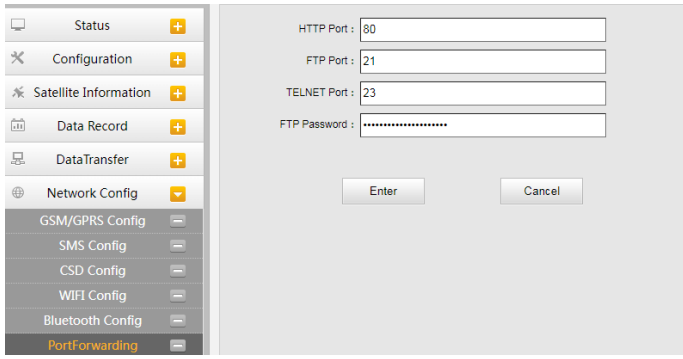
table.

The advanced Settings module enables Bluetooth search.



Port Forwarding

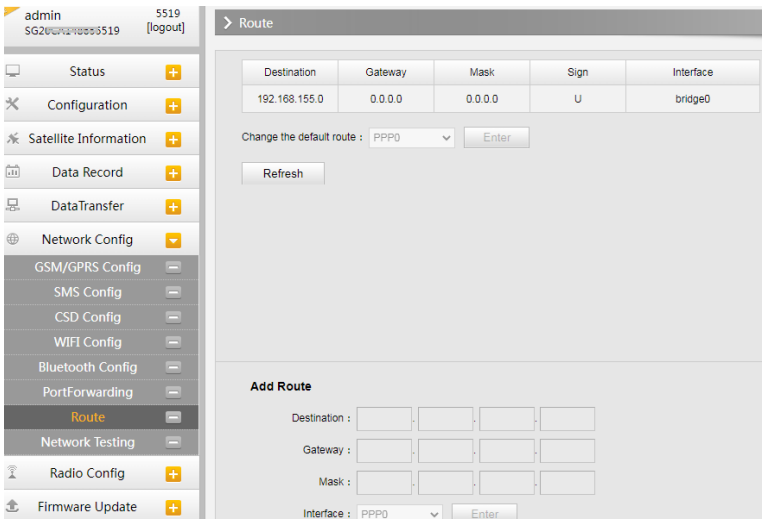
This page is mainly used to view and configure the internet transmission port of GALAXY G9, customize and debug receivers.



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

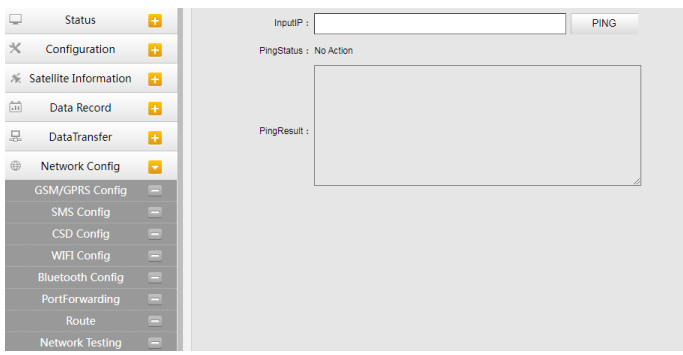
This is mainly used to view and configure the parameters of router, but only under the condition of customize and debug receiver.



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.

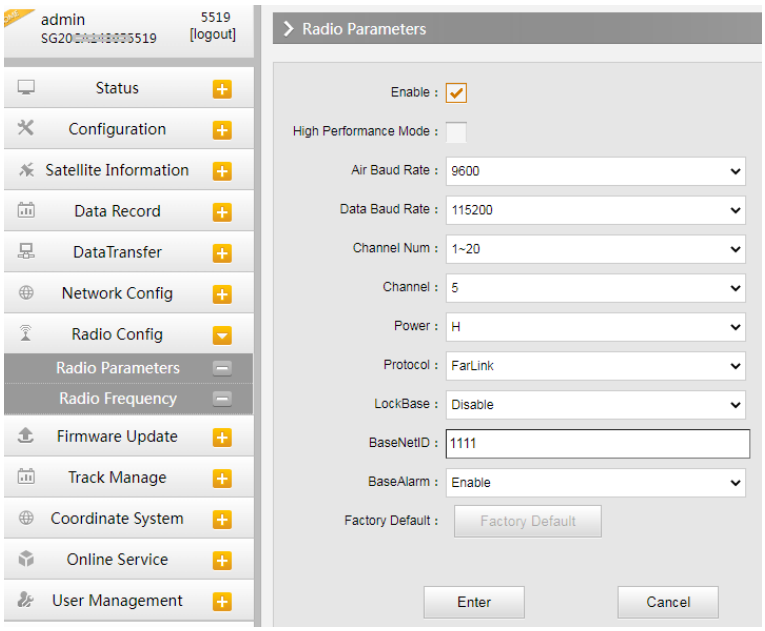


§4.4.7 Radio Config

"Radio Config" can set G9 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 GALAXY G9.



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.

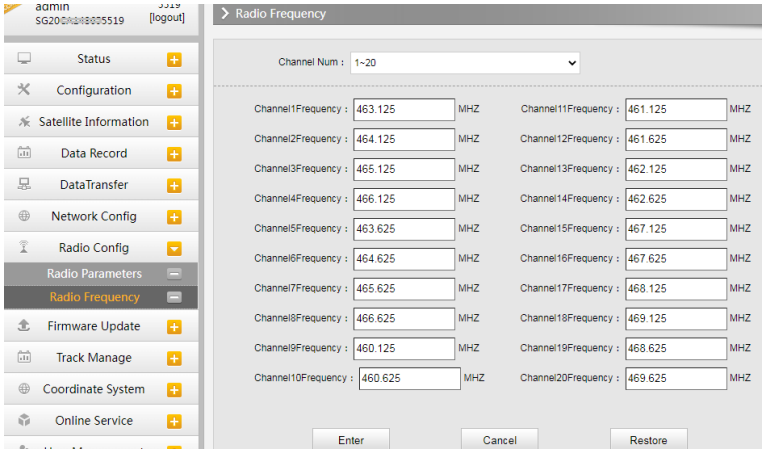
Factory Default: Click this button to restore the factory default for internal UHF module.

Radio Frequency

For GALAXY G9, 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.

G9 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 G9.

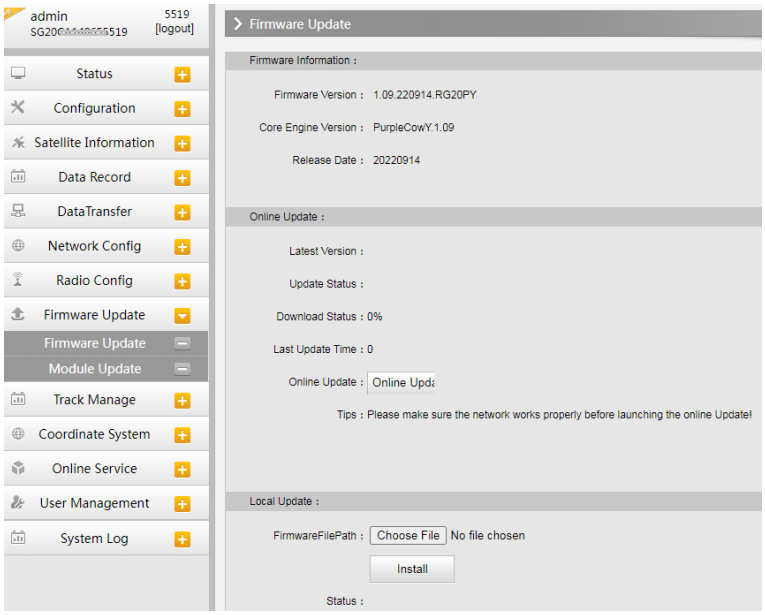


§4.4.8 Firmware Update

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 GALAXY G9, and allows updating the latest firmware for receiver. To get the latest firmware, please contact SOUTH technician.

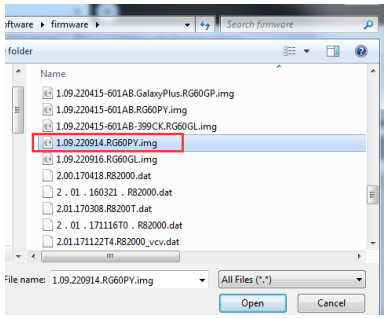


Online Update: GALAXY G9 supports updating the firmware online anytime if there is something updated or optimized.

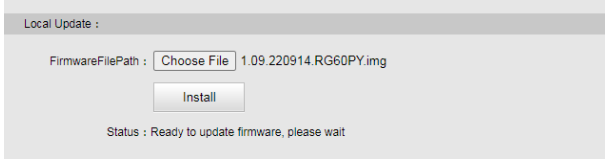
Local Update: Update the latest firmware using a firmware file.

How to upgrade the firmware with Local Update

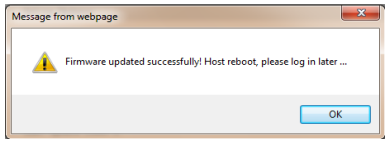
a) Click on "Choose File" button to load firmware file (Please take in mind that the firmware file is ended with **PY.img** as its extension name).



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



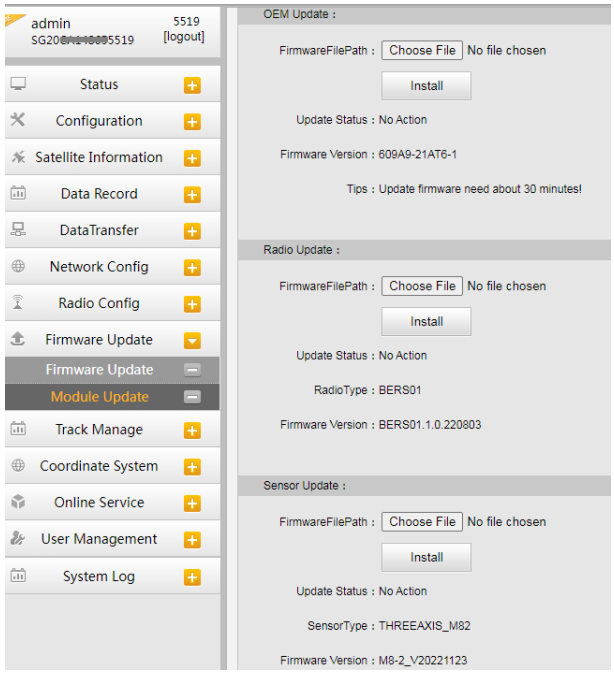
c) After the firmware completes upgrading, a dialog will appear saying "Firmware updated successfully! Host reboot, please log in later…", then the receiver will restart automatically.



SPECIAL REMIND:GALAXY G9 DOES NOT support updating the firmware with the help of INstar anymore. Updating the firmware for GALAXY G9 shall be done on Web UI.

Module Update

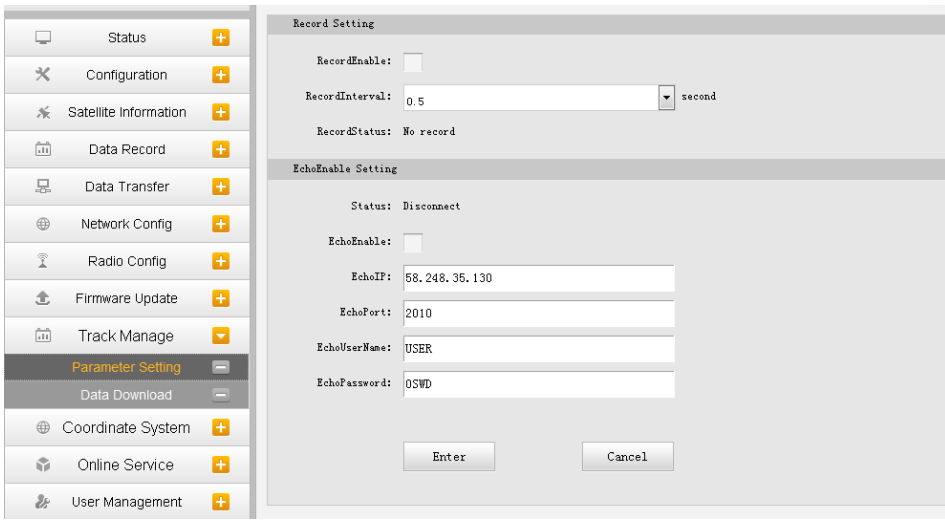
This page is used to update the firmware for corresponding modules such as OEM board, radio module and sensor.



§4.4.9 Track Manage

G9 now supports recording the track while doing measurements, and uploading the data onto the server.

Parameter Setting



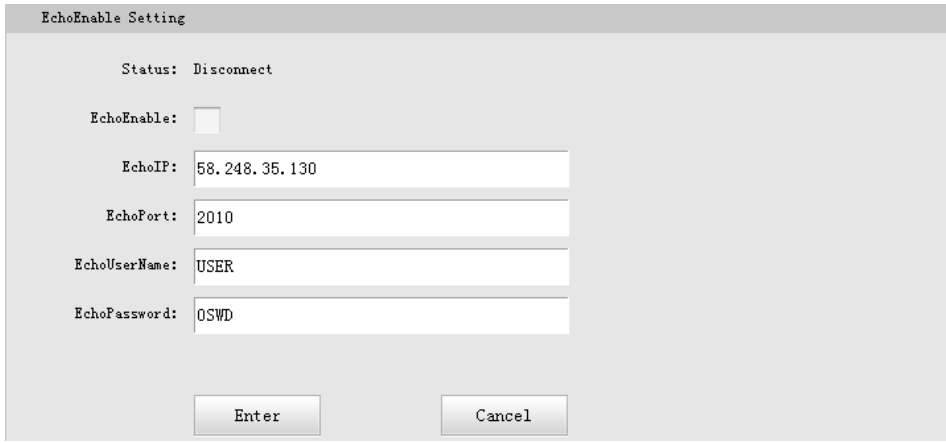
Record Setting

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

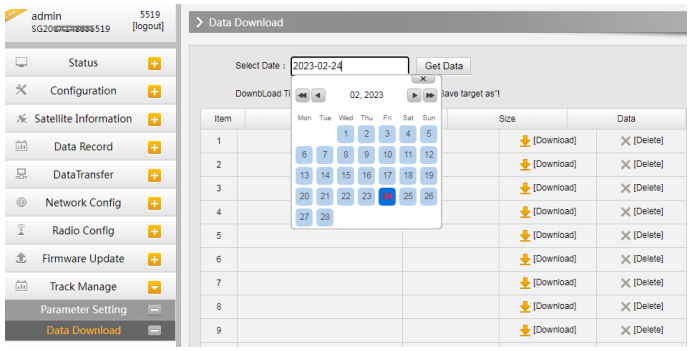
This configuration dialog is used to upload the recording data to a server in real time.



Data Download

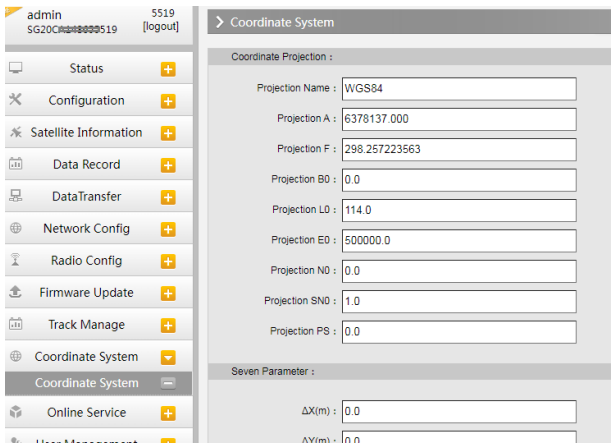
On this page, users can download the track data file from receiver. Choose the recording date and

click “Get Data” to load all the data files recorded on that day; then choose the files and click download button.



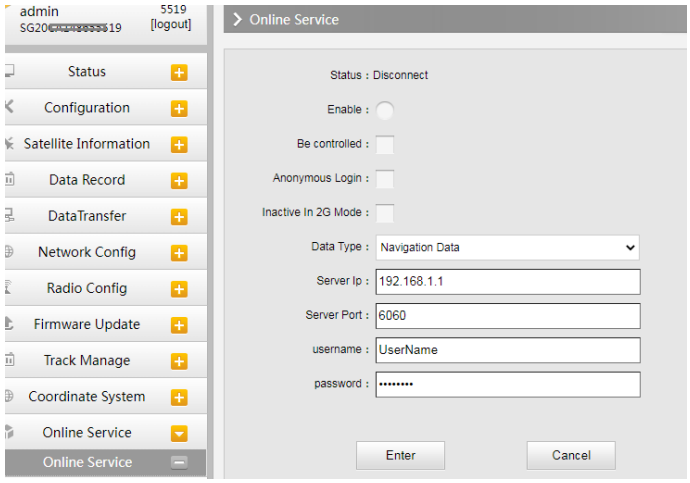
§4.4.10 Coordinate System(reserve)

G9 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.



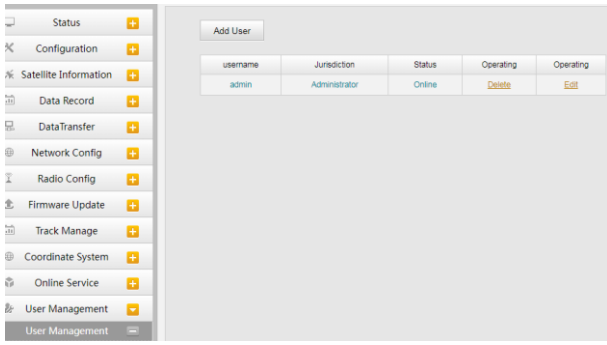
§4.4.11 Online Service(reserve)

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.

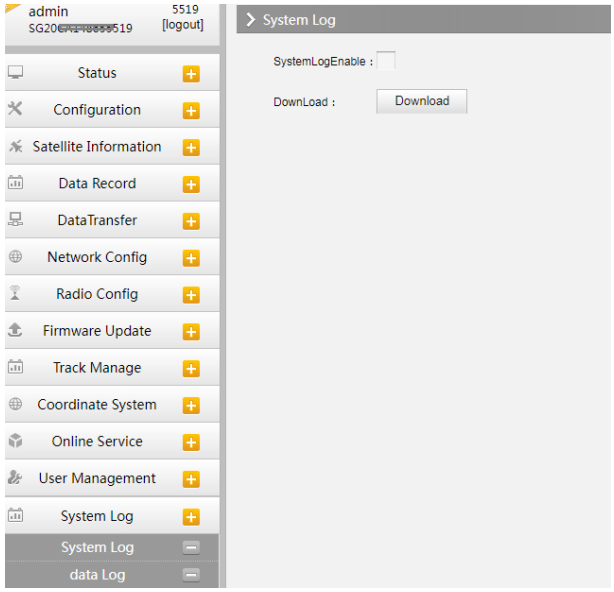


§4.4.13 System log

System log

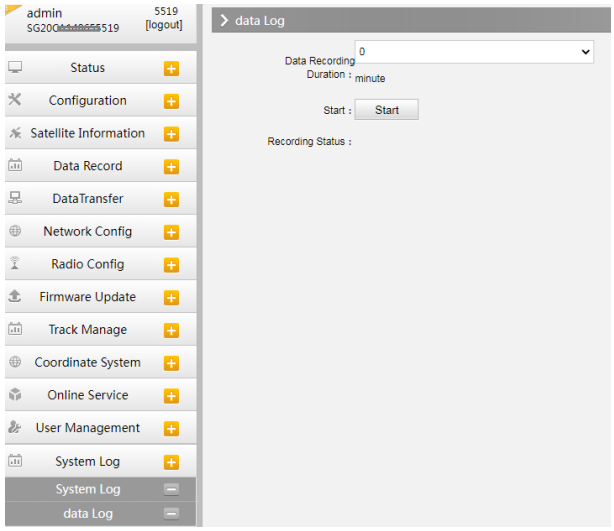
On this page, users can download the system log of the receiver (the log can help to backtrack the working status of the receiver).

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.



Chapter Ⅴ Accessories

§5.1 Instrument Case



The instrument case for GALAXY G9 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.

§5.2 Batteries

2 pcs of large capacity Li-ion batteries are the standard accessories for G9, which make sure G9 has enough power for a whole day of work

Specifications of battery
Model: BTNF-L7408W
Capacity: 7.4V×3400mAh





§5.3 Charger &Adapter



Red light: under charging
Green light: fully charged

§5.4 Cables

7 Pin-USB LEMO port cable

----For static data downloading.
----For firmware update.
----For receiver Web UI access.



Appendix A GALAXY G9 technical specifications

GNSS Features	
Channels	1598
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*
GALILEOS	E1, E5A, E5B, E6C, AltBOC*
SBAS	L1C/A, L5*
IRNSS	L5*
QZSS	L1, L2C, L5*
MSS L-Band	BDS-PPP
Positioning output rate	1Hz~20Hz
Initialization time	< 10s
Initialization reliability	> 99.99%
Positioning Precision	
Code differential GNSS positioning	Horizontal: 0.25 m + 1 ppm RMS Vertical: 0.50 m + 1 ppm RMS
GNSS static	Horizontal: 2.5 mm + 05 ppm RMS Vertical: 5 mm + 05 ppm RMS
Real-time kinematic(Baseline<30km)	Horizontal: 8 mm + 1 ppm RMS Vertical: 15 mm + 1 ppm RMS
SBAS positioning	Typically < 5m 3DRMS
RTK initialization time	2 ~ 8s
IMU tilt compensation	Additional horizontal pole tip uncertainty typically less than 10mm + 07 mm/ °tilt down to 30 °
IMU tilt angle	0 °~ 60 °
Hardware Performance	
Dimension	154mm(φ) × 106mm(H)
Weight	1.3kg (battery included)
Material	Magnesium aluminum alloy shell
Operating temperature	-25℃ ~ +65℃
Storage temperature	-40℃ ~ +80℃
Humidity	100% Non-condensing

Waterproof/Dustproof	IP68 standard, protected from long time immersion to depth of 1m IP68 standard, fully protected against blowing dust	
Shock/Vibration	Withstand 2 meters pole drop onto the cement ground naturally	
Power supply	6-28V DC, overvoltage protection	
Battery	7.4V 3400mAh ×2 rechargeable, removable Li-ion battery	
Battery life	15h(Rover Bluetooth mode)	
Communications		
I/O Port	5PIN LEMO external power port + RS232 5PIN KEMO (USB, OTG, Ethernet) 1PPS port SIM card slot(standard)	
Internal UHF	1/2/3W switchable radio, receive and transmit, radio router and radio repeater	
Frequency range	Supports only one of those three: 410MHz - 430MHz, 430MHz - 450MHz, 450MHz - 470MHz	26-30dBm
Channel spacing	25 kHz	
UHF Modulation	GMSK	
Communication protocol	Farlink, Trimtalk450s, SOUTH, HUACE, Hi-target	
Bluetooth Modulation	Bluetooth 3.0/4.1 standard, Bluetooth 2.1 + EDR(2402 ~ 2470 MHz)	8dBm
Bluetooth Modulation	GFSK, π/4-DQPSK, 8-DPSK	
NFC Communication	Realizing close range (shorter than 10cm) automatic pair between receiver and controller (controller requires NFC wireless communication module else)	
Cellular	LTE FDD: B1/B3/B5/B7/B8/B20 LTE TDD: B38/B40/B41 WCDMA: B1/B5/B8 GSM: 850/900/1800/1900MHz	LTE: 23dBm±2dB WCDMA: 24dBm±3dB GSM: 33dBm±2dB
Cellular Modulation	QPSK, 16QAM for LTE, QPSK for WCDMA, GMSK for GSM/GPRS	
WiFi Modem	802.11 b/g/n standard(2412 ~ 2468 MHz)	13-16dBm
Modulation	IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK) IEEE 802.11g/n: OFDM(64QAM, 16QAM, QPSK, BPSK)	
WiFi AP/client	AP mode, Receiver broadcasts its hotspot form Web UI accessing with any mobile terminals.	

	Client mode, search and connect the wifi from others, transmit and receive correction data stream via WiFi datalink.
Data Storage/Transmission	
Storage	16 GB SSD Automatic cycle storage (The earliest data files will be removed automatically while the memory is not enough). supports OTG to external USB disk
Data transmission	Plug and play mode of USB data transmission Supports FTP/HTTP data download
Data format	Static data format: STH, Rinex2.01, Rinex3.02 and etc. Differential format: RTCM 2.3, RTCM 3.0, RTCM 3.1, RTCM 3.2 GPS output data format: NMEA 0183, PJK plane coordinate, SOUTH Binary code Network model support: VRS, FKP, MAC, fully support NTRIP protocol
Sensors	
Electronic bubble	Controller software can display electronic bubble, checking leveling status of the carbon pole in real time
IMU	Built-in IMU module, calibration-free and immue to magnetic interference
Thermometer	Built-in thermometer sensor, adopting intelligent temperature control technology, monitoring and adjusting the receiver temperature
User Interaction	
Operating system	Linux
Buttons	one button
Indicators	4 LED indicators(Satellite, Charging, Power, Datalink, Bluetooth)
Web interaction	With the access of the internal web interface management via WiFi or USB connection, users are able to monitor the receiver status and change the configurations freely
Voice guidance	It provides status and operation voice guidance, and supports Chinese/English/Korean/Spanish/Portuguese/Russian/Turkish
Secondary development	Provides secondary development kit, and opens the OpenSIC observation data format and interaction interface definition
Cloud service*	The powerful cloud platform provides online services like remote manage, firmware update, online register and etc.
Items marked with * will be upgraded with the update of the firmware version	
The data comes from the SOUTH GNSS Product Laboratory, and the specific situation is subject to local actual usage	

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.

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.