



GALAXY G7 Positioning System User Manual

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Chapter I Preface

Read this chapter, you will have a brief knowledge of SOUTH Company and GALAXY G7 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 G7 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 EGStar.

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

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.

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 G7 is equipped with dual-mode Bluetooth v4.0 standard which is able to connect the other smart devices and compatible with Bluetooth v2.1 standard. It not only enlarges the work range but also makes the data communication become more stable.

WiFi

As the new feature and technology adopted on G7, 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

GALAXY G7 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. And the new protocol “Farlink” is able to achieve the working range as 8km.

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.

Full Constellations Tracking

Equipped with most advanced GNSS boards, G7 system can track most signal from all kinds of running satellite constellation, especially support B1, B2 and B3 signal from BeiDou, also get position result with only BeiDou signal.

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.

Intelligent Storage

The raw data including STH, Rinex2.01 and Rinex3.02 not only can be saved in the internal memory (8G SSD), but also can be stored into an external USB device (OTG). The configurable sample frequency is really up to 20Hz.

Ultimate portability

Highly integrated GNSS antenna, Bluetooth module and WIFI module, leading the design trend of miniaturization, light weight, and portable RTK to a new height. Magnesium alloy housing, tough line design, more delicate surface decoration, stronger sense of technological design, more durable.

NFC Function

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

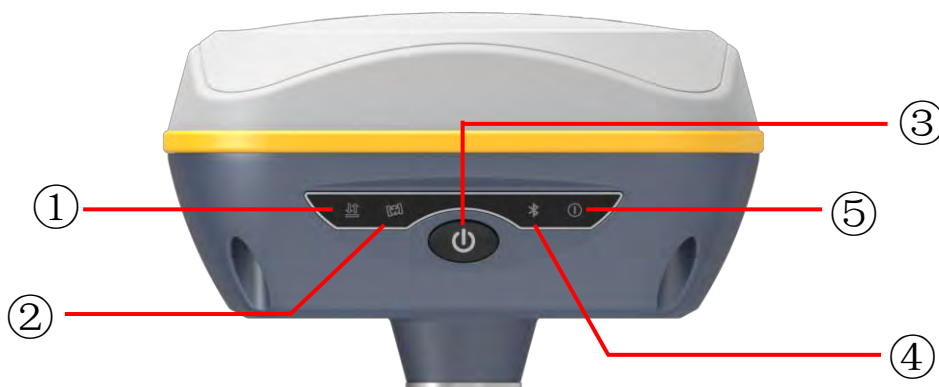
Chapter II Hardware Component

Reading this chapter, you can grasp the components, installation and the function of GALAXY G7 measuring system

The overall appearance of GALAXY G7 is round and flat, with a dimension of 135mm(L)×135mm(W)×84.75mm(H). It looks elegant, strong and durable. And it adopts a combination design of voice and buttons, easier to operate. The bottom of the receiver has commonly used interfaces.



§2.1 Front Components



Ref	Component	Description
①	Data Indicator	<p>UHF mode: Flashes in red to indicate that the signal is receiving/transmitting with the interval.</p> <p>WiFi mode: 1) Rapidly flashes in red to indicate that the receiver is establishing WiFi connection; 2) Flashes in red with the signal receiving/transmitting interval when successful connection.</p> <p>Static mode: Flashes by the data sampling interval to indicate the data file is recording.</p>
②	Satellites Indicator	Flashes in red to indicate that the satellites are tracking by 0.2s interval, repeat in every 10s.
③	Power Button	Power on/off receiver; Switch and confirm working mode; Perform self-check operation.
④	Bluetooth Indicator	Glow in red to indicate that Bluetooth connection has established between controller and receiver.
⑤	Power Indicator	<p>Glow in red to indicate that there is enough power for working; Flashing in red means low power.</p> <p>Glow in blue to indicate that the receiver is charging.</p>

§2.2 Bottom Components



Ref	Component	Description
①	7-pin	USB for data transmission, OTG interface and Ethernet port for login web interface. battery charging port.
②	5-pin LEMO port	1, As a power port connected with an external power supply device. 2, As a differential transmission port connected with an external radio. 3, As a serial port to check data output and debug.
③	UHF antenna interface	Install UHF antenna.
④	Speaker	Mode setting and working status prompt.
⑤	SN label	Apply for a registration code, Bluetooth ID.
⑥	Screw hole	Fix the mainframe to the tribrach or the pole.

Chapter III Hardware Operation

§3.1 Power on/off

Power on

Press the power button for once, all the indicators glow in red, after 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.

§3.2 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”).

§3.3 Charging

Insert the connector of G7 charger into 5-pin LEMO interface on G7, and plug the adapter to the power socket, while the power indicator glows in blue, that means the inbuilt battery is being charged.



§3.4 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 the instrument says power off), then G7 will say “start to set work mode”, at this moment, release power button, the working mode will be repeated from Rover to Static on control panel. When the **Bluetooth** indicator glows in red accompany with “Rover” voice message, 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 the instrument says power off), then GALAXY G7 will say “start to set work mode”, at this moment, release power button, the working mode will be repeated from Rover to Static on control panel. When the **Data** indicator glows in red accompany with “Base” voice message, 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 the instrument says power off), then G7 will say “start to set work mode”, at this moment, release power button, the working mode will be repeated from Rover to Static on control panel. When the **Satellite** indicator glows in red accompany with “Static” voice message, press the power button to confirm.



After that, press the power button for once to make sure if the working mode is correctly setup.

§3.5 Self-check

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

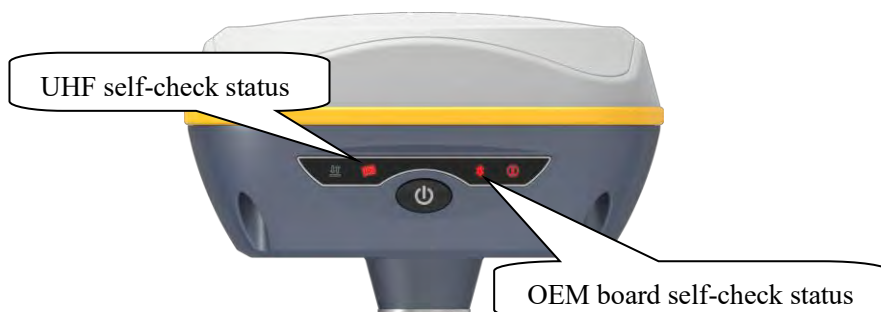
Press and hold the power button for about 10 seconds and pass over the state of power off and mode selection (do not release the button even the instrument says power off and start to set work mode), then G7 will say “start to self-check”, at this moment, release power button, the instrument will perform 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.



§3.6 USB mode setting

Press and hold the power button for about 15 seconds and pass over the foregoing states (power off, mode selection, self-check), G7 will get into USB mode setting with voice message saying “start to set USB mode”, at this moment, release power button, the instrument repeats “ USB disk” and “ USB network interface” for optional, choose the proper mode and press power button to confirm.



§ .7 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), GALAXY G7 will get into factory reset progress with voice message saying “start to restore factory default”, at this moment, release power button, all the indicators glows and the instrument is performing the factory reset automatically. After this progress complete, the instrument will restart automatically with the factory default settings.



Chapter IV Web UI Management

§4.1 Overview

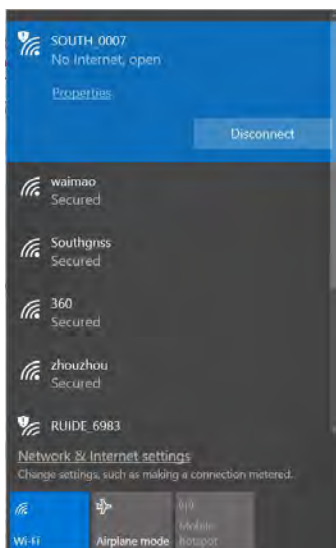
Because of using the smart embedded Linux operating system and SOUTH intelligent cloud technology, the web UI allows users to configure and monitor the status of G7 in real-time. The accessing way is not only by WiFi connection, but also can be USB mode.

§4.2 Access by WiFi

The WIFI hotspot is default broadcasted by G7, 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 GALAXY G7 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.





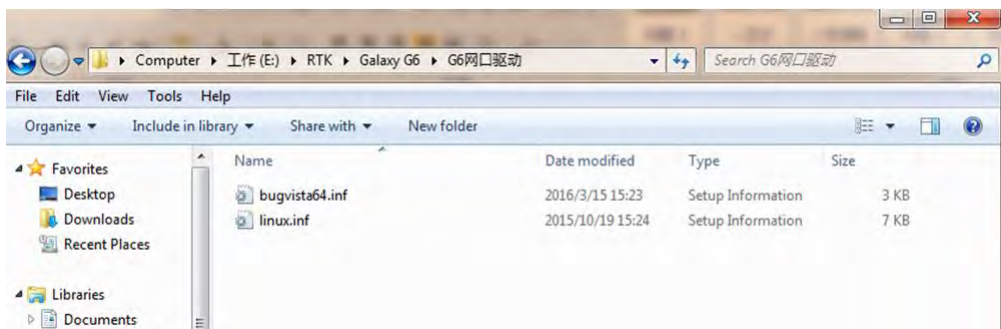
§4.3 Access by USB

On this mode, the 7-pins USB port of GALAXY G7 must work as an Ethernet port, then internal web UI shall be accessed via USB cable connection with computer.

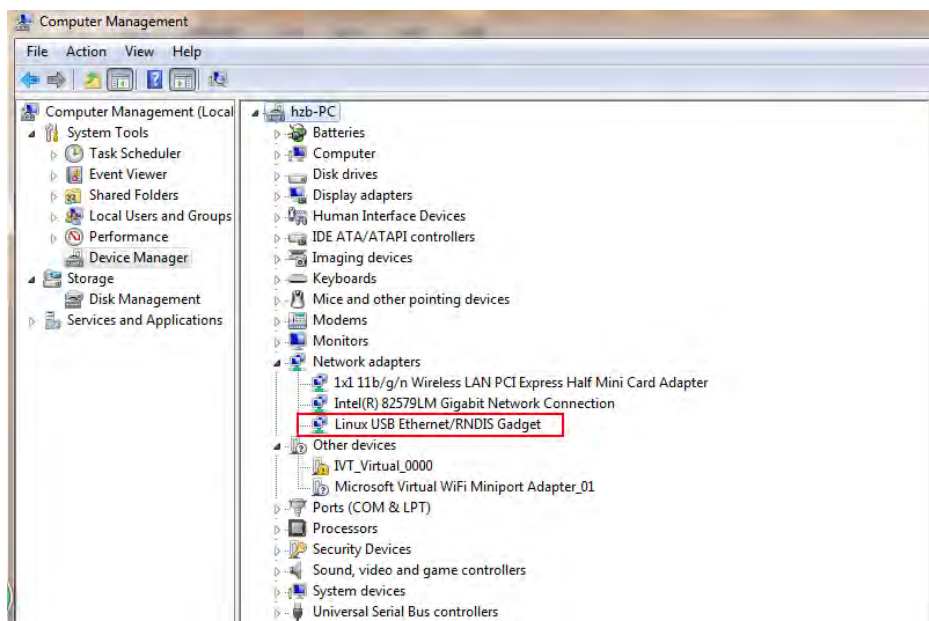
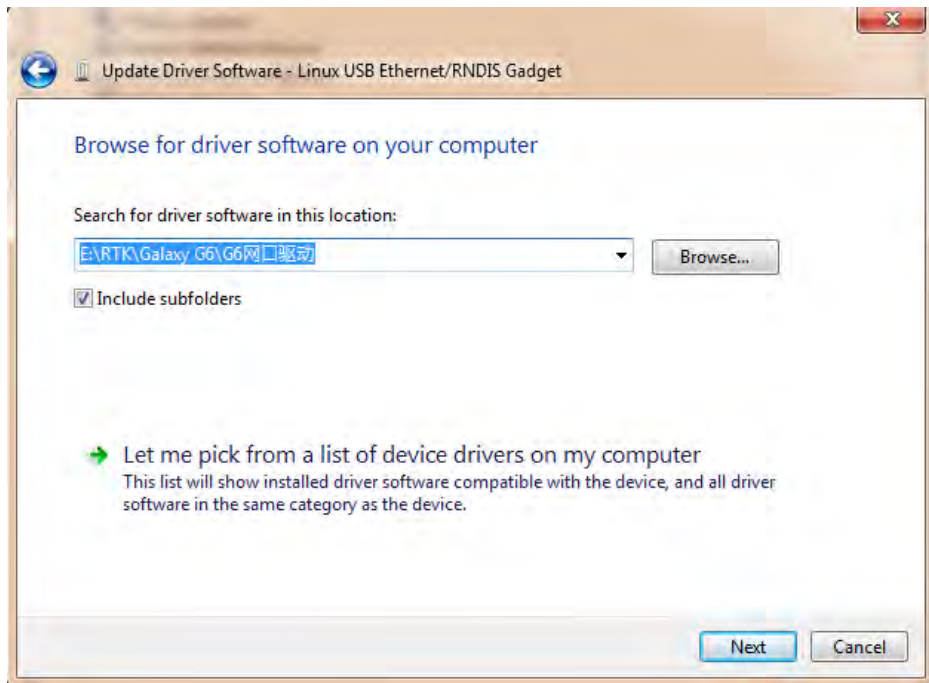
First of all, a corresponding driver is required to install to the computer, then this function could be activated.

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.

Make sure that the USB port is switched into USB network interface (please refer to section 3.5, USB mode setting).

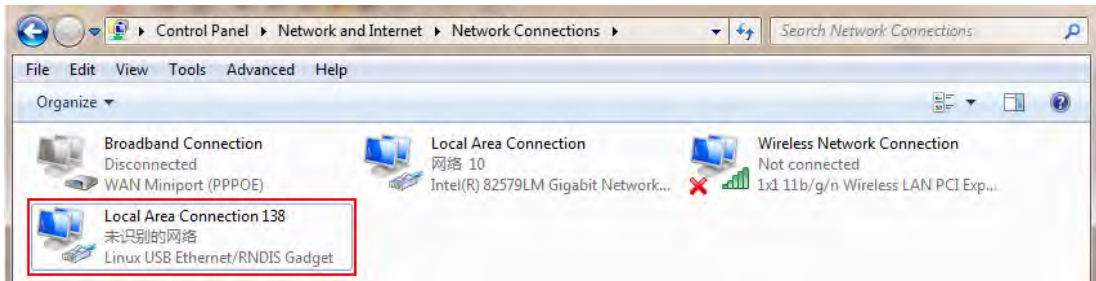


Choose the folder which contains the drivers



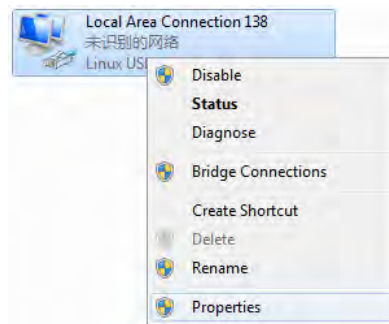
NOTE: The driver can be downloaded from official website automatically or please contact with us for more supports.

If the driver has been successfully installed, the USB port of GALAXY G7 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 G7 receiver to computer via USB network interface.

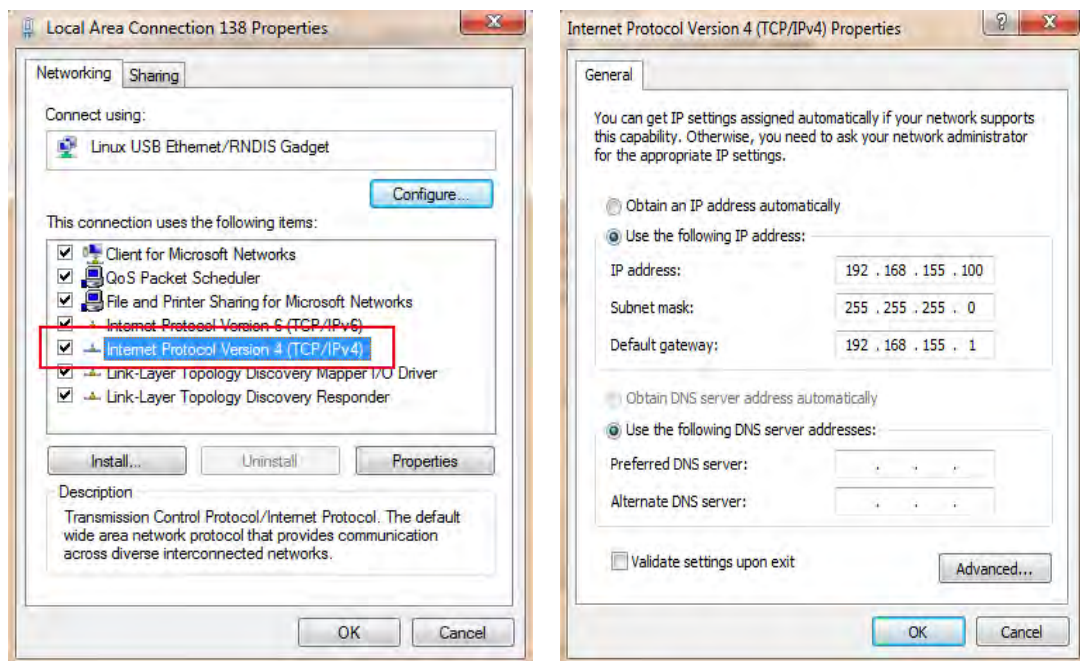


However, sometimes the computer cannot detect the receiver by USB network interface because there is something wrong with acquiring IP automatically, therefore, we need to do something to avoid such problem, that is to set a fixed LAN IP for the connection:

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.

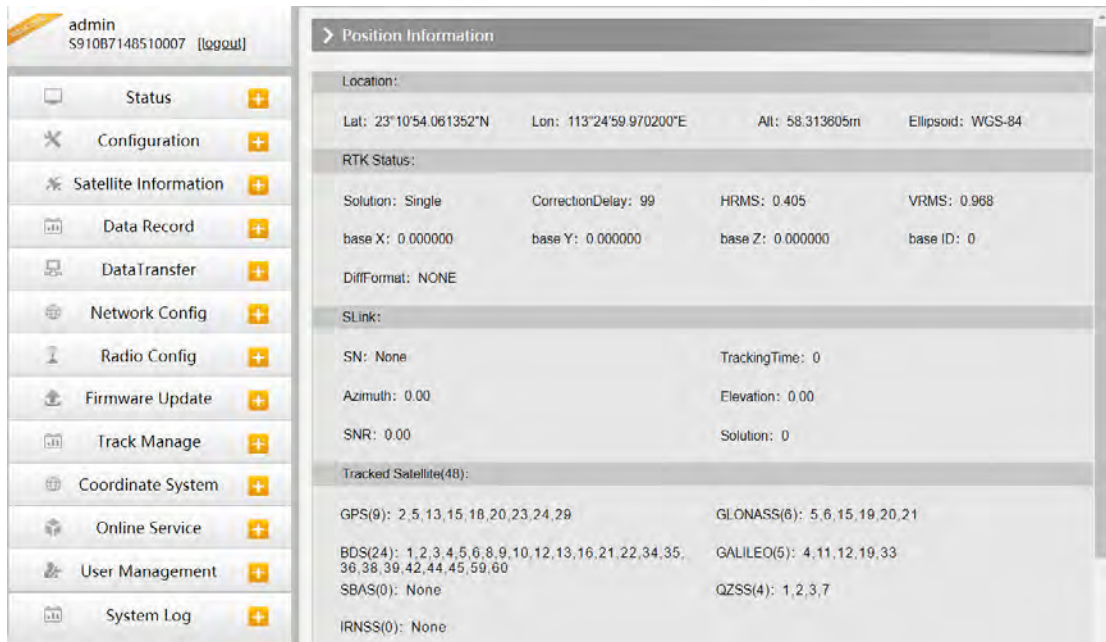


Run IE browser on computer and input the **default IP (192.168.155.155)** into address bar, after a while, the system login interface is refreshed, then apply **“admin”** for username and password to login.
















§4.4 Web UI main interface

After login the Web UI management of G7 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

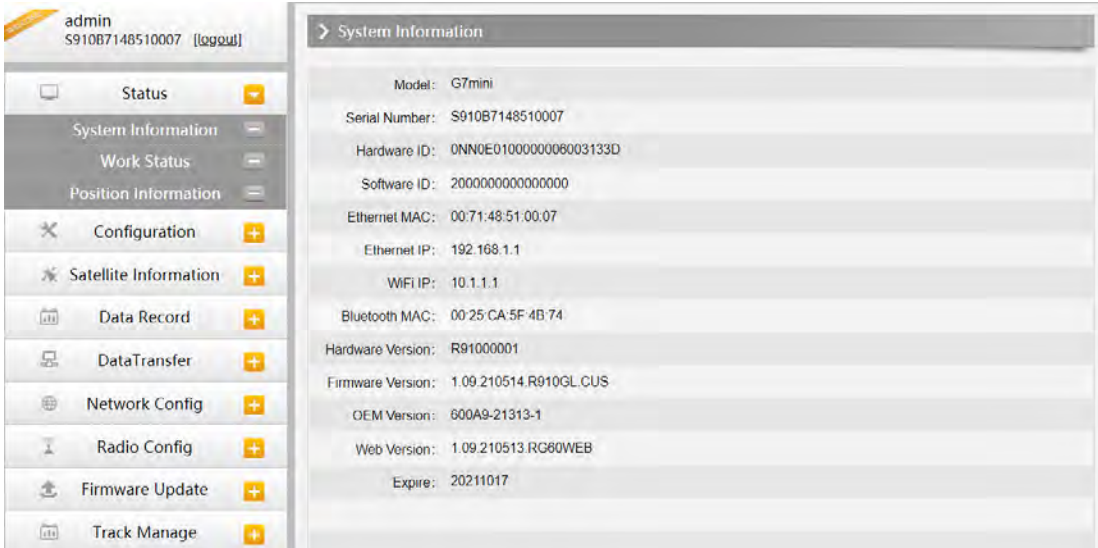
	Network Config	Contains network parameters configuration, WIFI configuration and the other functions
	Radio Config	Configure the parameters and frequency for radio modem
	Firmware Update	It is used to upgrade the firmware for receiver and each modem
	Track Manage	Record track file while doing measurement
	Coordinate System	Setup a local coordinate system forG7
	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 Status menu.

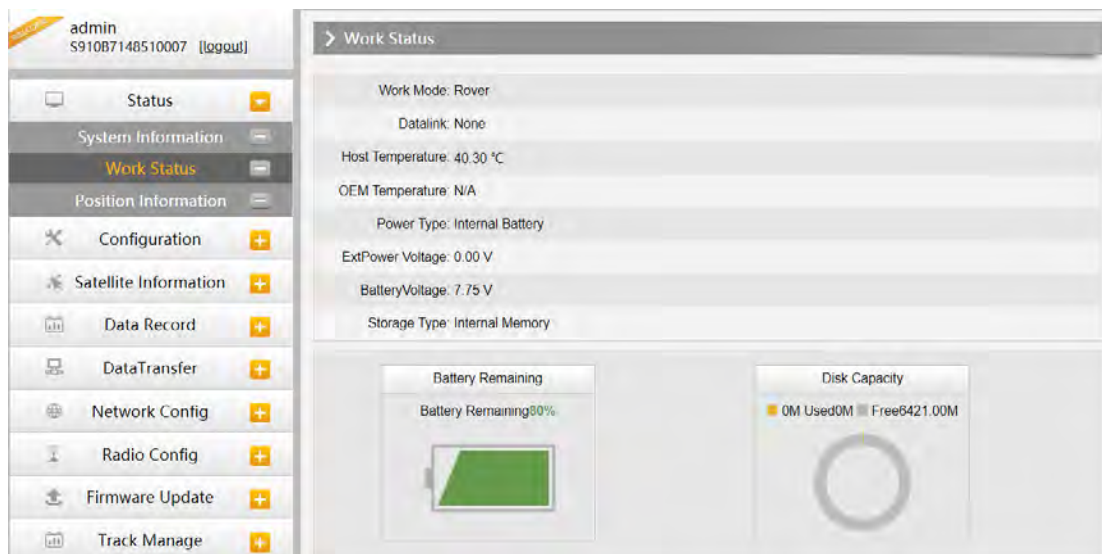
System Information

In this page, all the information of G7 is displayed such as serial number, hardware ID, MAC address, firmware version and so on.



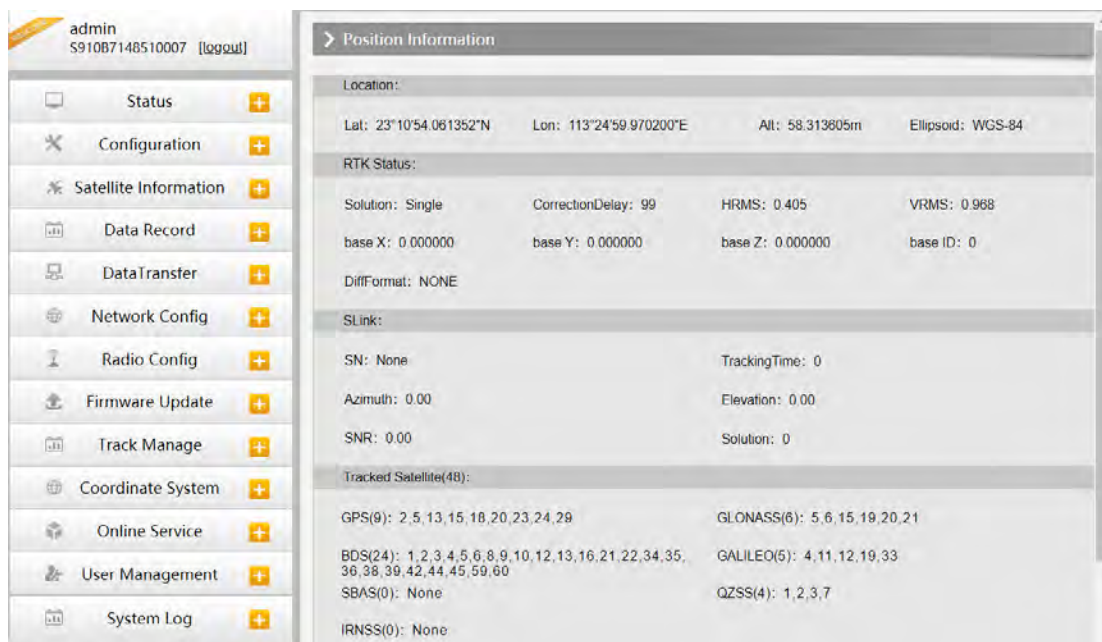
Work Status

The physical state of G7 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



§4.4.2 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 GALAXY G7 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 'General Configuration' web interface. On the left is a sidebar menu with options: Status, Configuration (selected), General Config (selected), Base Setup, Antenna Setup, Satellite Tracking, Receiver Operate, System Setup, Satellite Information, Data Record, Data Transfer, Network Config, Radio Config, Firmware Update, and Track Manage. The main content area is titled 'General Configuration' and contains two sections: 'Registration' and 'Mode setting'. The 'Registration' section includes fields for 'Serial Number' (S82667117186476), 'Code' (81BEC3B23329A67BB6500E421BFB8484317), 'ExpiredDate' (20161104), and 'OnlineRegistration' (OnlineRegi), with a 'Register' button. An 'OperationTips' message reads: 'Use Online Reig Function, please Make Sure Network is Work Well!'. The 'Mode setting' section includes dropdown menus for 'Work Mode' (Rover), 'Datalink' (Radio), and 'RadioRoute' (None), along with checkboxes for 'RadioTransfer', 'RTK Record', '1PPS', and 'EVENT', and an 'EVENT Polarity' dropdown set to 'Negative'.

If the code of GALAXY G7 has expired or is going to be run out, please provide the serial number of your G7 for us to apply for another available code, then input the code into the blank or register the receiver online.

Registration

Serial Number: S82667117186476

Code: 81BEC3B23329A67BB6500E421BFB8484317

ExpiredDate: 20161104

OnlineRegistration:

OperationTips: Use Online Reig Function, please Make Sure Network is Work Well!

G7 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 GALAXY G7.

Mode setting

Work Mode:

Datalink:

RadioRoute:

RadioTransfer: ☐

RTK Record: ☐

1PPS: ☐

EVENT: ☐

EVENT Polarity:

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 and CSD.

Radio

None

Radio

Network

External

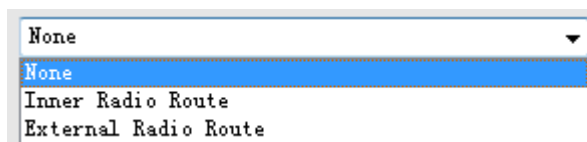
Dual

Blue Tooth

WIFI

CSD

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.



RadioTransfer: This is the function that GALAXY G7 is able to transfer the correction from Base station to the other rovers with the internal UHF, definitely, GALAXY G7 can work as a radio repeater.

A screenshot of the 'Mode setting' dialog box. It contains several configuration options: 'Work Mode' set to 'Rover', 'Datalink' set to 'Radio', 'RadioRoute' set to 'None', 'RadioTransfer' (checkbox, highlighted with a red box), 'RTK Record' (checkbox), '1PPS' (checkbox), 'EVENT' (checkbox), and 'EVENT Polarity' set to 'Negative'. At the bottom are 'Enter' and 'Cancel' buttons.

Operation:

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



Mode setting

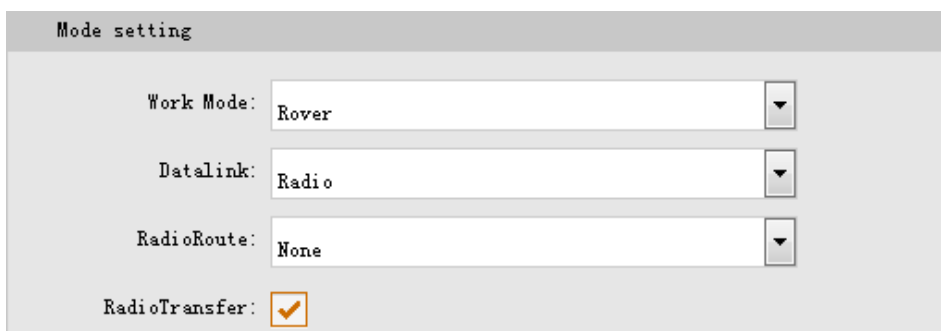
Work Mode: Base

Datalink: Radio

RadioRoute: None

RadioTransfer: ☒

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

RadioRoute: None

RadioTransfer: ☒

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

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

EVENT: This option is for the EVENT marker input

EVENT Polarity: EVENT input method.

Base Setup

When GALAXY G7 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.

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

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.

admin
SG11A6132348104 [logout]

Status +

Configuration -

General Config -

Base Setup -

Antenna Setup -

Satellite Tracking -

Receiver Operation -

System Setup -

Receiver Security -

Satellite +

Data Record +

Data Transfer +

Antenna NO#: SG11A6132348104

RINEX: HX-CSX049A

Antenna Height: 1.800 m

MeasuringMethod: Carrier Phase Center

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.

Measuring Method: Carrier phase center

- Carrier phase center
- Slant height
- Antenna Edge
- Height tape
- 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

admin
S82667117188476 [logout]

Status +

Configuration -

General Config -

Base Setup -

Antenna Setup -

Satellite Tracking -

Receiver Operate -

System Setup -

Satellite Information +

Data Record +

Data Transfer +

Network Config +

Radio Config +

Firmware Update +

Track Manage +

Satellite Tracking

Mask Angle: 10 degree

Type	Signal	
GPS	L1-C/A	<input checked="" type="checkbox"/>
GPS	L1-P	<input checked="" type="checkbox"/>
GPS	L2-C/A	<input checked="" type="checkbox"/>
GPS	L2-P	<input checked="" type="checkbox"/>
GPS	L5	<input checked="" type="checkbox"/>
GLONASS	L1-C/A	<input checked="" type="checkbox"/>
GLONASS	L1-P	<input checked="" type="checkbox"/>
GLONASS	L2-C/A	<input checked="" type="checkbox"/>
GLONASS	L2-P	<input checked="" type="checkbox"/>
GLONASS	L3	<input checked="" type="checkbox"/>
BDS	B1	<input checked="" type="checkbox"/>
BDS	B2	<input checked="" type="checkbox"/>
BDS	B3	<input checked="" type="checkbox"/>

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.

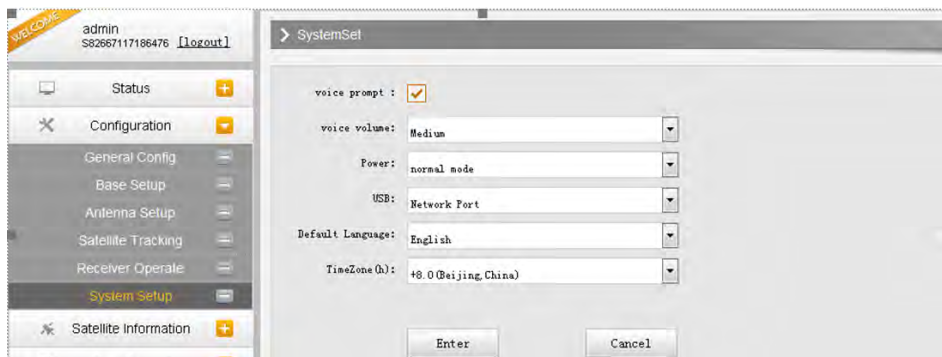
Factory Default: Click this button to bring the receiver back to factory default setting.

Reboot: Click this button to restart the receiver.

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

System Setup

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



Voice Prompt: Check on this box to turn on the voice guide for GALAXY G7, uncheck it to turn off the voice guide.

Voice Volume: Define the voice volume for GALAXY G7's speaker.

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

USB: This is used to configure GALAXY G7 what kind of USB mode output from 7-pin port when connect the receiver with computer via USB cable. USB and network port for optional.

Default Language: Configure the default language for GALAXY G7 which associates with voice guid.

Note: This is not the language setup for web UI, the Web UI only supports Chinese and English.

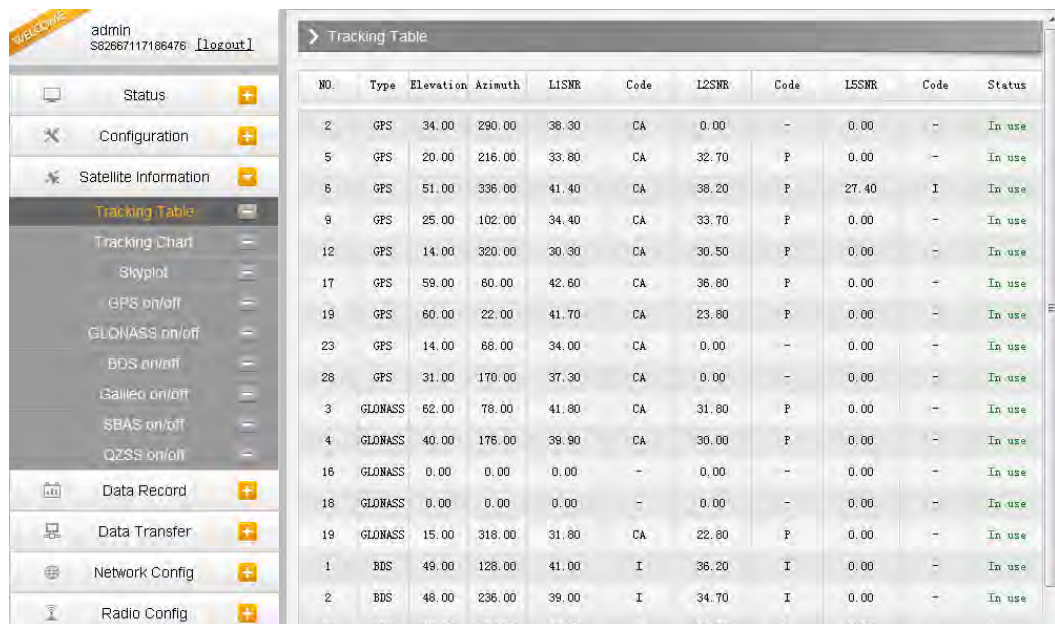
TimeZone(h): Use this to setup the corresponding time zone for your country or area.

§4.4.3 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

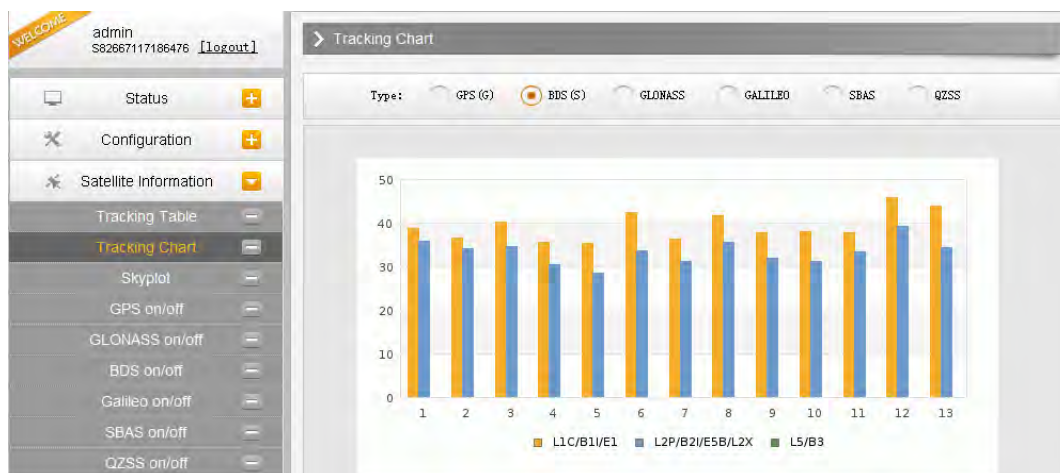
Here is the table to list all current used satellites and the other information for these satellites.



NO.	Type	Elevation	Azimuth	L1SNR	Code	L2SNR	Code	L5SNR	Code	Status
2	GPS	34.00	290.00	38.30	CA	0.00	-	0.00	-	In use
5	GPS	20.00	216.00	33.80	CA	32.70	P	0.00	-	In use
6	GPS	51.00	336.00	41.40	CA	38.20	P	27.40	I	In use
9	GPS	25.00	102.00	34.40	CA	33.70	P	0.00	-	In use
12	GPS	14.00	320.00	30.30	CA	30.50	P	0.00	-	In use
17	GPS	59.00	60.00	42.60	CA	36.80	P	0.00	-	In use
19	GPS	60.00	22.00	41.70	CA	23.80	P	0.00	-	In use
23	GPS	14.00	68.00	34.00	CA	0.00	-	0.00	-	In use
28	GPS	31.00	170.00	37.30	CA	0.00	-	0.00	-	In use
3	GLONASS	62.00	78.00	41.80	CA	31.80	P	0.00	-	In use
4	GLONASS	40.00	176.00	39.90	CA	30.00	P	0.00	-	In use
16	GLONASS	0.00	0.00	0.00	-	0.00	-	0.00	-	In use
18	GLONASS	0.00	0.00	0.00	-	0.00	-	0.00	-	In use
19	GLONASS	15.00	318.00	31.80	CA	22.80	P	0.00	-	In use
1	BDS	49.00	128.00	41.00	I	36.20	I	0.00	-	In use
2	BDS	48.00	236.00	39.00	I	34.70	I	0.00	-	In use
3	BDS	63.00	188.00	42.50	I	34.80	I	0.00	-	In use

Tracking Chart

In this page, the histogram will indicate the signals from those used satellites, and allow to check each constellation separately.



Skyplot

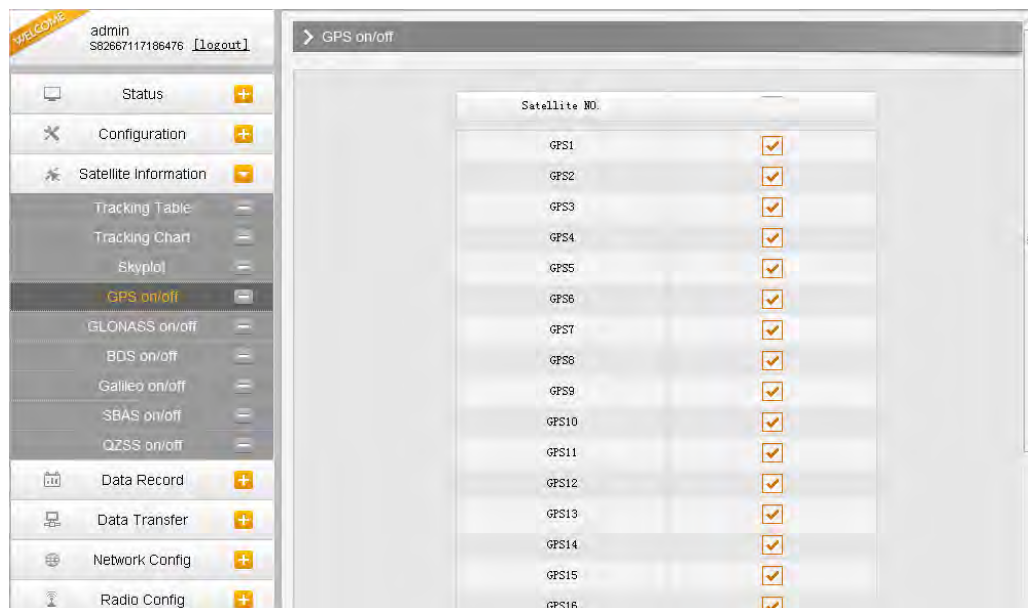
In this page, all the tracking satellites are shown on the skypolt, this let users intuitively view and know where the current position of satellite is.



GPS on/off

For all the running GNSS constellations or the augmentation system, GALAXY G7 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.

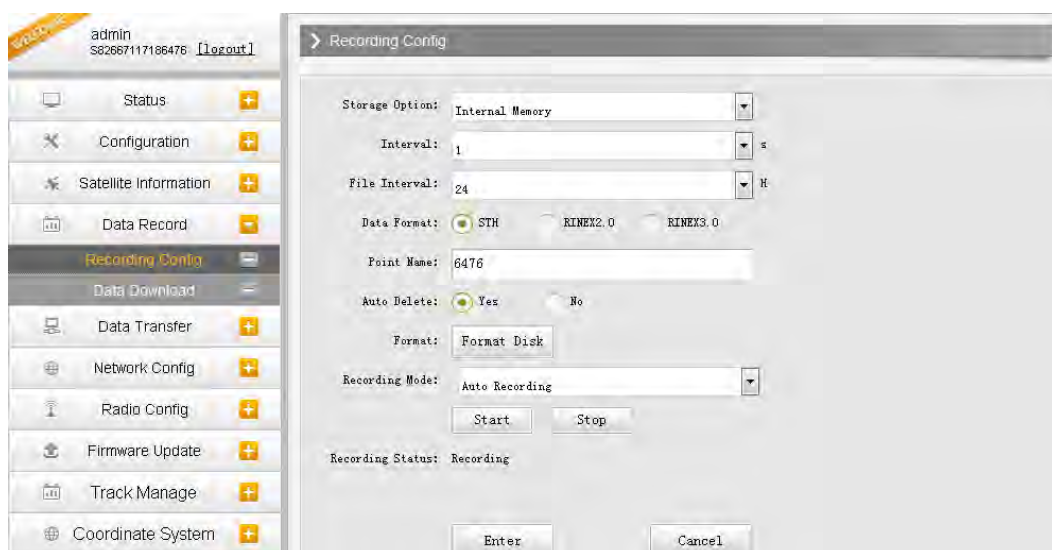


§4.4.4 Data Record

The “Data Record” performance is mainly used to configure all the parameters for receiver in static mode. Much more operations can be done on GALAXY G7 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 G7.

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

Data Format: Here are 3 options to selected for GALAXY G7 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 GALAXY G7 to delete the previous data files automatically if the memory is full.

Format: Click this button to format the internal memory for GALAXY G7.

Recording Mode: Here are 2 options to configure GALAXY G7 to record raw data automatically or not if it achieves the sampling conditions.

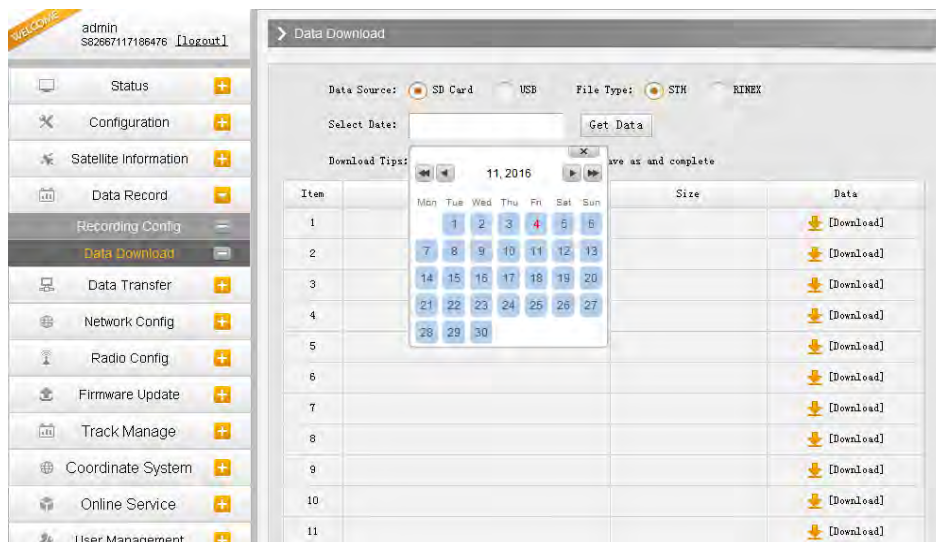
Start/Stop: Click these buttons to start recording or stop recording the raw data.

Recording Status: Here shows the status 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.

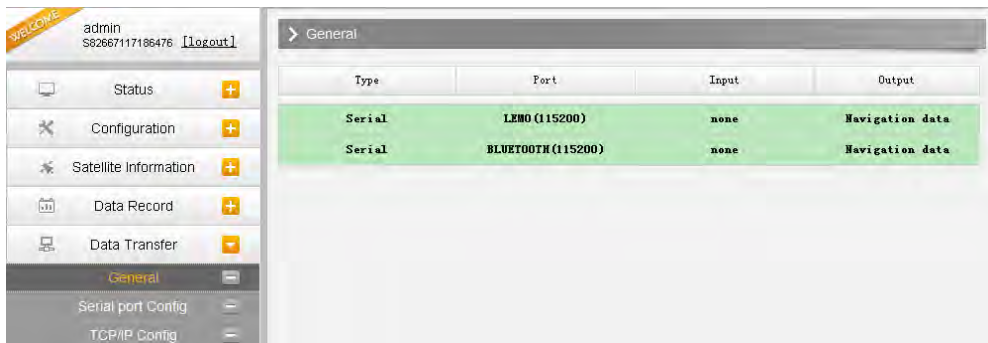


§4.4.5 Data Transfer

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	Port	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	<input checked="" type="checkbox"/>
3	BLUETOOTH	115200	None	Navigation Data	<input checked="" type="checkbox"/>

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.

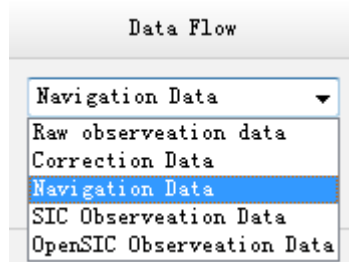
Correction Data: This is the correction data straight from OEM board.

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.

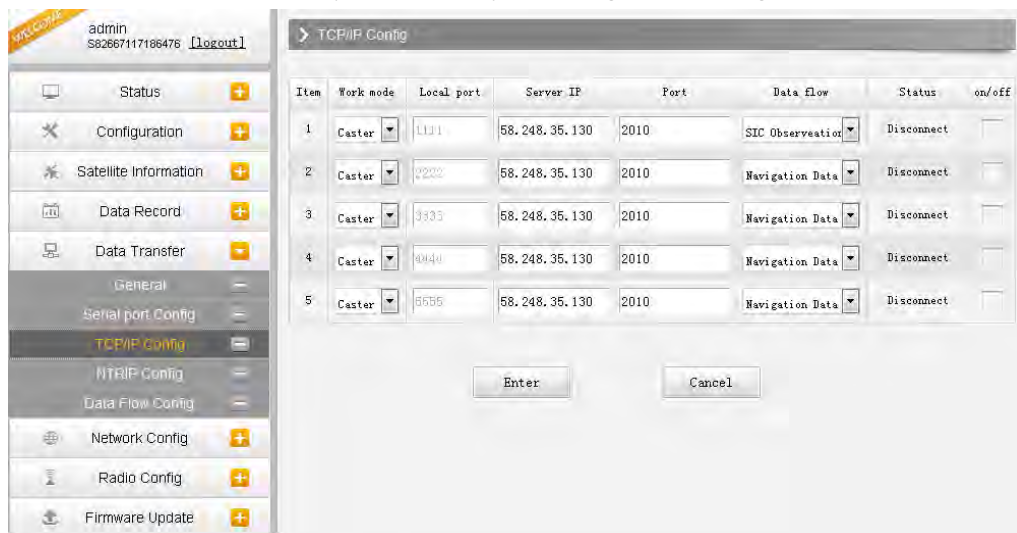


TCP/IP Config

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, GALAXY G7 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: GALAXY G7 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 G7 through the IP from receiver.



NTRIP Config

This is used to configure the NTRIP performance while receiver is going to connect to internet. GALAXY G7 supports complete NTRIP performance including NTRIP Client, NTRIP Server and NTRIP Caster.

The screenshot displays the 'NTRIP Config' window. On the left sidebar, the 'NTRIP Config' option is selected. The main area is divided into two sections: 'NtripClient' and 'NtripServer'.

NtripClient Configuration:

- Status: Disconnect
- Active: ☒
- Authentication Mode: ☐ Eagle Mode ☐ TCP/IP Mode ☐ LARK Mode
- NtripClient Address: 58.248.35.130
- NtripClient Port: 2010
- User: wmbgps
- Password: huli
- Mountpoint: RTCM30
- GetPoint Status: No Action

NtripServer Configuration:

- Status: Disconnect
- Active: ☐
- Ntrip Version: NTRIPv1.0
- Authentication Mode: ☐ Eagle Mode ☐ LARK Mode

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

The screenshot displays the 'Data Flow Config' window. On the left sidebar, the 'Data Flow Config' option is selected. The main area is divided into three sections: 'Navigation Data', 'SIC Navigation Data', and 'Raw Observation Data'.

Navigation Data:

- GGA: 1 GSA: 1 GSV: 5 GST: 1
- ZDA: 1 BPQ: 10 PJK: OFF GLI: OFF
- RMC: OFF VTG: OFF

SIC Navigation Data:

- PST: 1 GSI: 10 BSI: 5 TPI: OFF
- VCY: OFF STA: OFF DEV: OFF AAT: WhenChanged
- REC: OFF DAL: WhenChanged

Raw Observation Data:

- Output Interval: 1 s
- GPS Ephemeris: WhenChanged
- GLDRASS Ephemeris: WhenChanged
- BDS Ephemeris: WhenChanged
- GALLILEO Ephemeris: WhenChanged
- Ionosphere: ☒ Yes ☐ No

§4.4.6 Network Config

WIFI Config

This is mainly used on the WIFI configuration for GALAXY G7, there are AP mode and Client mode for optional.

AP: This is used to enable the WIFI hotspot for GALAXY G7 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 GALAXY G7, and define the SSID, password, encryption method and broadcasting channel for WIFI connection.

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

Client:

This option enables GALAXY G7 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.

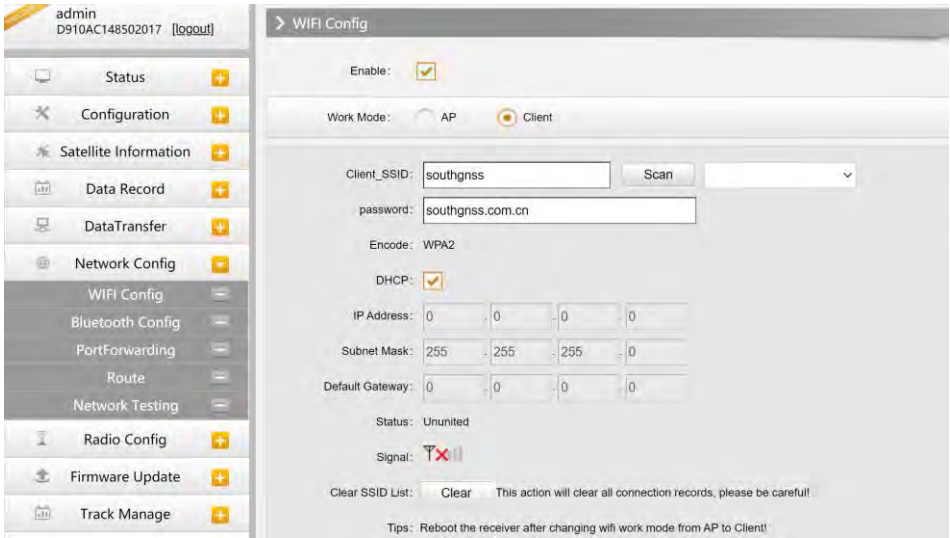
Client_SSID: This is the WIFI hotspot which GALAXY G7 is going to connect

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

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

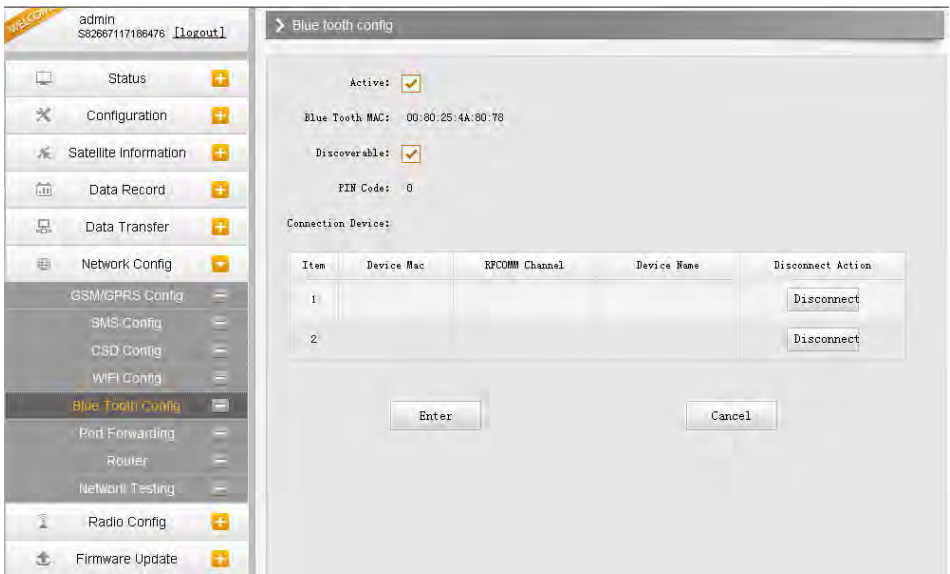
IP fields: If GALAXY G7 successfully connects to the WIFI, there will be an LAN IP address generated by GALAXY G7.

ClearSSID: Click this button to clear the SSID list.



Bluetooth Config

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



Port Forwarding

This page is mainly used to view and configure the internet transmission port for GALAXY G7, customize and debug receiver.



The screenshot shows the 'Port Forwarding' configuration page. On the left is a sidebar menu with options: Status, Configuration, Satellite Information, Data Record, Data Transfer, Network Config, GSM/GPRS Config, SMS Config, CSD Config, WiFi Config, Blue Tooth Config, Port Forwarding (selected), Router, and Network Testing. The main content area is titled 'Port Forwarding' and contains three input fields: 'HTTP Port:' with value 80, 'FTP Port:' with value 21, and 'TELNET Port:' with value 23. Below these fields 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.

Router

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 'Router' configuration page. The sidebar menu is identical to the previous page, with 'Router' selected. The main content area is titled 'Router' and contains a table with the following data:

Destination	Gateway	Mask	Sign	Interface
192.168.155.0	0.0.0.0	0.0.0.0	U	usb0

Below the table, there is a section 'Change the default route:' with a dropdown menu set to 'PPPOE' and an 'Enter' button. A 'Refresh' button is also present. At the bottom, there is an 'Add Route' section with input fields for 'Destination:', 'Gateway:', 'Mask:', and 'Interface:' (set to 'PPPOE'), along with an 'Enter' button.



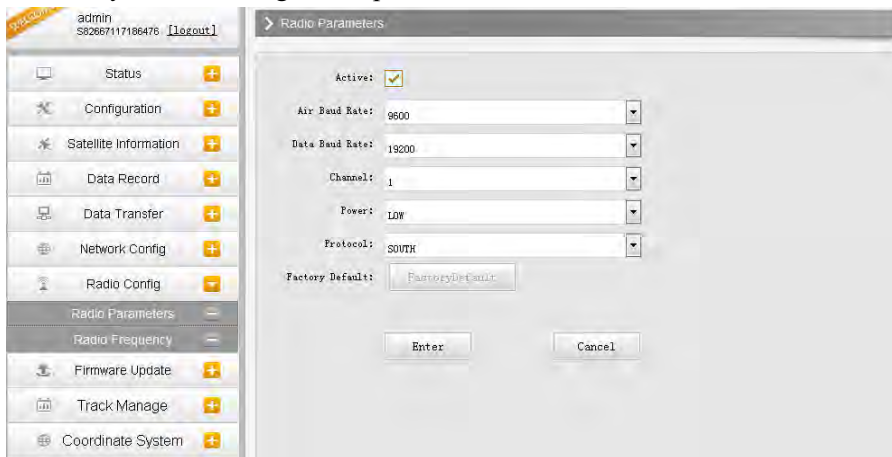
NOTE: Usually we will keep the default setting in this page, if you would like to modify it, please contact with SOUTH technician for more supports.

§4.4.7 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 GALAXY G7.



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.

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.

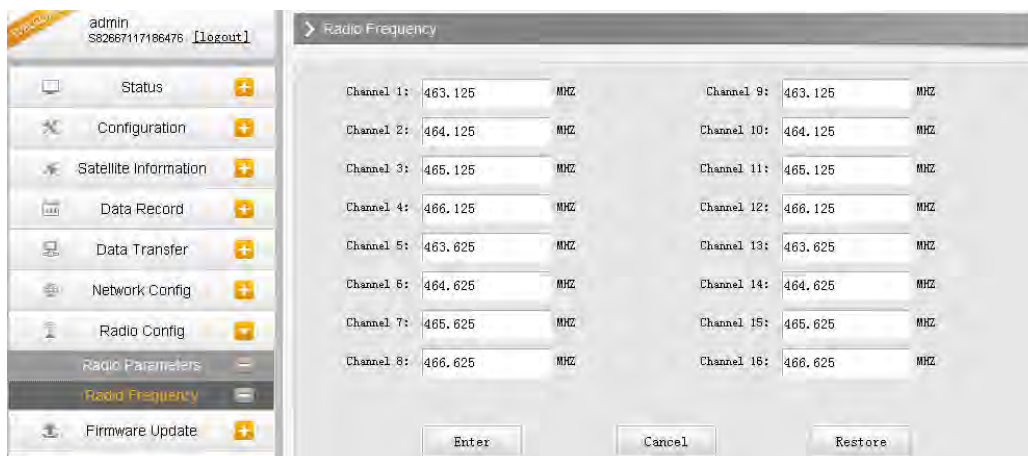
Protocol: This is radio communication protocol for data transmission, SOUTH (SOUTH) , Farlink and TRIMTALK are optional in this page and SOUTH is the default setting, if it is changed, Base and Rover must use the same protocol for communication.

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

Radio Frequency

For GALAXY G7, 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.

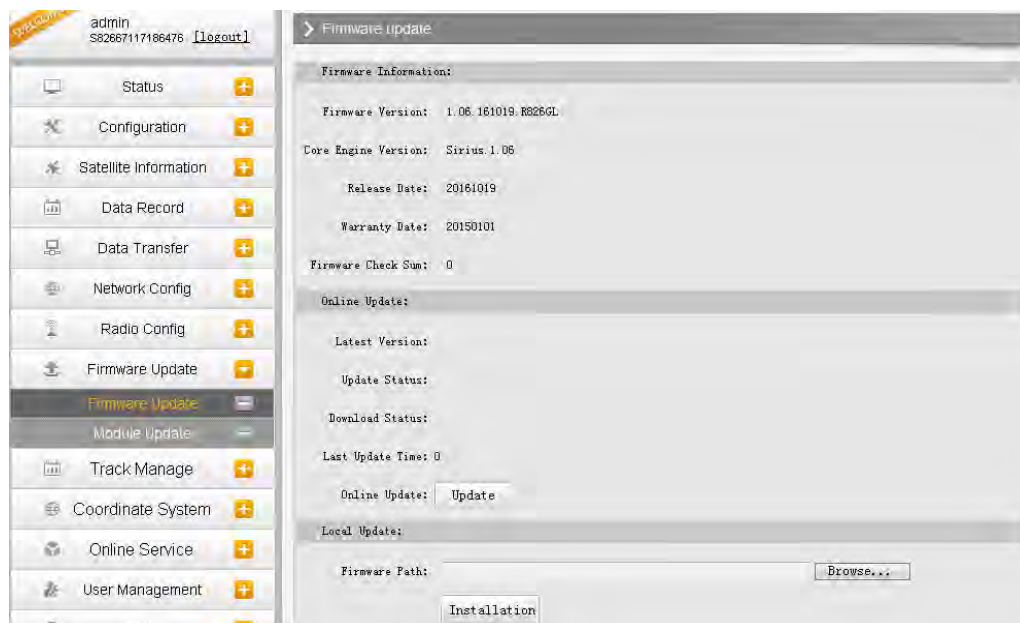


§4.4.8 Firmware Update

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 GALAXY G7, and allows to update the latest version firmware for receiver. To get latest version firmware please contact with SOUTH technician.

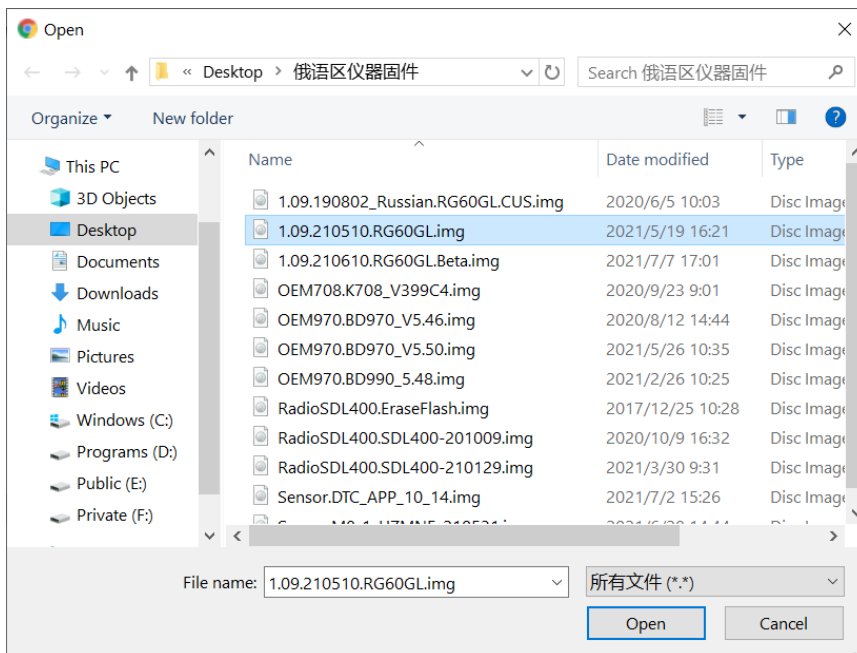


Online Update: GALAXY G7 supports to update the firmware online anytime if there is something update or optimized.

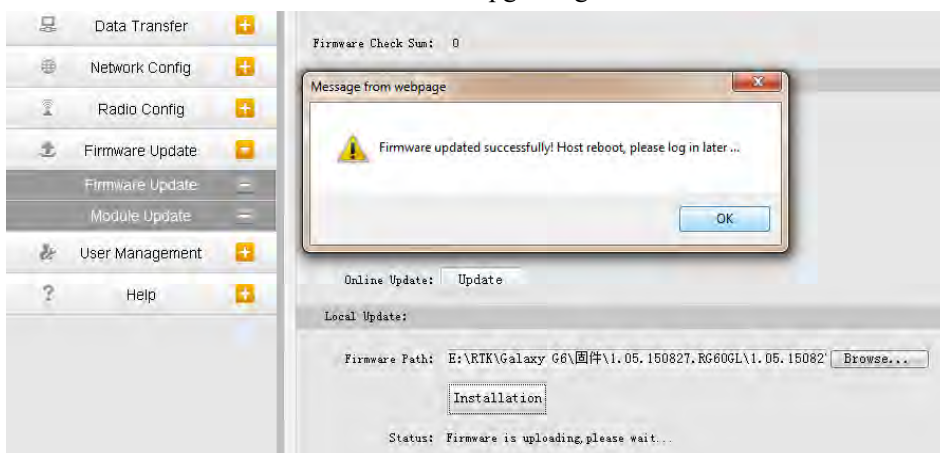
Local Update: Update the latest firmware by using a firmware file.

How to upgrade the firmware with Local Update

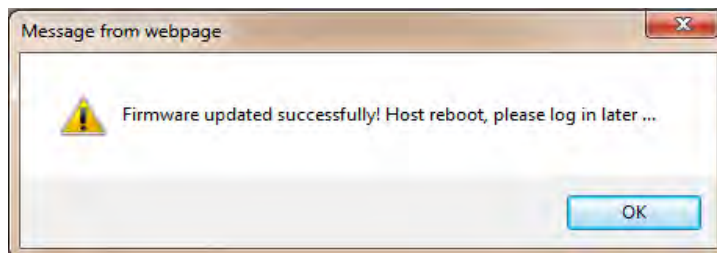
- Click on “Browse” button to load firmware file (Please take in mind that the firmware is ended with .img as the extension name).



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



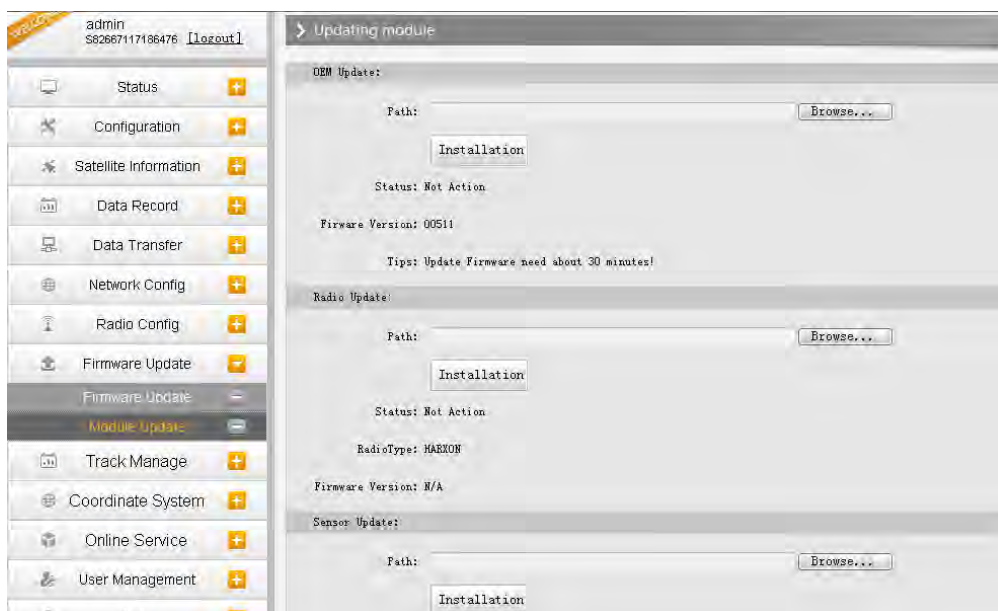
- After the firmware is completed upgrading, a dialog will appear saying “Firmware updated successfully! Host reboot, please log in later...”, then the receiver will restart automatically.



SPECIAL REMIND: GALAXY G7 doesn't support to update the firmware with the help of INstar program any more, in the future, update the firmware for GALAXY G7 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.



§4.4.9 Track Manage

G7 now supports to record the track while doing measurement, and upload the data onto the server.

Parameter Setting

admin
582687117186476 [Logout]

Status +

Configuration +

Satellite Information +

Data Record +

Data Transfer +

Network Config +

Radio Config +

Firmware Update +

Track Manage +

Parameter Setting

Data Download -

Coordinate System +

Online Service +

User Management +

Parameter Setting

Record Setting

RecordEnable: ☐

RecordInterval: 0.5 second

RecordStatus: No record

EchoEnable Setting

Status: Disconnect

EchoEnable: ☐

EchoIP: 58.248.35.130

EchoPort: 2010

EchoUserName: USER

EchoPassword: OSWD

Enter Cancel

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”.

Record Setting

RecordEnable: ☐

RecordInterval: 0.5 second

RecordStatus: No record

EchoEnable Setting

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

EchoEnable Setting

Status: Disconnect

EchoEnable: ☐

EchoIP: 58.248.35.130

EchoPort: 2010

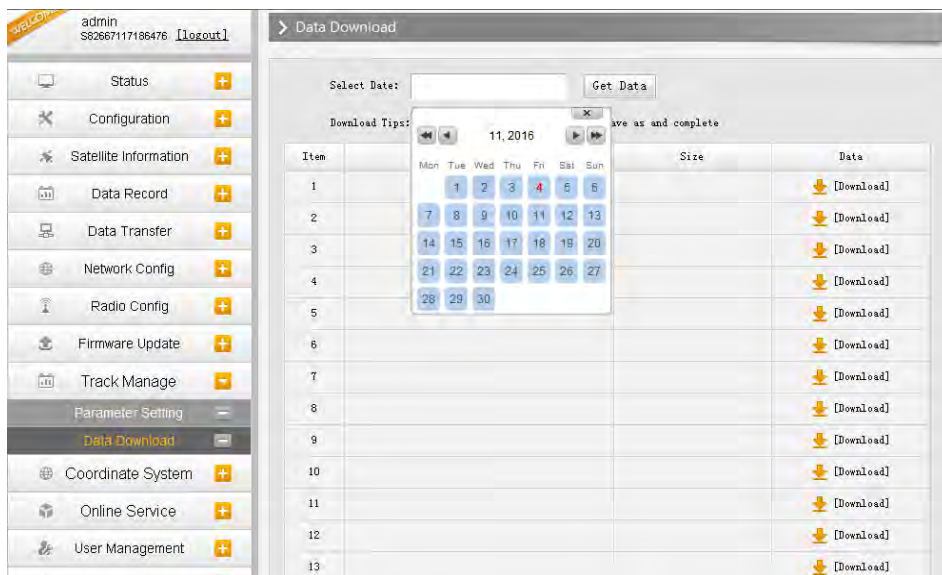
EchoUserName: USER

EchoPassword: OSWD

Enter Cancel

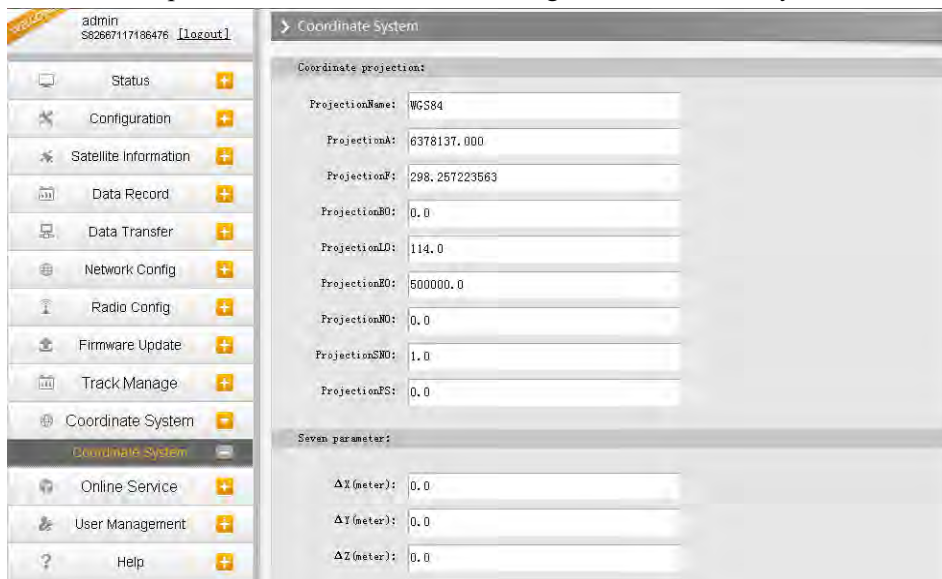
Data Download

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.



§4.4.10 Coordinate System(reserve)

G7 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.



§4.4.11 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.

The screenshot shows the 'Online Service' configuration page. On the left is a sidebar menu with options: Status, Configuration, Satellite Information, Data Record, Data Transfer, Network Config, Radio Config, Firmware Update, Track Manage, Coordinate System, Online Service (selected), User Management, and Help. The main content area is titled 'Online Service' and contains the following fields:

- Status: Disconnect
- Active: ☐
- Be controlled: ☐
- Anonymous Login: ☐
- Inactive In 2G Mode: ☐
- DataType: Navigation Data (dropdown menu)
- IP: 192.168.1.1
- Port: 6060
- UserName: UserName
- Password: Password

At the bottom of the form are 'Enter' and 'Cancel' buttons.

§4.4.12 User Management

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

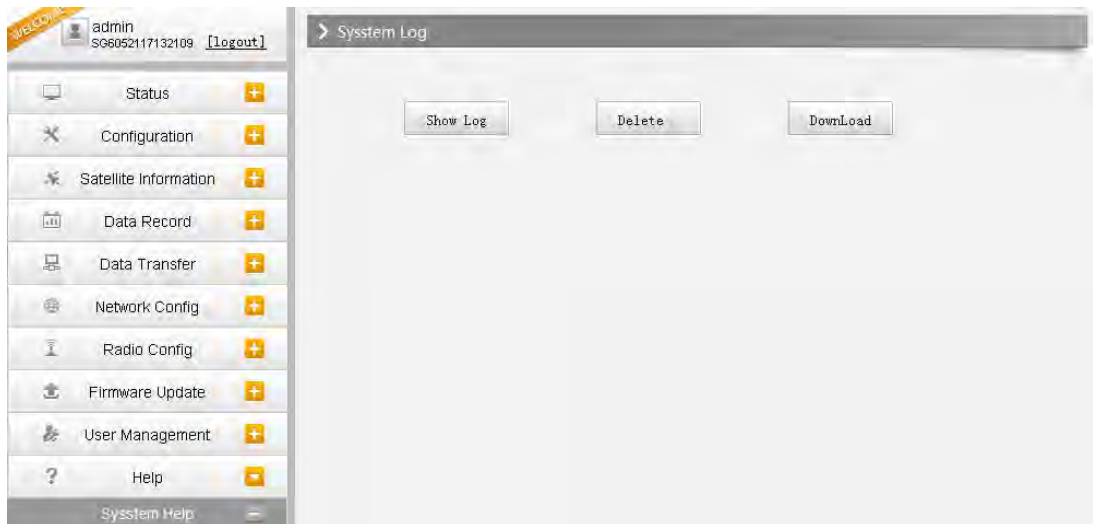
The screenshot shows the 'User Management' page. On the left is the same sidebar menu as in the previous screenshot, with 'User Management' selected. The main content area is titled 'User Management' and contains an 'Add user' button and a table of users.

Name	Limits of authority	Status	Operating	Operating
admin	Administrator	online	delete	edit

§4.4.13 Help

In this page, users can get help and check the 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.



Chapter V Accessories

§5.1 Instrument Case



The instrument case for GALAXY G7 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

Equipped with a rechargeable internal battery, it uses a 5-pins cable with PD adapter for the charging.



§5.3 Differential Antennas



UHF Antenna

The differential antennas are as shown above;

The UHF differential antenna is required to install to the interface at the bottom of receiver if GALAXY G7 is set up into internal UHF mode.

§5.4 Cables

7-pin cable

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

USB, connect to
computer



7-pin end, connect to
receiver

L7U50

Appendix A GALAXY G7 technical specifications

GNSS Features	
Channels	965
GPS	L1, L1C, L2C, L2P, L5
GLONASS	G1, G2, G3
BDS	BDS-2: B1I, B2I, B3I BDS-3: B1I, B3I, B1C, B2a, B2b*
GALILEO	E1, E5A, E5B, E6C, AltBOC*
SBAS	L1*
IRNSS	L5*
QZSS	L1, L2C, L5*
MSS L-Band*	Reserve
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 + 0.5 ppm RMS Vertical: 5 mm + 0.5 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 + 0.7 mm/° tilt down to 30°
IMU tilt angle	0° ~60°
Hardware performance	
Dimension	135mm(L)×135mm(W)×84.75mm(H)
Weight	970g (battery included)
Material	Magnesium aluminum alloy shell
Operating temperature	-25℃~+65℃
Storage temperature	-35℃~+80℃
Humidity	100% Non-condensing
Waterproof/Dustproof	IP67 standard, protected from long time immersion to depth of 1m
	IP67 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	Inbuilt 6800mAh rechargeable Lithium-ion battery
Battery life	Single battery: 15h (static mode)
	6h (internal UHF base mode)
	12h (rover mode+bluetooth)
Communications	
I/O Port	5-PIN LEMO interface (external power port + RS232)
	7-PIN USB interface (USB+OTG+Ethernet)
	1 UHF antenna interface
Internal UHF	1W Radio receiver and transmitter
Frequency range	410-470MHz
Communication protocol	Farlink, Trimtalk450s, SOUTH, SOUTH+, SOUTHx, HUACE, Hi-target, Satel
Communication range	Typically 8km with Farlink protocol
Bluetooth	Bluetooth 3.0/4.1 standard, Bluetooth 2.1 + EDR
NFC Communication	Realizing close range (shorter than 10cm) automatic pair between receiver and controller (controller requires NFC wireless communication module else)
WIFI	
Modem	802.11 b/g/n standard
WIFI hotspot	Receiver broadcasts its hotspot form web UI accessing with any mobile terminals
WIFI datalink	Receiver can transmit and receive correction data stream via WiFi datalink
Data Storage/Transmission	
Storage	8GB SSD internal storage
	Automatic cycle storage (The earliest data files will be removed automatically while the memory is not enough)
	Support external USB storage
	The customizable sample interval is up to 20Hz
Data Transmission	Plug and play mode of USB data transmission
	Supports FTP/HTTP data download
Data Format	Static data format: STH, Rinex2.01, Rinex3.02 and etc.
	Differential data format: CMR, SCMRx, 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, Trimble GSOE
	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 immune 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	Single button
Indicators	4 LED indicators
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	The intelligent voice technology provides status and operation voice guidance, supports Chinese/English/Korean/Spanish/Portuguese/Russian/Turkish
Secondary development	Provides secondary development package, and opens the OpenSIC observation data format and interaction interface definition
Cloud service	The powerful cloud platform provides online services like remote manage, firmware update, online register and etc.

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 1.023MHz, 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:
$$e = \frac{\sqrt{a^2 - b^2}}{a}$$
 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:
$$f = \frac{a - b}{a} = 1 - \sqrt{1 - e^2}$$

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.