

GALAXY G7Q

Technician Manual

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Chapter Ⅰ Preface

Read this chapter, you will have a brief knowledge of SOUTH Company and GALAXY G7Q 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 takes the new G7Q 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 G7Q is equipped with dual-mode Bluetooth v4.1 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 G7Q, 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 G7Q 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, G7Q 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 (4G 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.

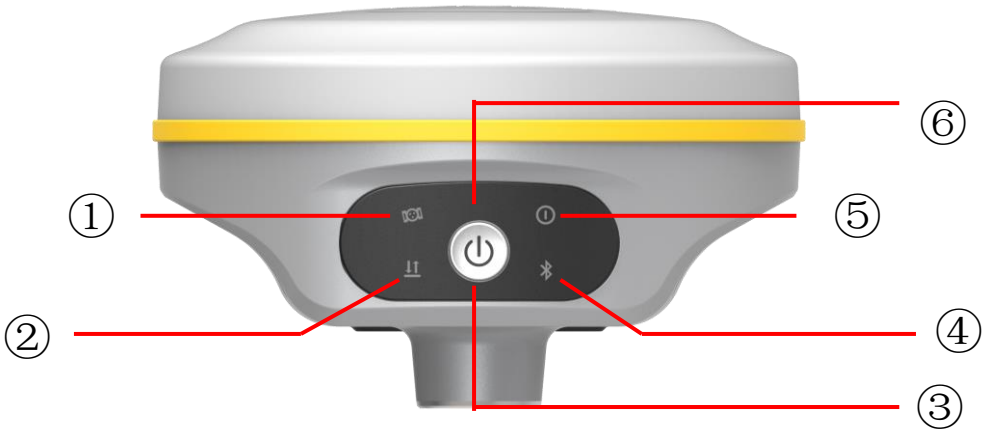
Chapter Ⅱ Hardware Component

Reading this chapter, you can grasp the components, installation and the function of GALAXY G7Q measuring system

The overall appearance of GALAXY G7Q is round and flat, with a dimension of 135mm(L)×135mm(W)×83mm(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.

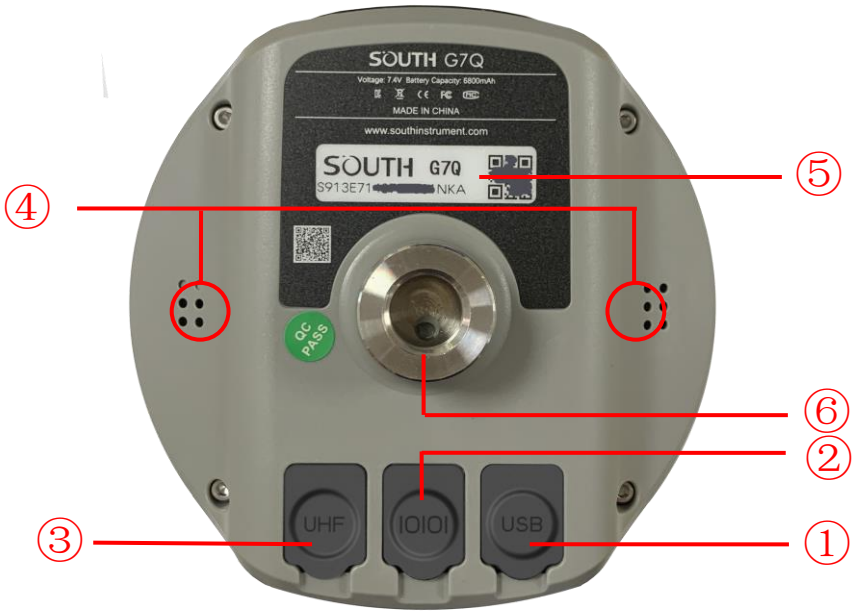


§2.1 Front Components



Ref	Component	Description
①	**Satellites Indicator**	Flashes in green to indicate that the satellites are tracking by 0.2s interval, repeat in 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 WiFi connection; 2)Client mode, flashes in green with the signal receiving/transmitting interval when successful connection. **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 Bluetooth connection has established between controller and receiver.
⑤	**Power Indicator**	Glows in red to indicate that there is enough power for working; Flashing in red means low power. When G7Q is turned off and charging, glows in blue. When G7Q is turned on and charging, glows in pink. Fully charged will glows in green.

§2.2 Bottom Components



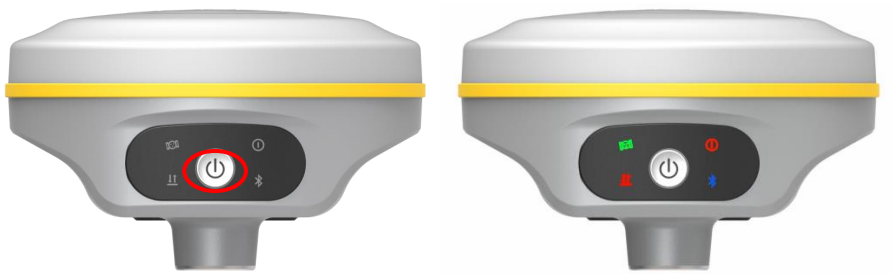
Ref	Component	Description
①	**USB**	1.Use Type-C interface, support access the WebUI interface and the static data transmission of the receiver at the same time. 2.Battery charging port.
②	**5-pin LEMO port**	1, As a power port connected with an external power supply device. 2, As a differential transmission 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.

ChapterⅢ Hardware Operation

§3.1 Power on/off

Power on

Press the power button, 4 indicators turn on for few seconds (around 10 seconds), the instrument completes initializing along with voice prompt about the working mode (for example, "Rover, internal radio mode"). After a while, instrument starts to track satellites.



Power off

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

§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

Use type-C port interface on G7Q, and plug the adapter to the power socket. If G7Q is turned off and charging, LED is blue. If G7Q is turned on and charging, LED in pink. Fully charged will be green.







§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 G7Q 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 blue 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 G7Q 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 G7Q 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 green 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.

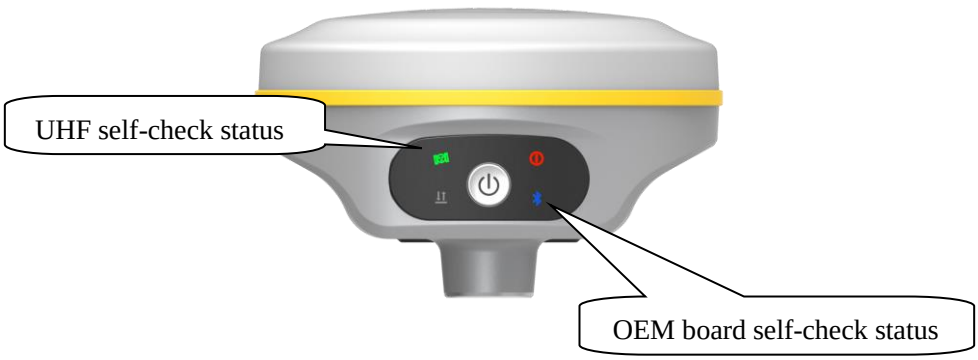
Press and hold the power button for about 10 seconds and pass over the state of power off and mode selection (do not release the button even the instrument says power off and start to set work mode), then G7Q will say “start to self-check”, at this moment, release power button, the

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

The new G7Q adopts the integrated mode of USB disk and network interface. After connecting to the computer through type-C interface, the user can access the WebUI interface and the internal storage of the receiver at the same time, without selecting USB mode. After making adjustment on the original basis, the operation is more simple and convenient.

§3.7 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 G7Q 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.



ChapterⅣ Web UI Management

§4.1 Overview

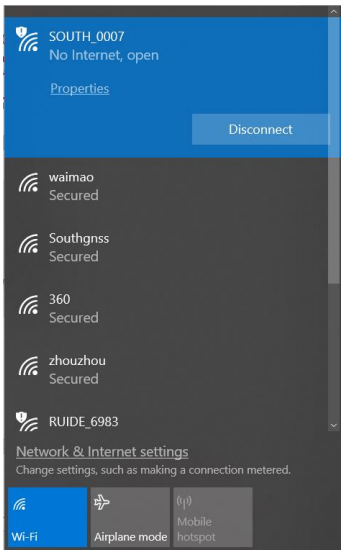
Because of using the smart embedded Linux operating system and SOUTH intelligent cloud technology, the web UI allows users to configure and monitor the status of G7Q in real-time. The accessing way is not only by WiFi connection, but also can be USB mode.

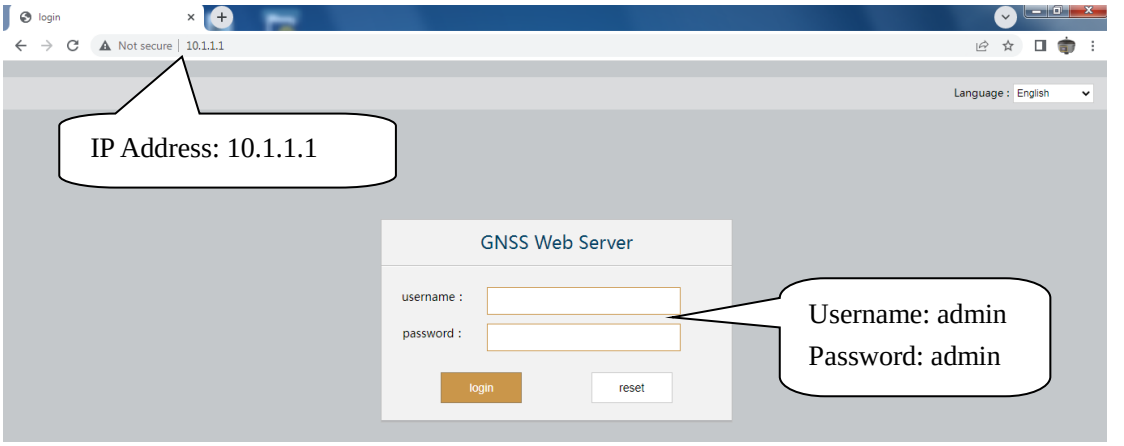
§4.2 Access by WiFi

The WIFI hotspot is default broadcasted by G7Q, search the WIFI hotspot which named with SOUTH_xxxx using smartphone, tablet or laptop, then establish the WIFI connection, input the **default IP (10.1.1.1)** into broswer, on the login interface, apply "admin" for the username and password.

For example, search the WIFI hotspot broadcasted by a GALAXY G7Q receiver using a laptop PC, choose the WIFI hotspot and click on connect button to establish the connection without password.

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



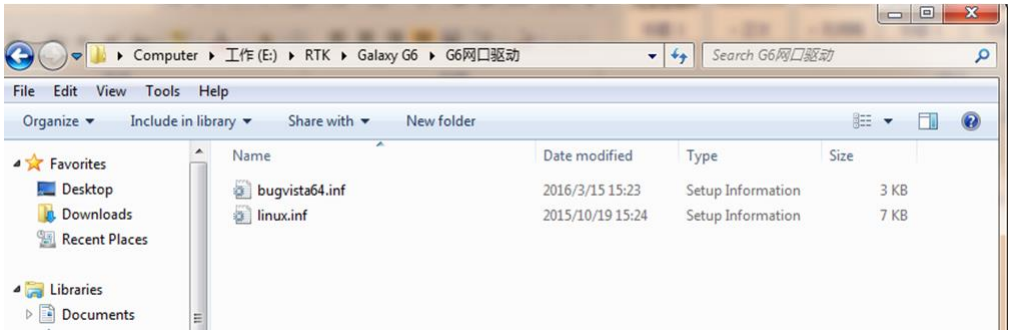


§4.3 Access by USB

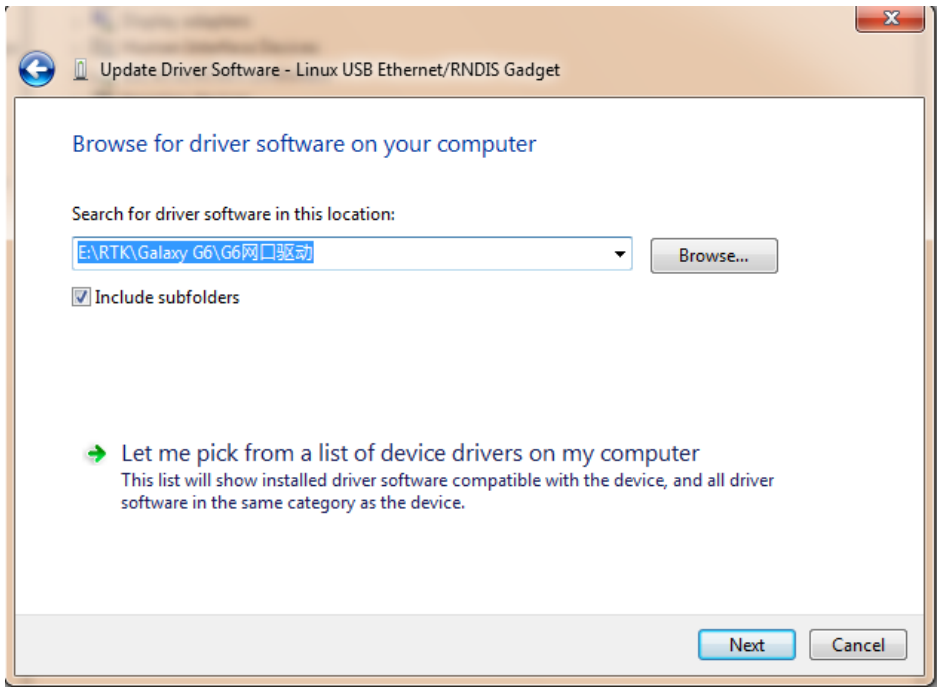
On this mode, the Type-C USB port of GALAXY G7Q must work as an Ethernet port, then internal web UI shall be accessed via USB cable connection with computer.

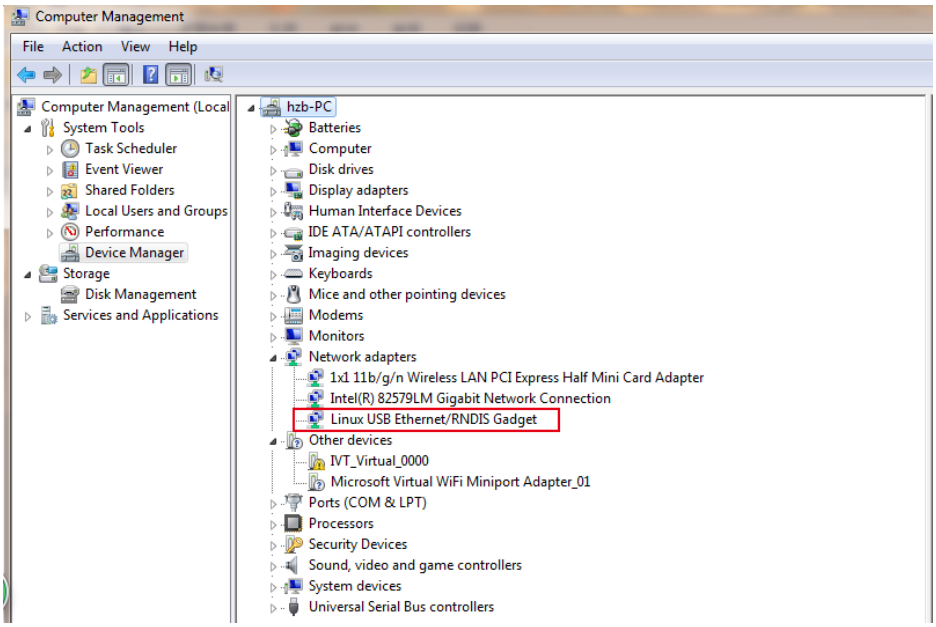
First of all, a corresponding driver is required to install to the computer, then this function could be activated.

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



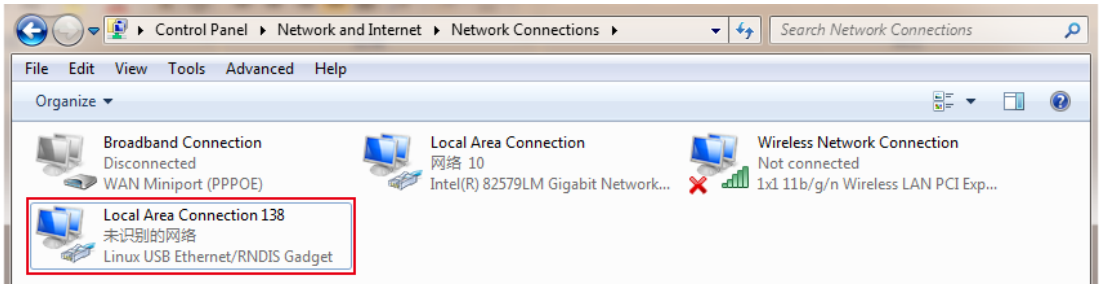
Choose the folder which contains the drivers





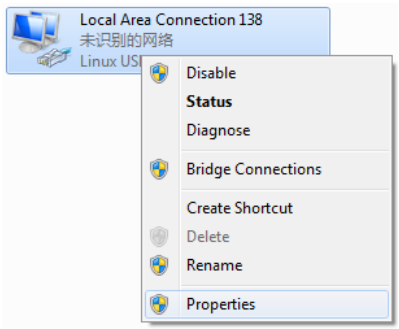
NOTE: *The driver can be downloaded from official website automatically or please contact with us for more supports.*

If the driver has been successfully installed, the USB port of GALAXY G7Q 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 connectingGALAXY G7Q receiver to computer via USB network interface.

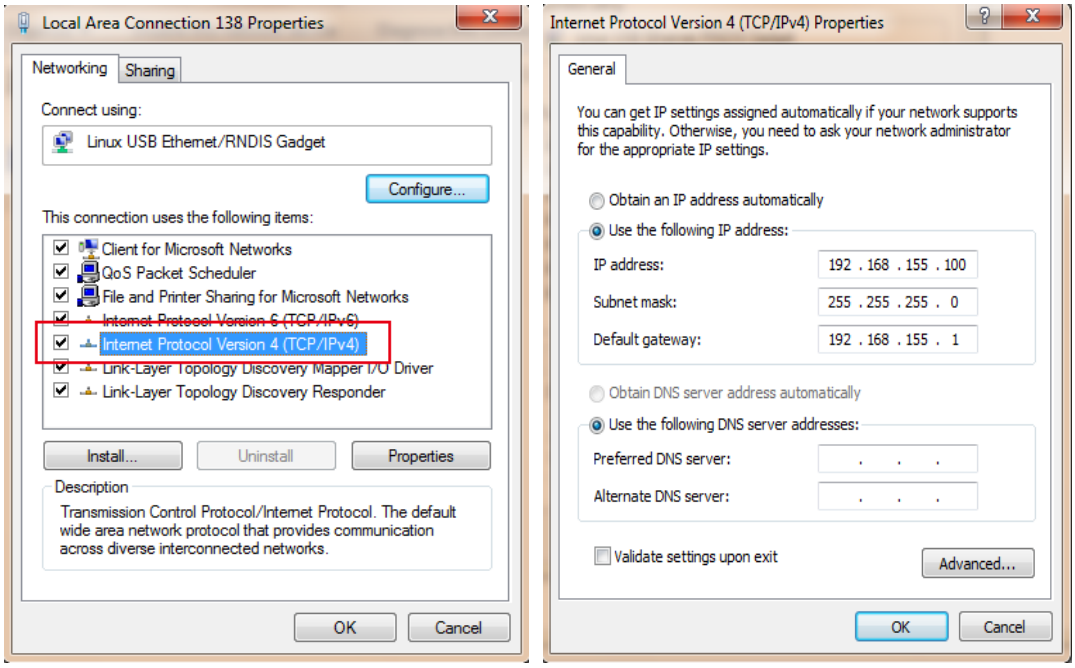


However, sometimes the computer cannot detect the receiver by USB network interface because there is something wrong with acquiring IP automatically, therefore, we need to do something to avoid such problem, that is to set a fixed LAN IP for the connection:

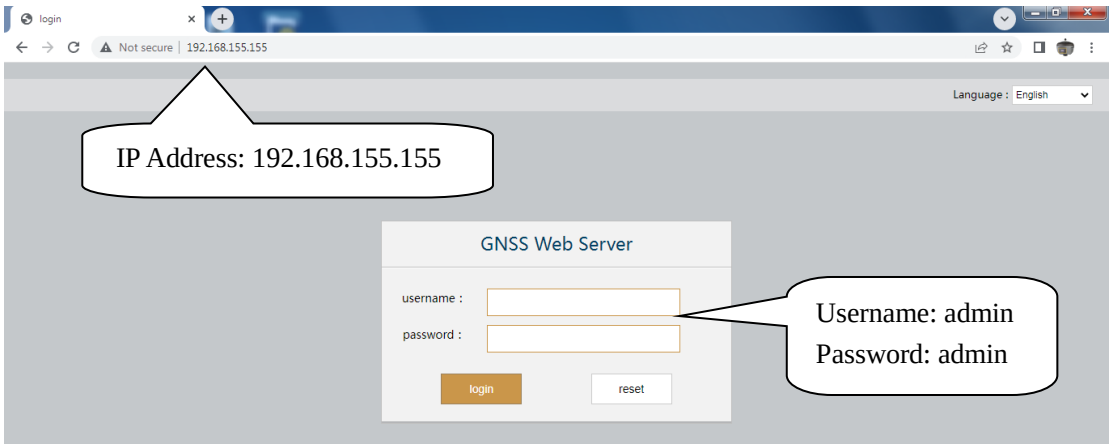
Right click on the local area connection which newly generates, choose properties to call out the local area connection properties window.



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

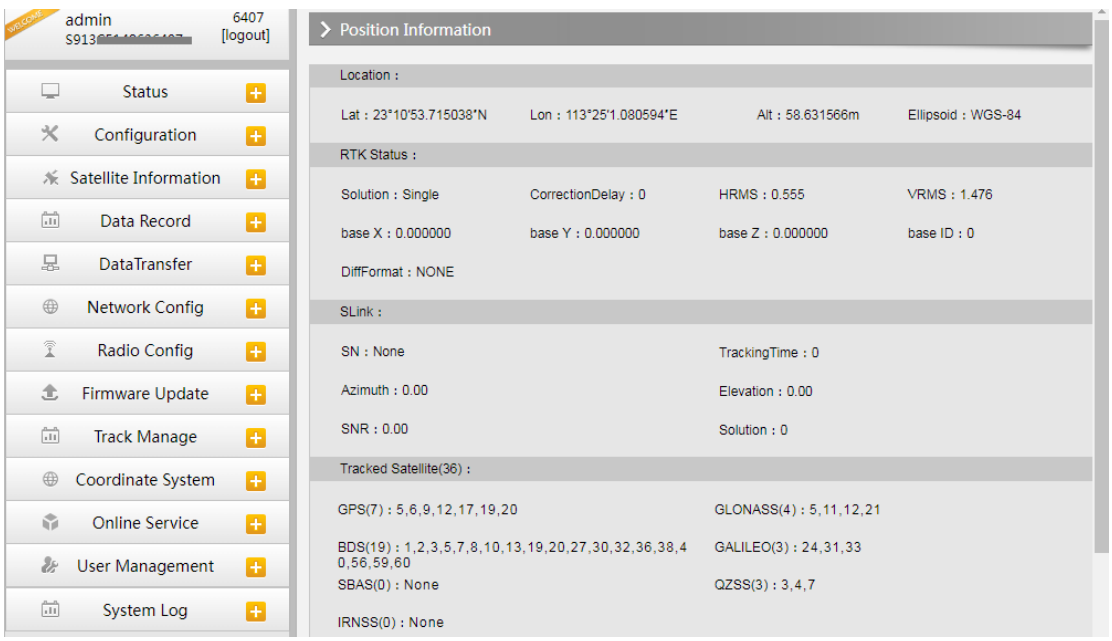


Run IE broswer on computer and input the default IP (**192.168.155.155**) into address bar, after a while, the system login interface is refreshed, then apply **"admin"** for username and password to login.



§4.4 Web UI main interface

After login the Web UI management of G7Q 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 informaiton including coordinates information and satellites are diplayed at right side.

Ref	Component	Description

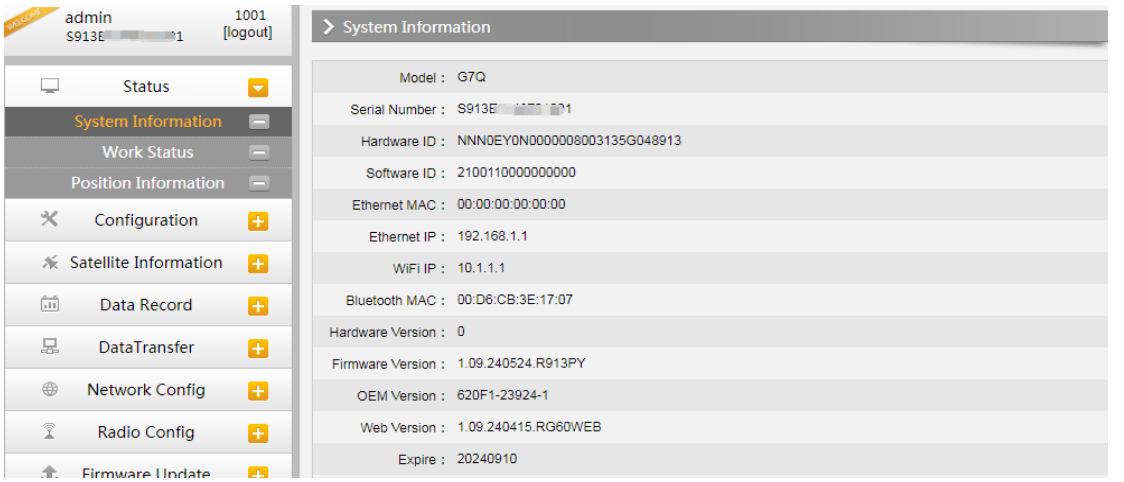
	**Status**	Positioning information, satellite tracking and the others will be displayed in this page
	**Configuration**	It contains registration for receiver, base configuration, antenna configuration, satellite configuration, receiver configuration and system configuration.
	**Satellite Information**	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 forG7Q
	**Online Service**	Upload data onto a server in real-time
	**User Management**	Add and manage the Web UI users

§4.4.1 Status

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

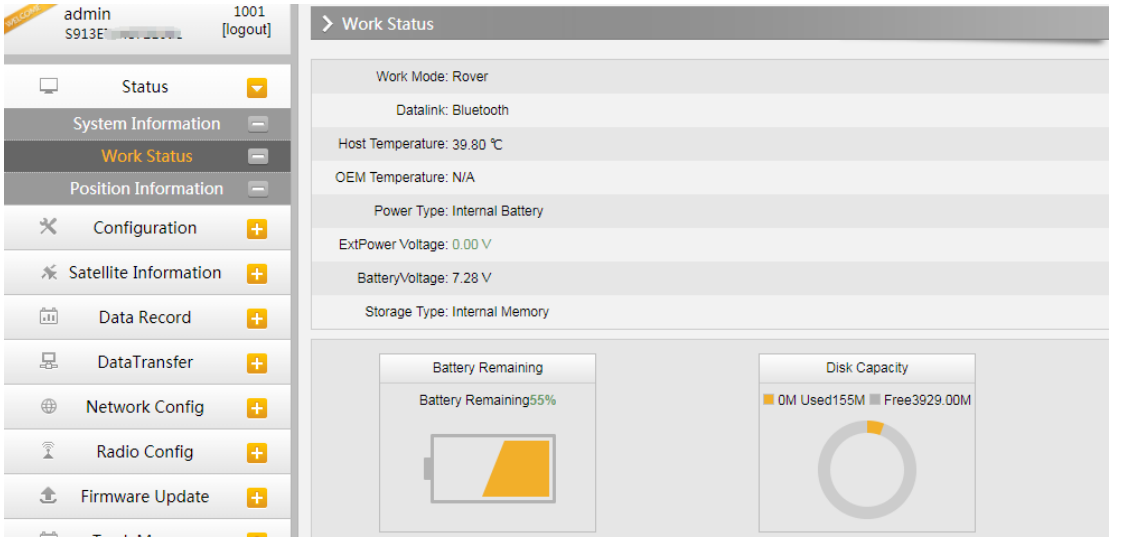
System Information

In this page, all the information of G7Q is diplayed such as serial number, hardware ID, MAC address, firmware version and so on.



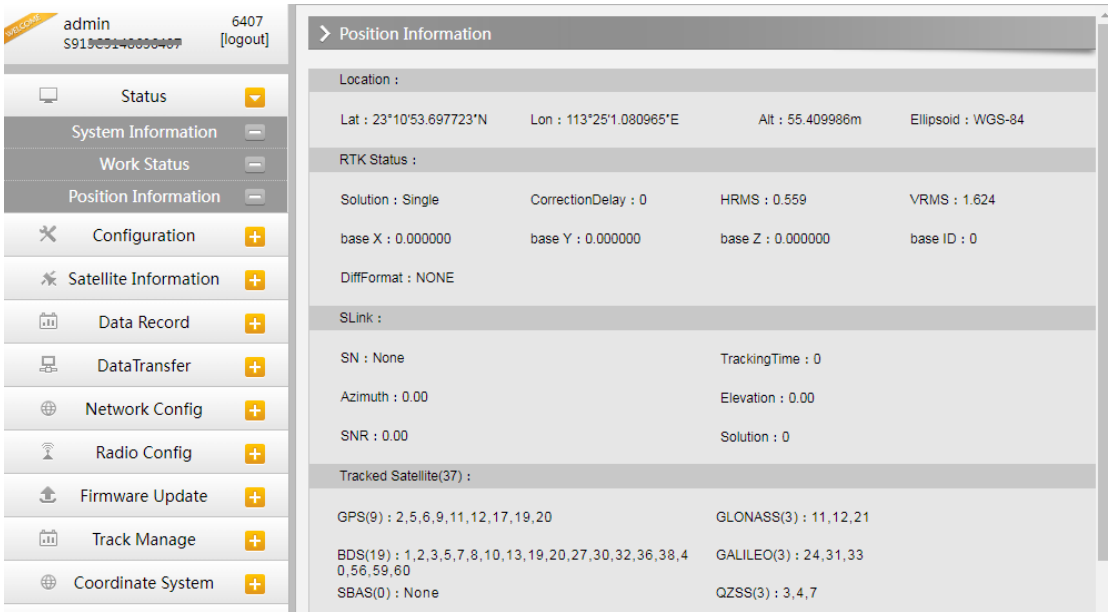
Work Status

The physical state of G7Q 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

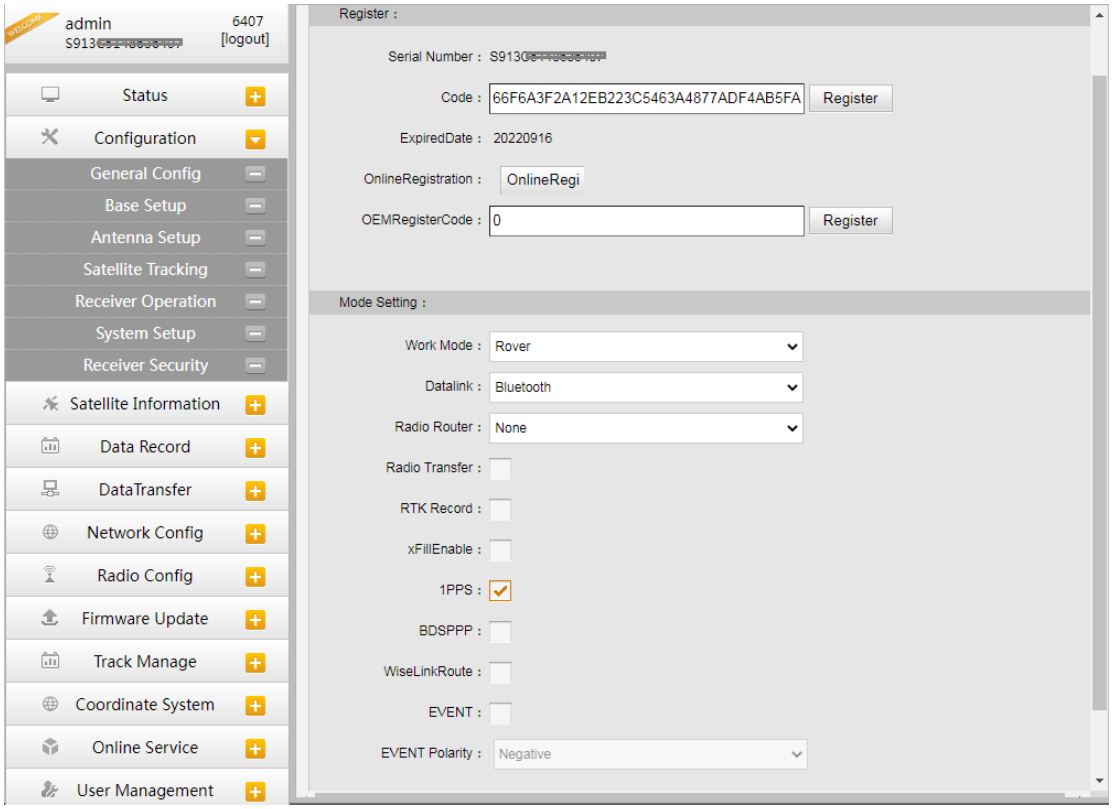


§4.4.2 Configuration

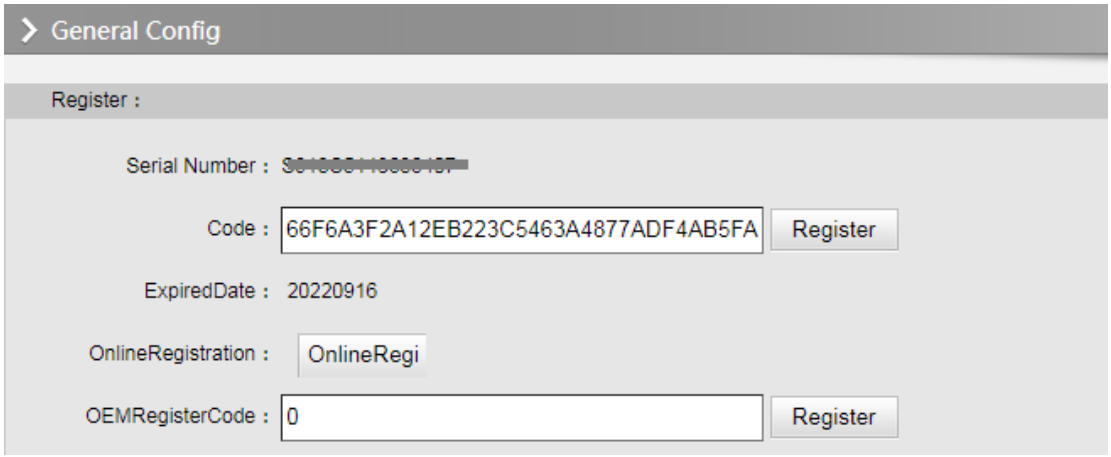
General Config, Base Setup, Antenna Setup, Satellite Tracking, Receiver Operate and Default Language are contained under Configuration menu. Users are able to configure all kinds of parameters for GALAXY G7Q under Configuration menu, and all the settings are immediate effect after saving.

General Config

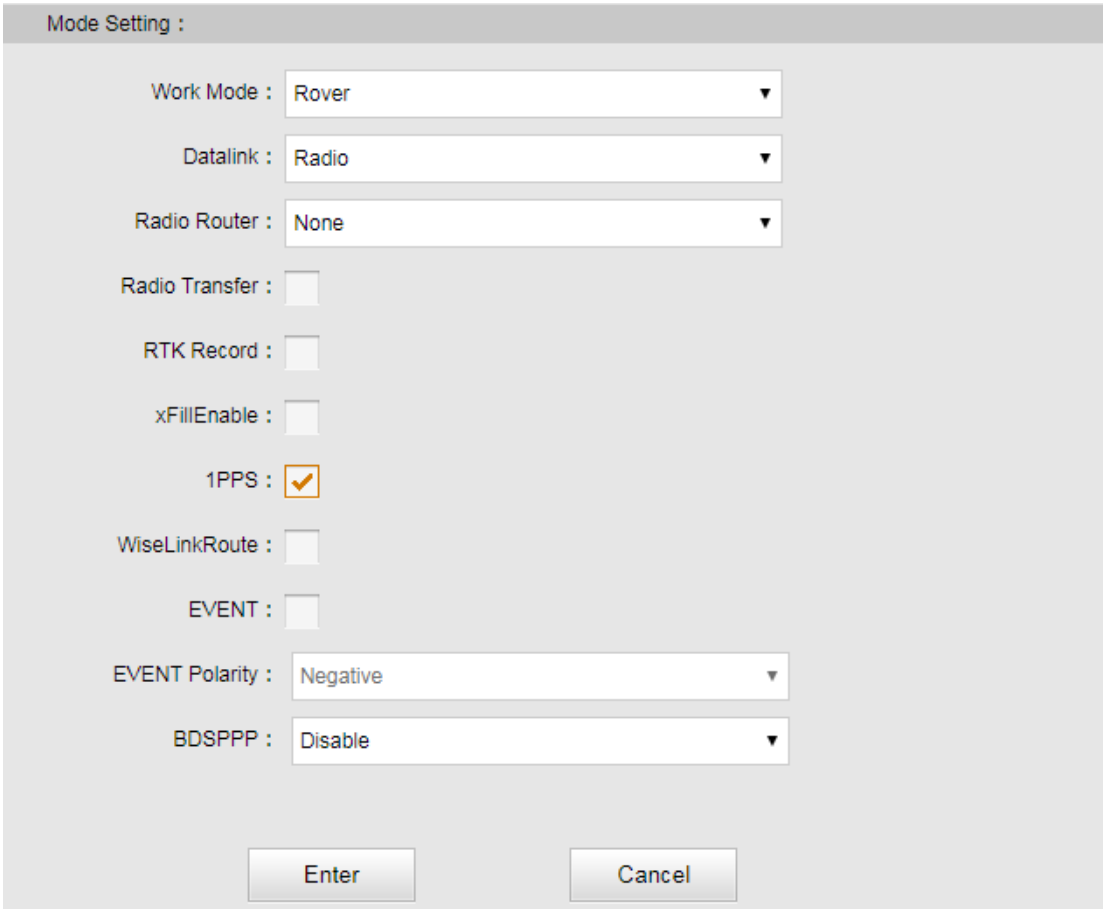
The registration for receiver working mode setting can be completed in this general configuration page.



If the code of GALAXY G7Q has expired or is going to be run out, please provide the serial number of your G7Q for us to apply for another available code, then input the code into the blank or register the receiver online.

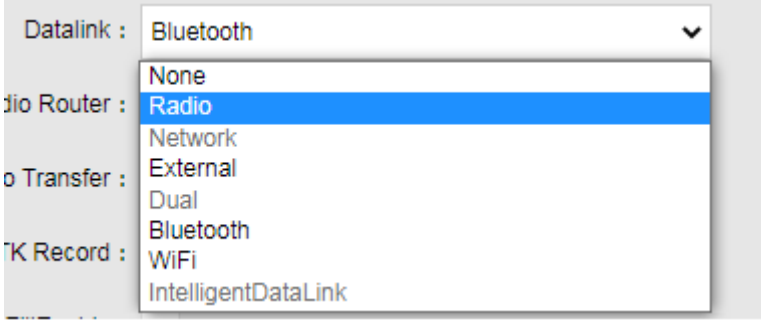


G7Q allows users to setup the working mode and datalink from this Web UI that only need the mobile phone or tablet PC is able to connect the wifi hotspot of GALAXY G7Q.



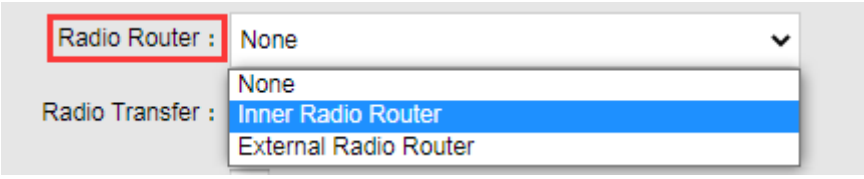
Work Mode: There are Rover, Base and Static contained in this dropdown list

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

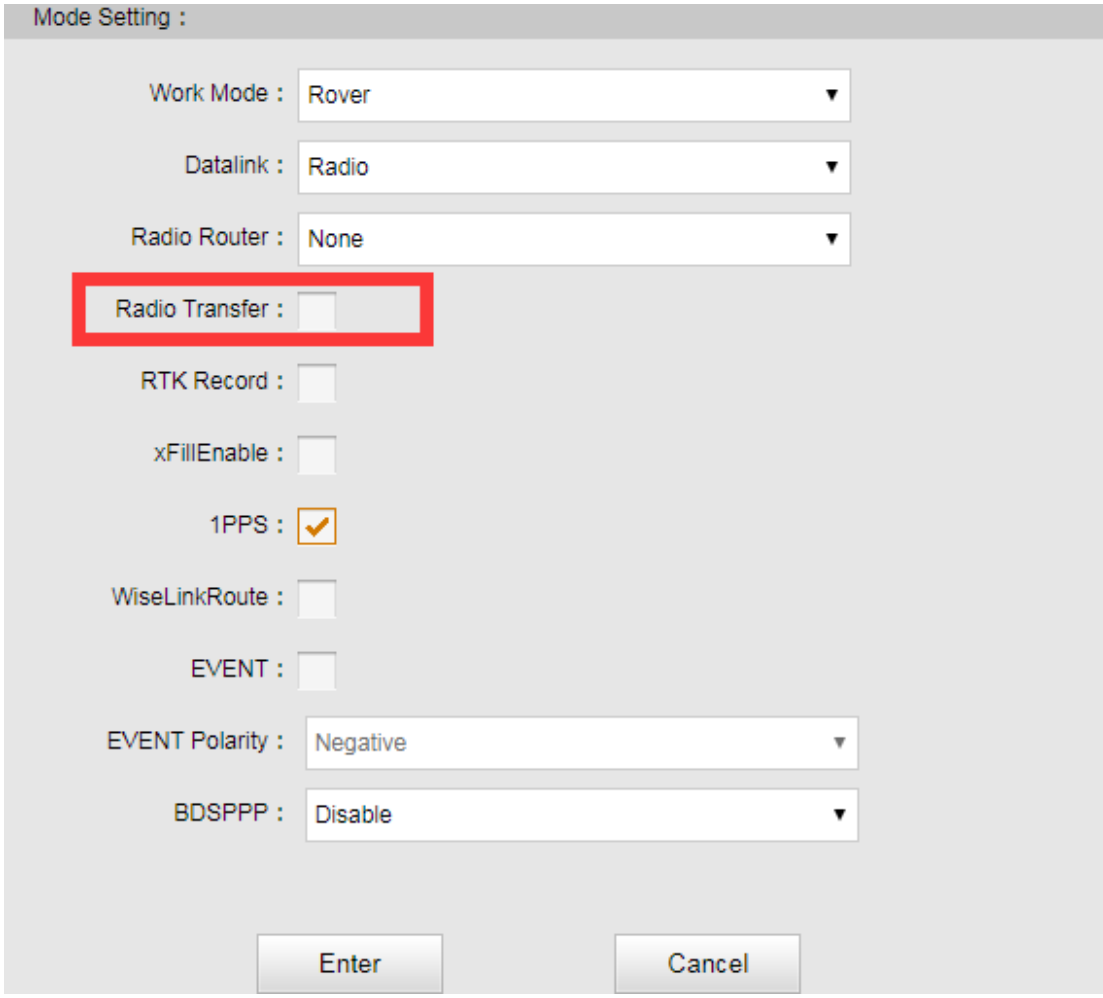


Radio Route: This feature is used to transfer the correction which from the reference station to the other rover by radio, the rovers will have the same reference coordindates. This is in the case of working in some places where there is poor signals from reference station or there is only a SIM card 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.

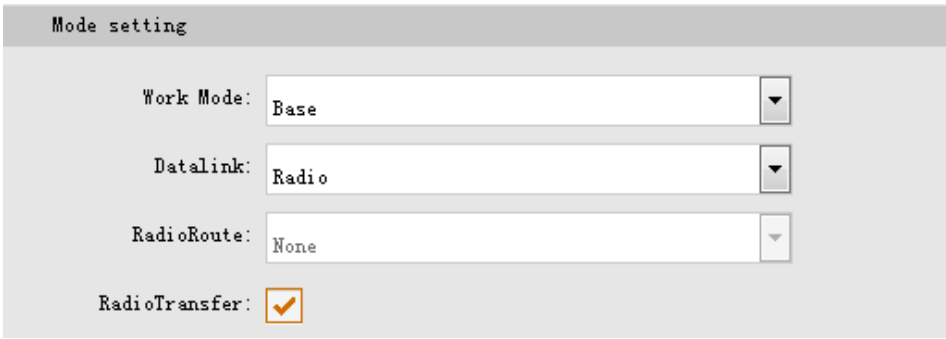


RadioTransfer: This is the function that GALAXY G7Q is able to transfer the correction from Base station to the other rovers with the internal UHF, definitely,GALAXY G7Q can work as a radio transfer (radio repeater).

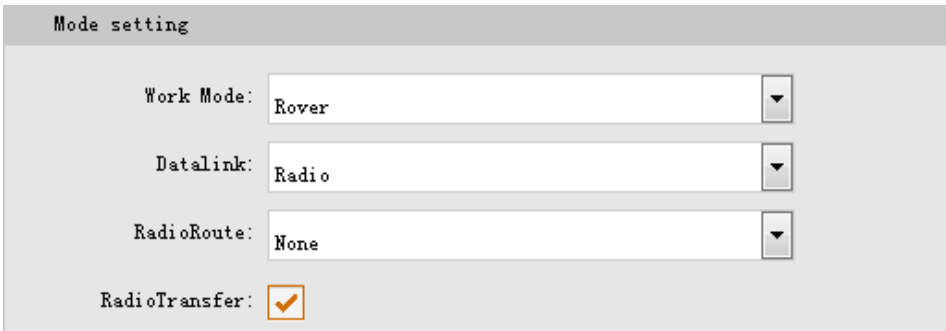


Operation:

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



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



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

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

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

xFillEnable: the “**Fixed-keep**” function, to allow G7Q keep the centimiter-level accuracy when the correction is missing

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

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

EVENT: This option is for the EVENT marker input

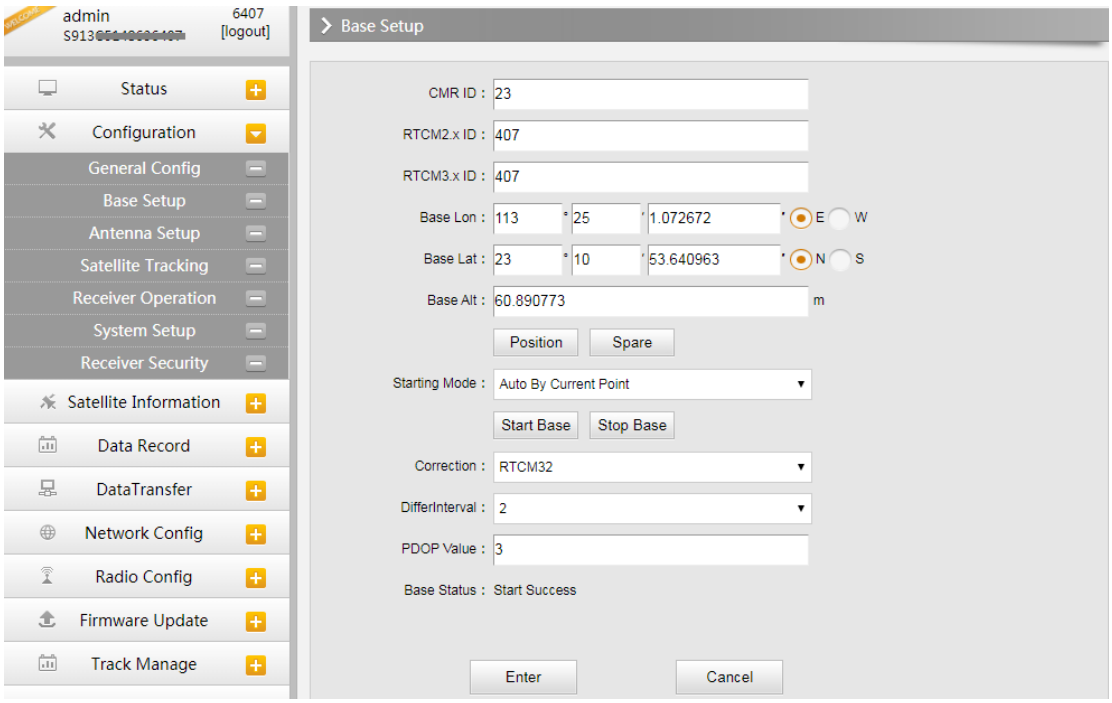
EVENT Polarity: EVENT input method.

BDSPPP: to use the BDS L-band corrections for centimeter level real-time position system. *If*

want use BDSPPP or Galileo HAS, usually select the "Dynamic PPP".

Base Setup

When GALAXY G7Q 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 RTCM30, RTCM32

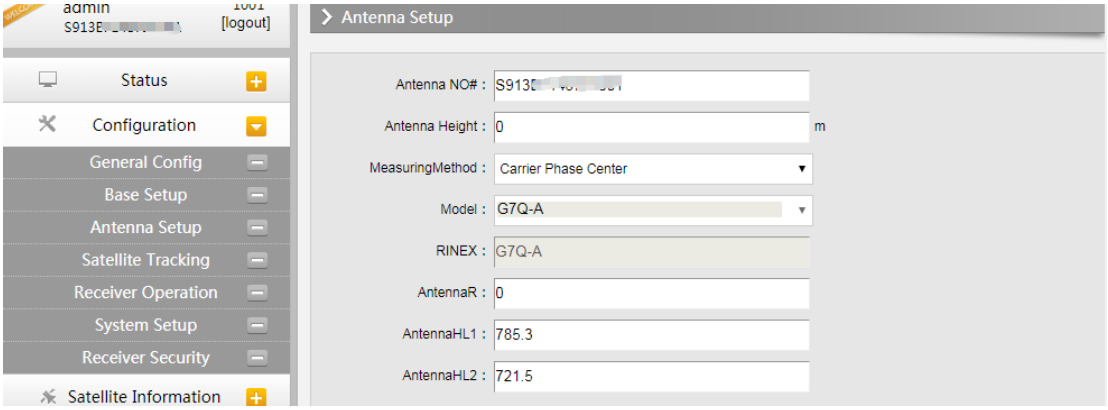
DifferInterval: Base differential transmit interval (seconds/once)

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

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

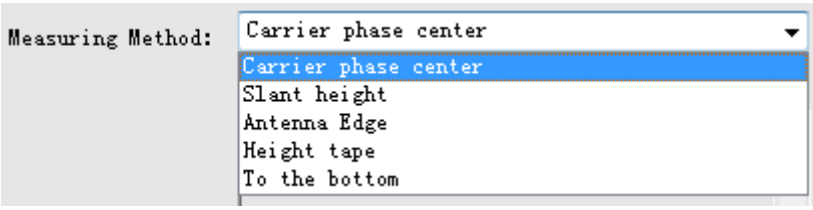
Antenna Setup

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



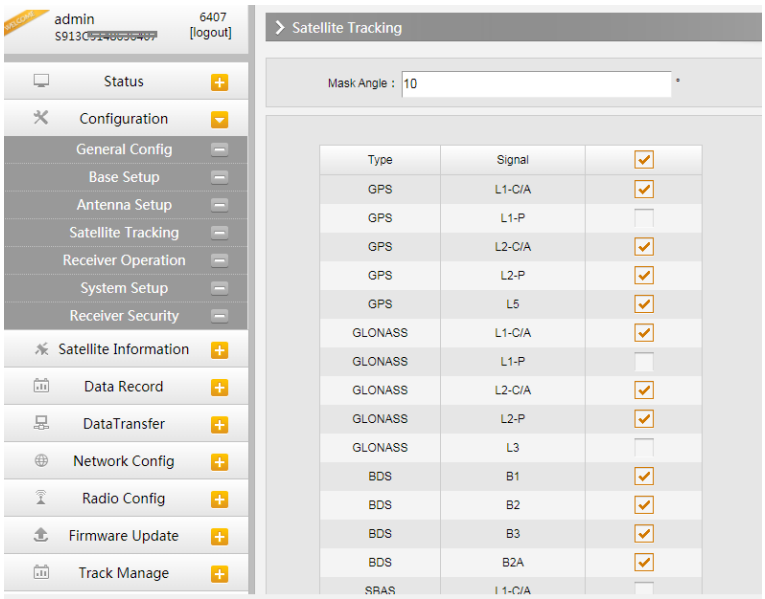
Antenna Height: This is the value for height from ground subject point to receier .

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. Usually we use carrier phase center, or slant height, or To the bottom height.



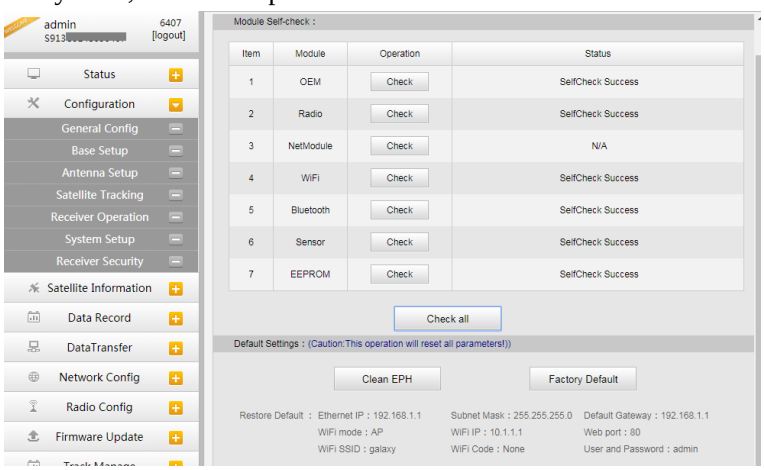
Satellite Tracking

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



Receiver Operate

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



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

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

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

Reboot: Click this button to restart the receiver.

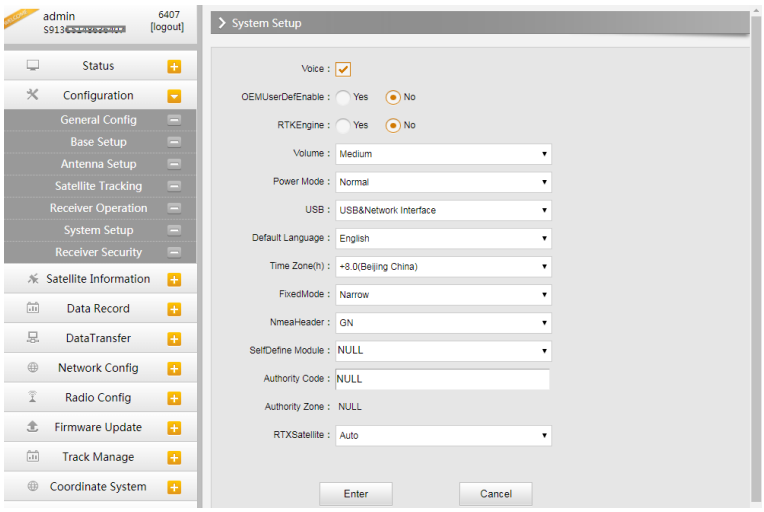
Power Off: Click this button to power off the receiver.

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

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

System Setup

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



Voice: Check on this box to turn on the voice guide for GALAXY G7Q, uncheck it to turn off the voice guid.

OEMuserdefEnable: check “No” for G7Q

RTKEngine: check “No” for G7Q

Voice Volume: Define the voice volume for GALAXY G7Q’s speaker.

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

USB: Now G7Q supports the USB mode and Network interface at the same time through the usb type-c cable

Default Language: Configure the default language for GALAXY G7Q which associates with voice guid.

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

FixedMode: some receiver has the option for fixed mode narrow or wide, but this option is not working on G7Q

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

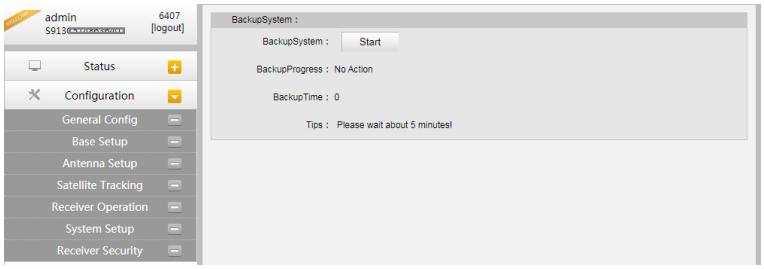
Selfdefin module: to set a user-defined work mode and output mode for receiver. Usually please choose NULL

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 in all around the world

RTX satellite: options for RTX satellite. G7Q 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

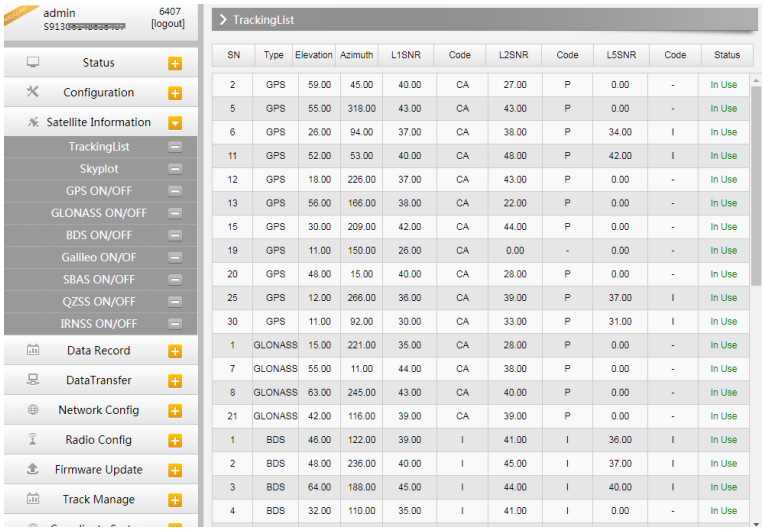


§4.4.3 Satellite Information

The "Satellite Information" provides all kinds of tables, 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 list

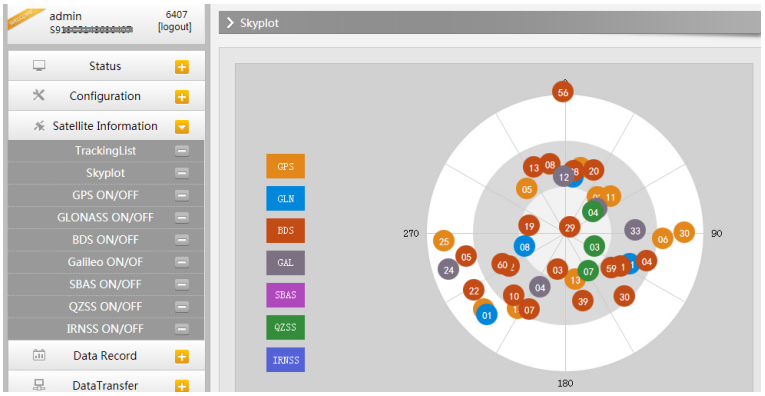
Here is the table to list all current used satellites and the other information for these satellites.



SN	Type	Elevation	Azimuth	L1SNR	Code	L2SNR	Code	L5SNR	Code	Status
2	GPS	59.00	45.00	40.00	CA	27.00	P	0.00	-	In Use
5	GPS	55.00	318.00	43.00	CA	43.00	P	0.00	-	In Use
6	GPS	26.00	94.00	37.00	CA	38.00	P	34.00	I	In Use
11	GPS	52.00	53.00	40.00	CA	48.00	P	42.00	I	In Use
12	GPS	18.00	226.00	37.00	CA	43.00	P	0.00	-	In Use
13	GPS	56.00	166.00	38.00	CA	22.00	P	0.00	-	In Use
15	GPS	30.00	209.00	42.00	CA	44.00	P	0.00	-	In Use
19	GPS	11.00	150.00	26.00	CA	0.00	-	0.00	-	In Use
20	GPS	48.00	15.00	40.00	CA	28.00	P	0.00	-	In Use
25	GPS	12.00	266.00	36.00	CA	39.00	P	37.00	I	In Use
30	GPS	11.00	92.00	30.00	CA	33.00	P	31.00	I	In Use
1	GLONASS	15.00	221.00	35.00	CA	28.00	P	0.00	-	In Use
7	GLONASS	55.00	11.00	44.00	CA	38.00	P	0.00	-	In Use
8	GLONASS	63.00	245.00	43.00	CA	40.00	P	0.00	-	In Use
21	GLONASS	42.00	116.00	39.00	CA	39.00	P	0.00	-	In Use
1	BDS	46.00	122.00	39.00	I	41.00	I	36.00	I	In Use
2	BDS	48.00	236.00	40.00	I	45.00	I	37.00	I	In Use
3	BDS	64.00	188.00	45.00	I	44.00	I	40.00	I	In Use
4	BDS	32.00	110.00	35.00	I	41.00	I	0.00	-	In Use

Skyplot

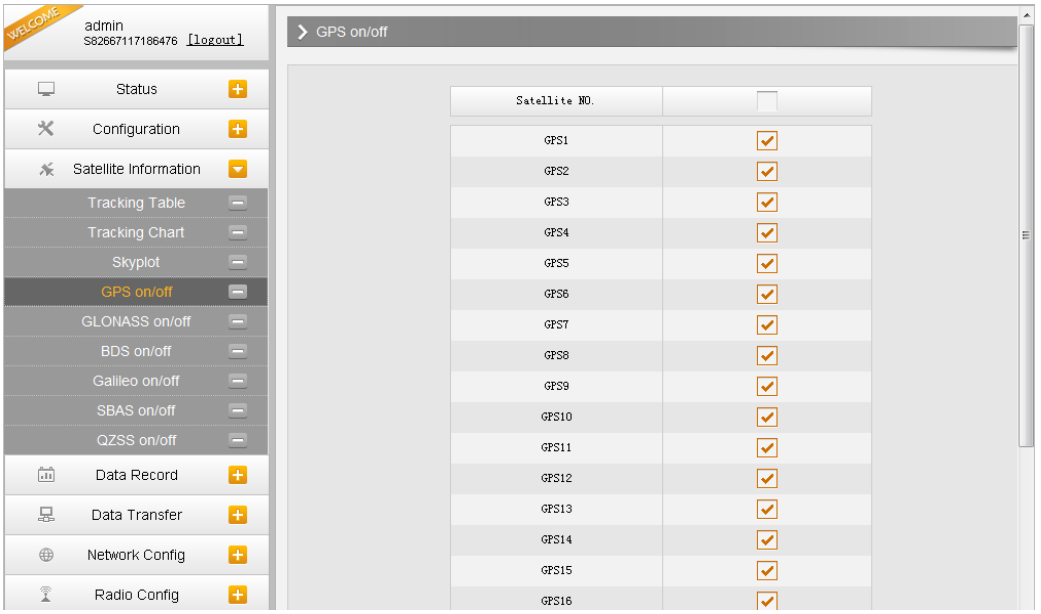
In this page, all the tracking satellires are shown on the skypolt, this let users intuitively view and know where the current position of satellite is.



GPS on/off

For all the running GNSS constellations or the augmentation system,GALAXY G7Q allows to configure to use which satellite or not.

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



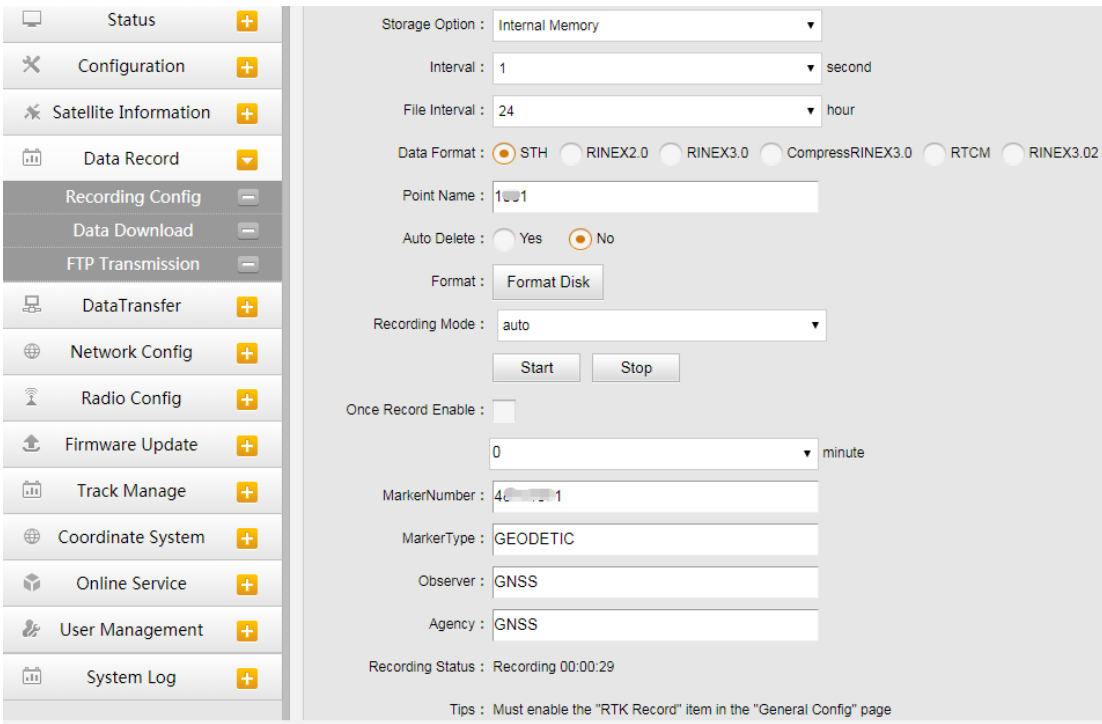
GLONASS on/off: to check and uncheck the satellites for tracking
BDS on/off: to check and uncheck the satellites for tracking
GALILEO on/off: to check and uncheck the satellites for tracking
SBAS on/off: to check and uncheck the satellites for tracking
QZSS on/off: to check and uncheck the satellites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

§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 G7Q 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 (via the type-C OTG to external USB disk).

Interval: This is the sampling interval for data storage

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

Data Format: Here are 3 options to selected for GALAXY G7Q to store what kind of format data, STH, Rinex2.0 and Rinex3.0. (RTCM static data is not supported on G7Q)

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 G7Q to delete the previous data files automatically if the memory is full.

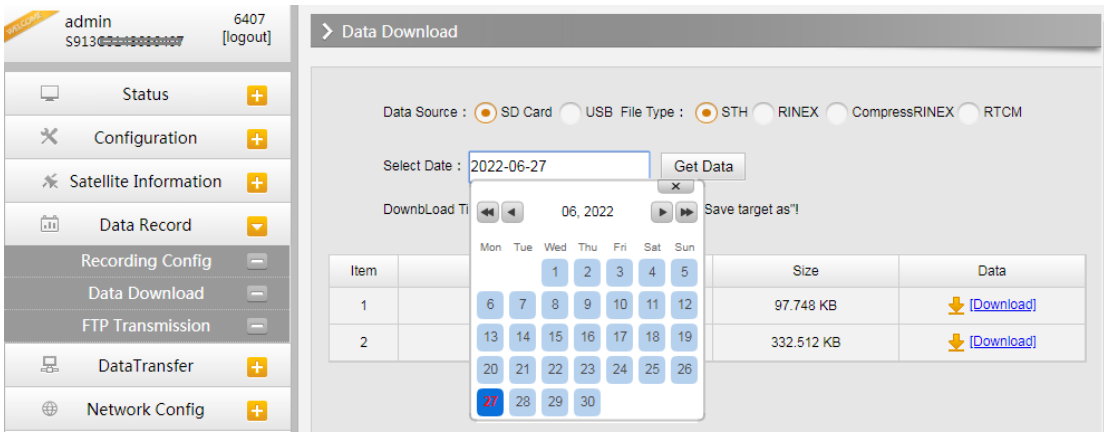
Format: Click this button to format the internal memory for GALAXY G7Q.

Recording Mode: Here are 2 options to configure GALAXY G7Q to record raw data automatically or not if it achieves the sampling conditions.

Start/Stop: Click these buttons to start recording or strop recording the raw data.
Once Record Enable: to set a Timer for static recording, for example if set 5 minutes, then the receiver will only record 5 minutes, after that receiver will stop record static data.
Recording Status: Here shows the status(time) of static data storage.

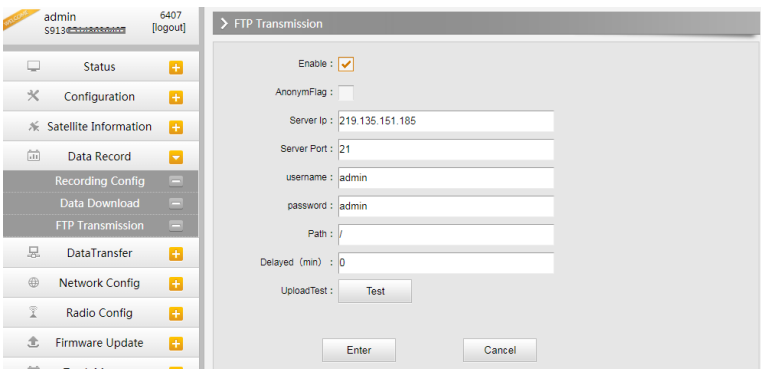
Data Download

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



FTP Transmission

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

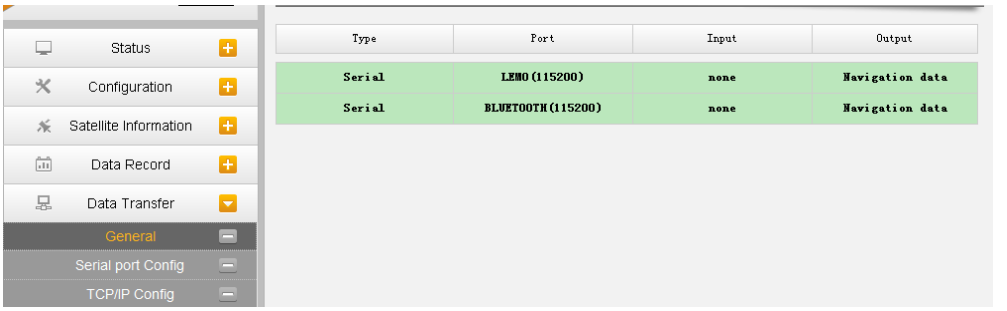


§4.4.5 Data Transfer

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.

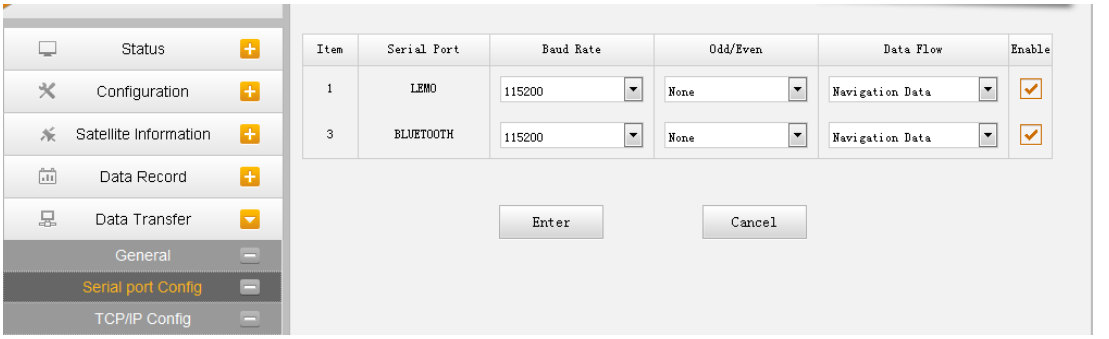
General

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.



Serial port Config

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



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

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

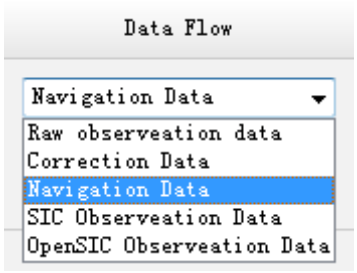
Raw observation data: This is the raw observation data straight from OEM board.

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

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

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

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

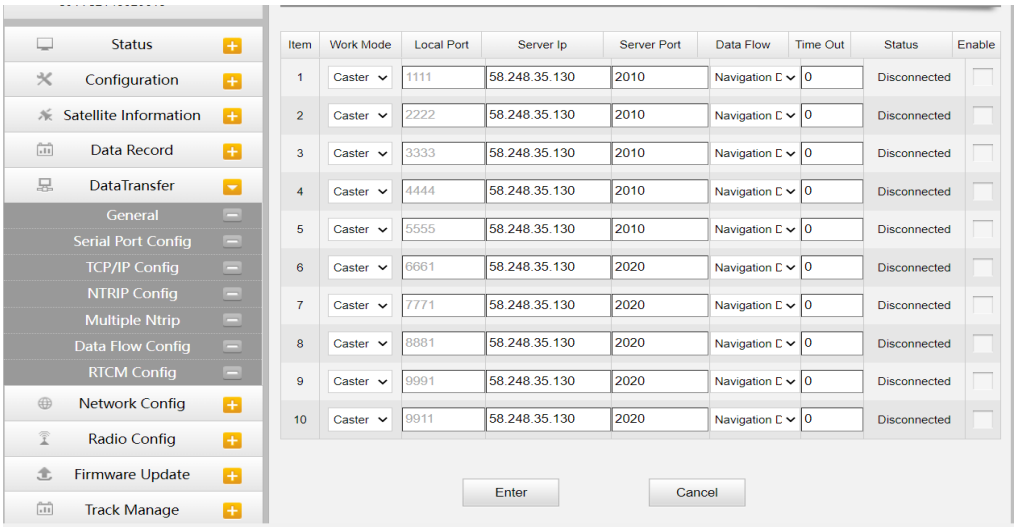


TCP/IP Config

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.

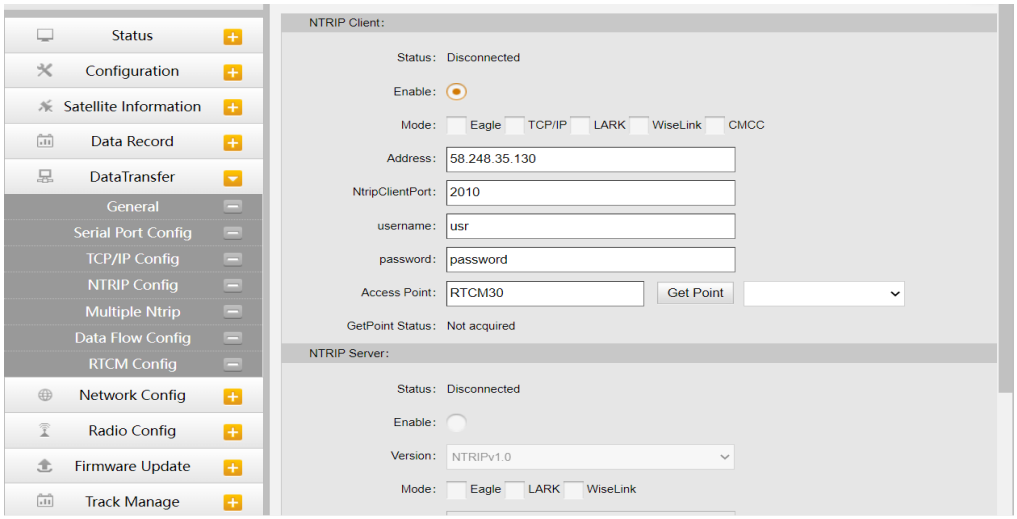
Caster: If this working mode is selected, GALAXY G7Q will be a client to upload the data to a specify server if it connects to the internet by WIFI or GPRS connection with SIM card inserted. Input the specified IP and port for server, and the data format what is uploaded. Then users are able to see the uploaded data on server.

Server: GALAXY G7Q 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 G7Q through the IP from receiver.



NTRIP Config

This is used to configure the NTRIP performance while receiver is going to connect to internet. GALAXY G7Q supports complete NTRIP performance including NTRIP Client, NTRIP Server and NTRIP Caster.



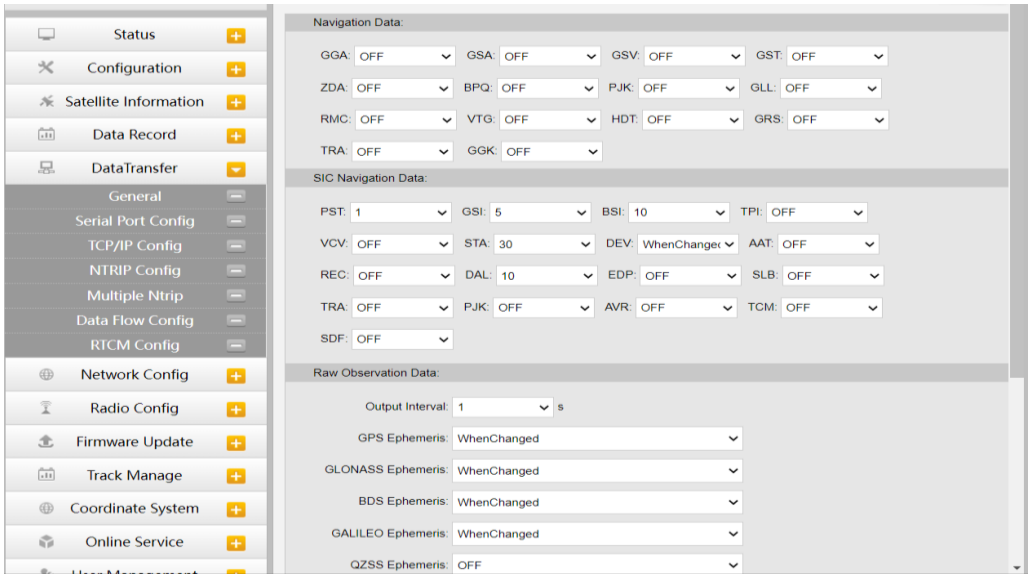
Multiple Ntrip

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

Data Flow Config

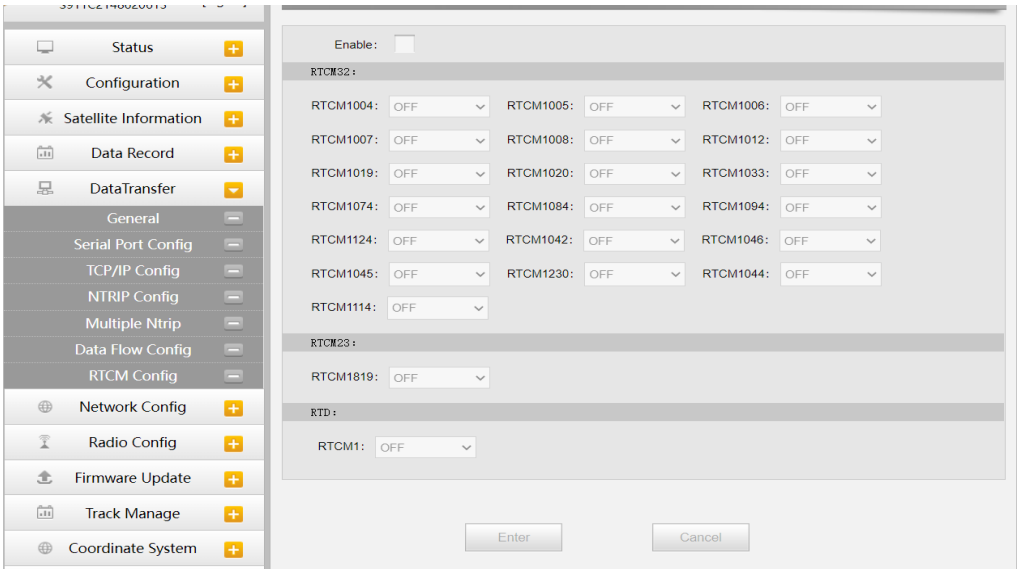
In this page, users can optionally to configure the content and the update rate of data flow that to output or not to output what kind of data format.

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



RTCM Config

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



§4.4.6 Network Config

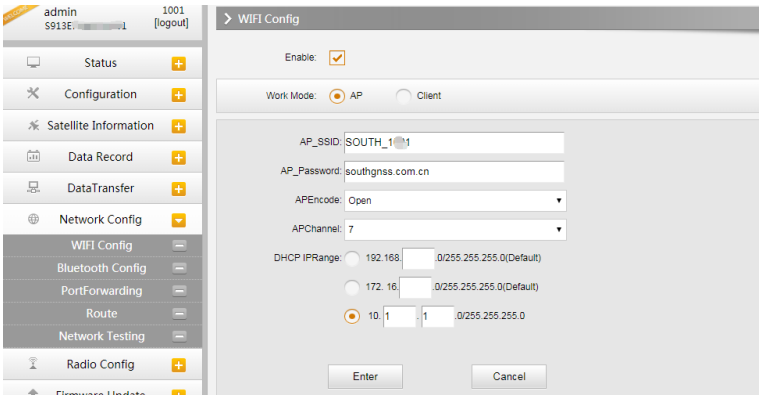
WIFI Config

This is mainly used on the WIFI configuration for GALAXY G7Q, there are AP mode and Client mode for optional.

AP: This is used to enable the WIFI hotspot for GALAXY G7Q 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 forGALAXY G7Q, 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 G7Q 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.

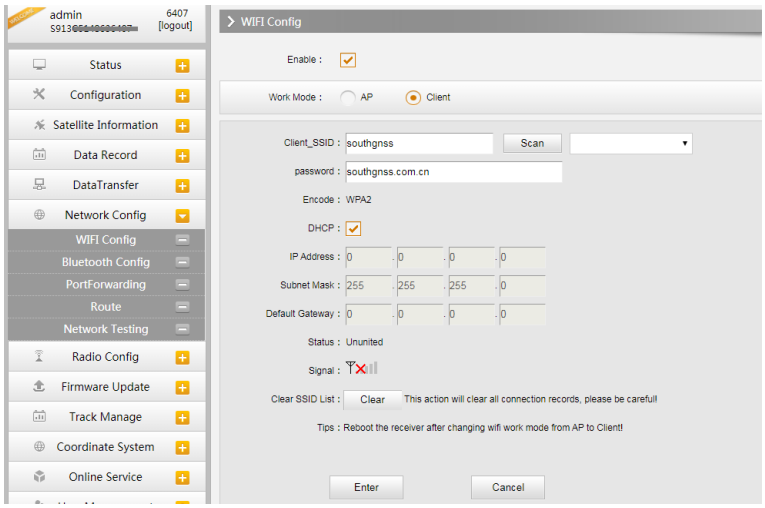
Client_SSID: This is the WIFI hotspot which GALAXY G7Q is going to connect

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 G7Q successfully connects to the WIFI, there will be an LAN IP address generated by GALAXY G7Q.

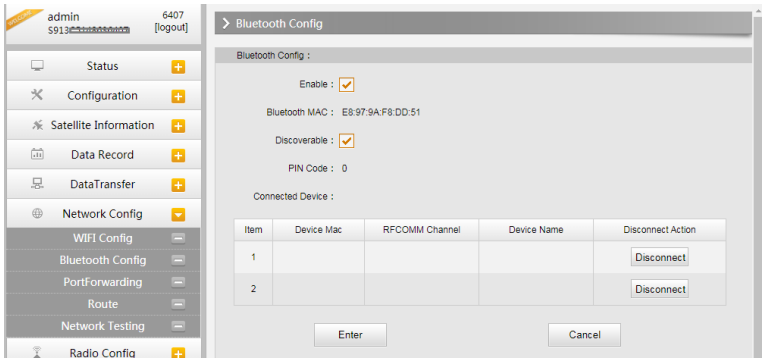
ClearSSID: Click this button to clear the SSID list.



Bluetooth Config

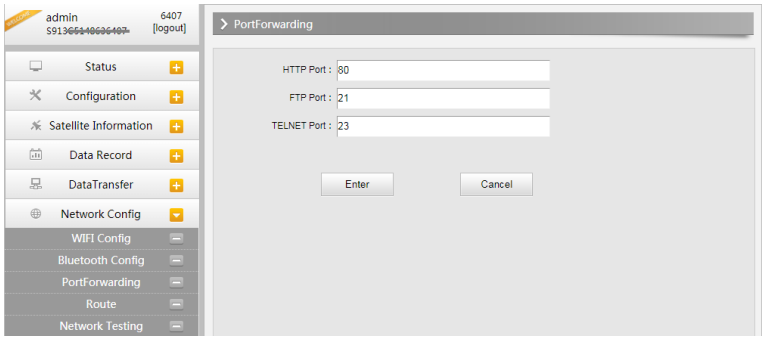
In this page, users can view the information and connection status of Bluetooth, such the MAC of Bluetooth, discoverable or not, the PIN code, and the connection devices in following table.

The advanced Settings module enables Bluetooth search.



Port Forwarding

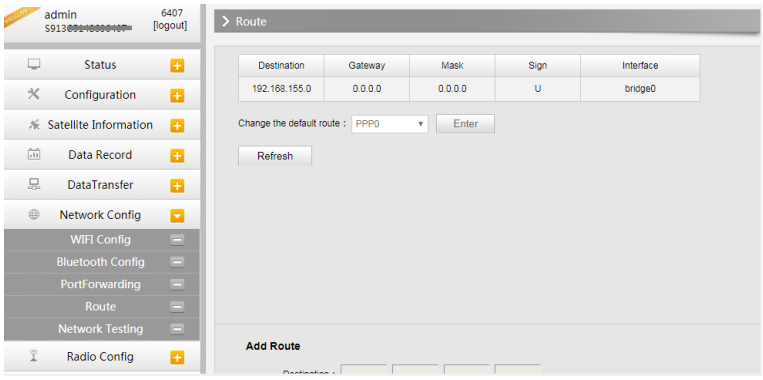
This page is mainly used to view and configure the internet transmission port for GALAXY G7Q, customize and debug receiver.



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

Route

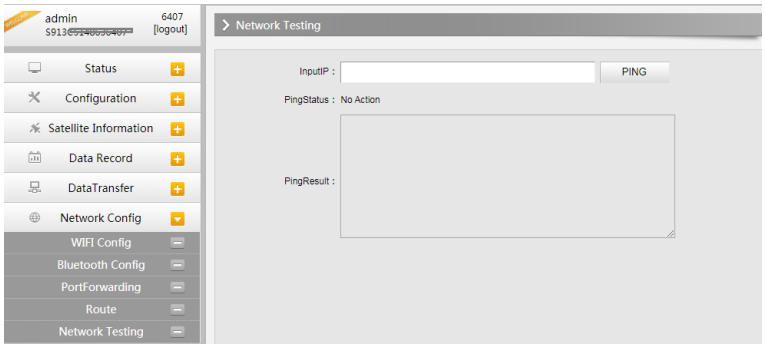
This is mainly used to view and configure the parameters for router, only under the condition of customize and debug receiver.



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

Network testing

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

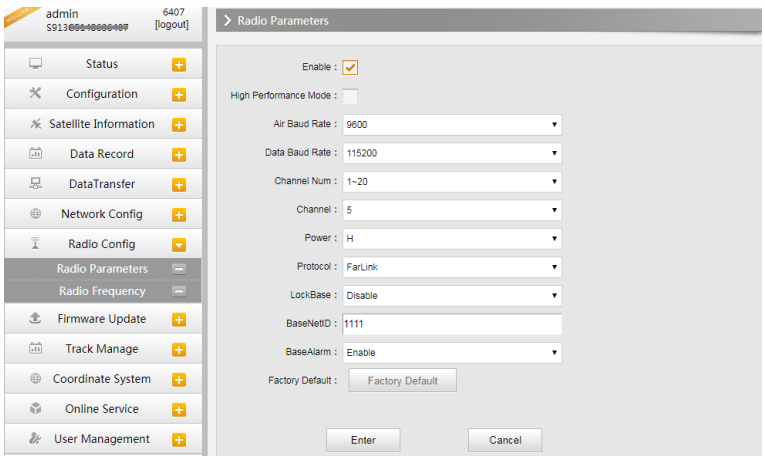


§4.4.7 Radio Config

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 G7Q.



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

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

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

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

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

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

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

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

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

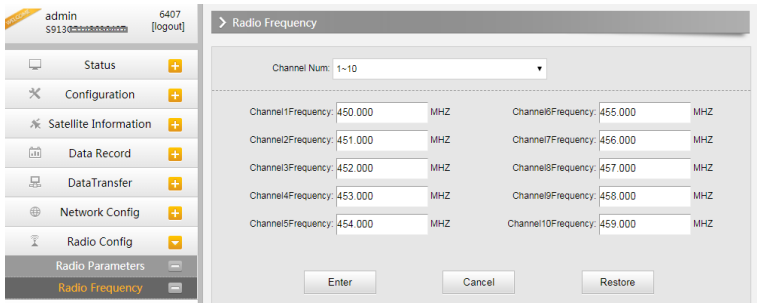
notification about the base movement.

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

Radio Frequency

For GALAXY G7Q, 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.

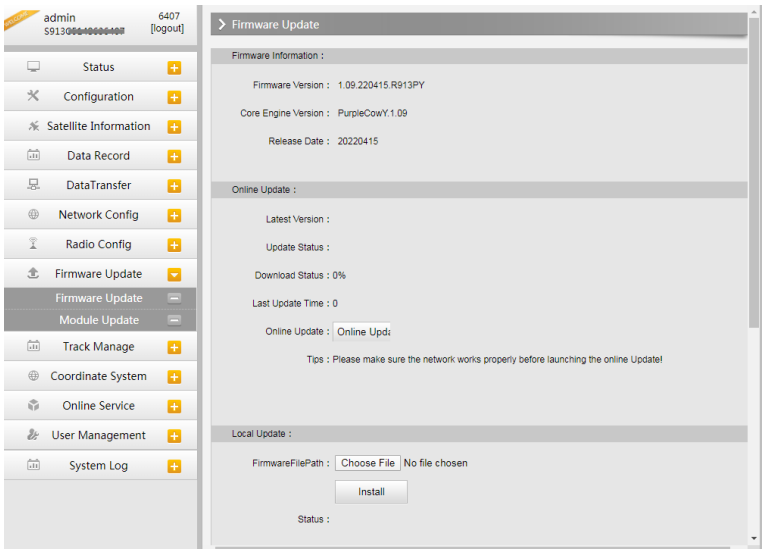


§4.4.8 Firmware Update

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 G7Q, and allows to update the latest version firmware for receiver. To get latest version firmware please contact with SOUTH technician.

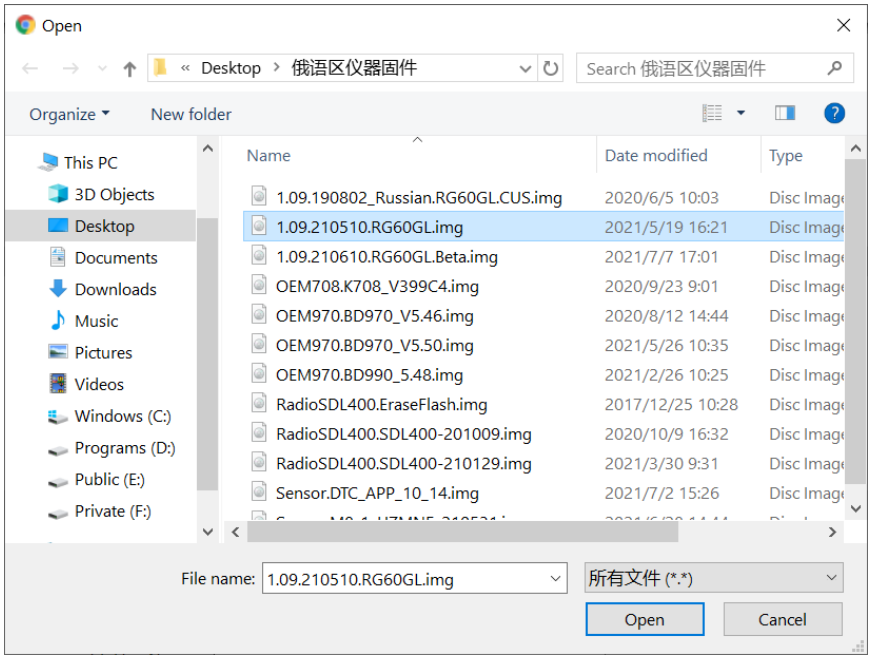


Online Update:GALAXY G7Q supports to update the firmware online anytime if there is something update or optimized.

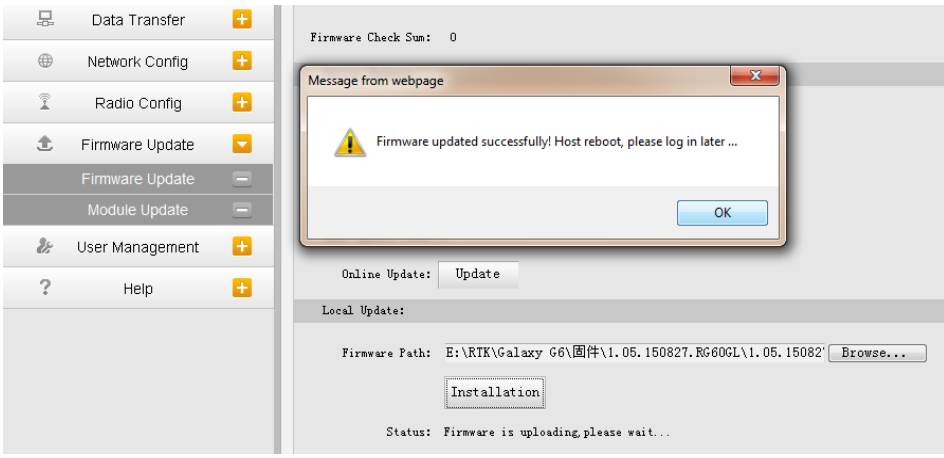
Local Update: Update the latest firmware by using a firmware file.

How to upgrade the firmware with Local Update

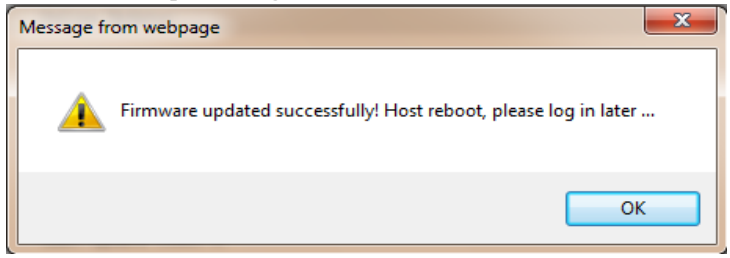
a) Click on “Browse” button to load firmware file (Please take in mind that the firmware is ended with .img as the extension name).



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



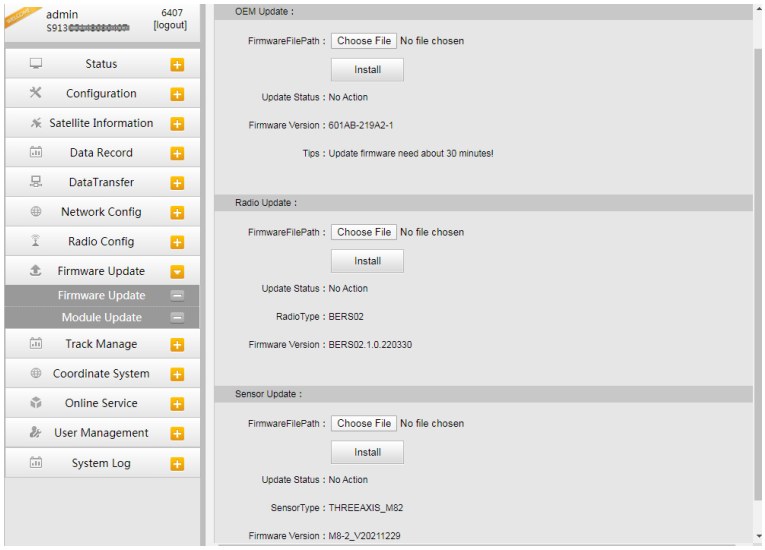
c) After the firmware is completed upgrading, a dialog will appear saying “Firmware updated successfully! Host reboot, please log in later…”, then the receiver will restart automatically.



SPECIAL REMIND:GALAXY G7Q doesn't support to update the firmware with the help of INstar program any more, in the future, update the firmware for GALAXY G7Q shall be done through the Web UI.

Module Update

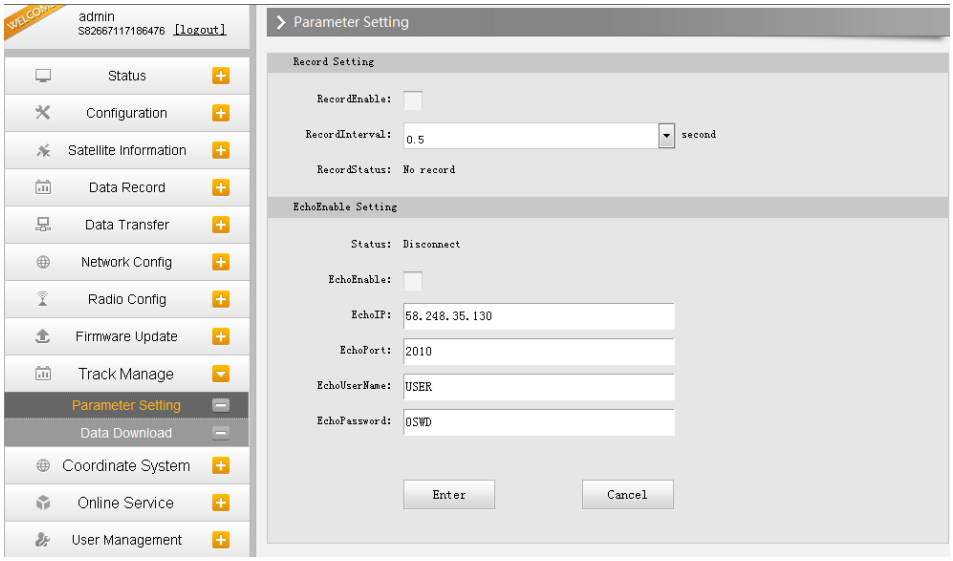
This page is used to update the firmware for corresponding modem such as OEM board, radio module and sensor.



§4.4.9 Track Manage

G7Q now supports to record the track while doing measurement, and upload the data onto the server.

Parameter Setting



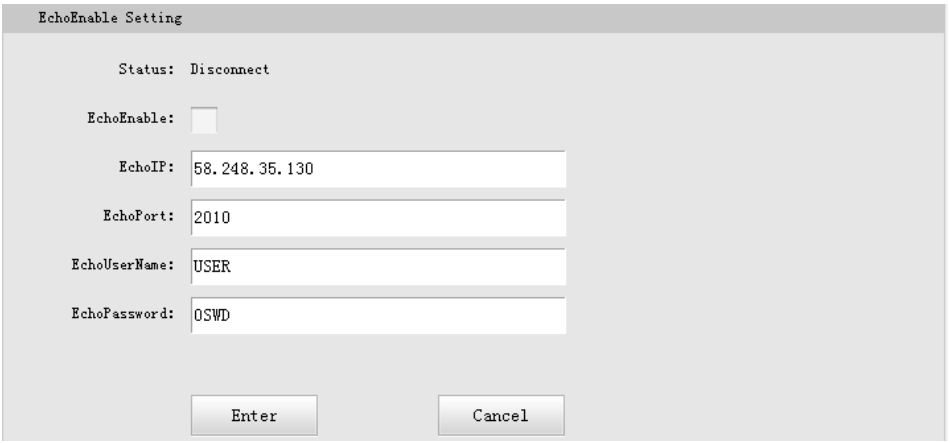
Record Setting

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



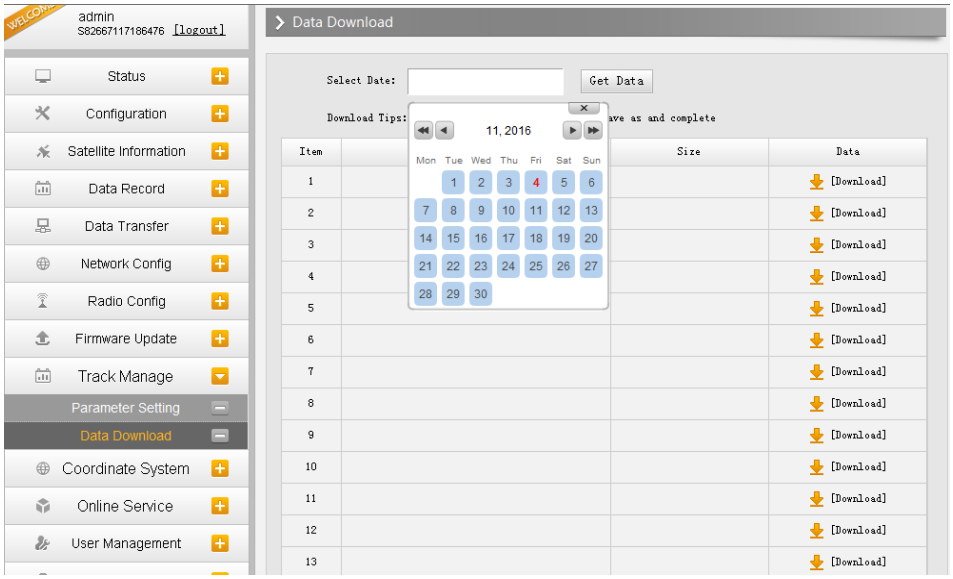
EchoEnable Setting

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



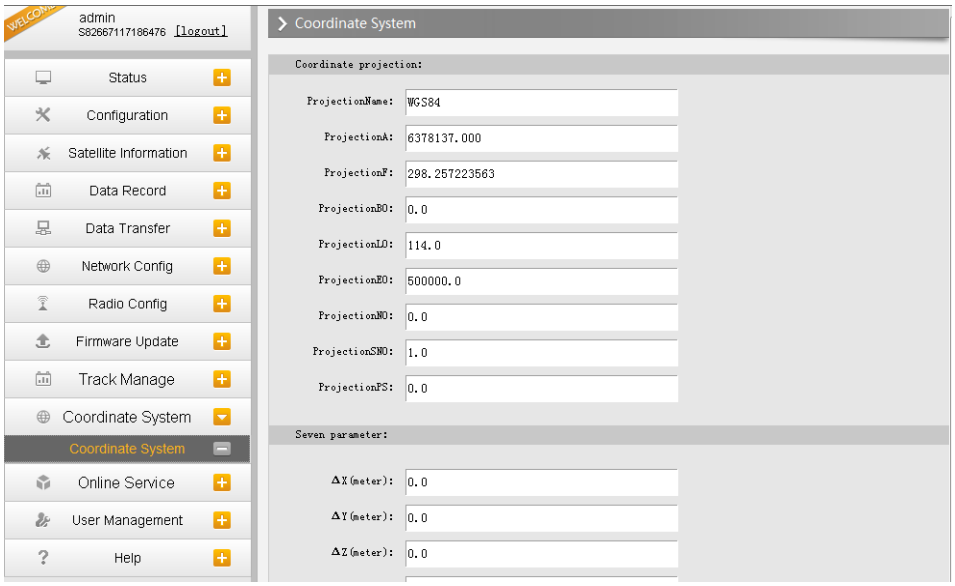
Data Download

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



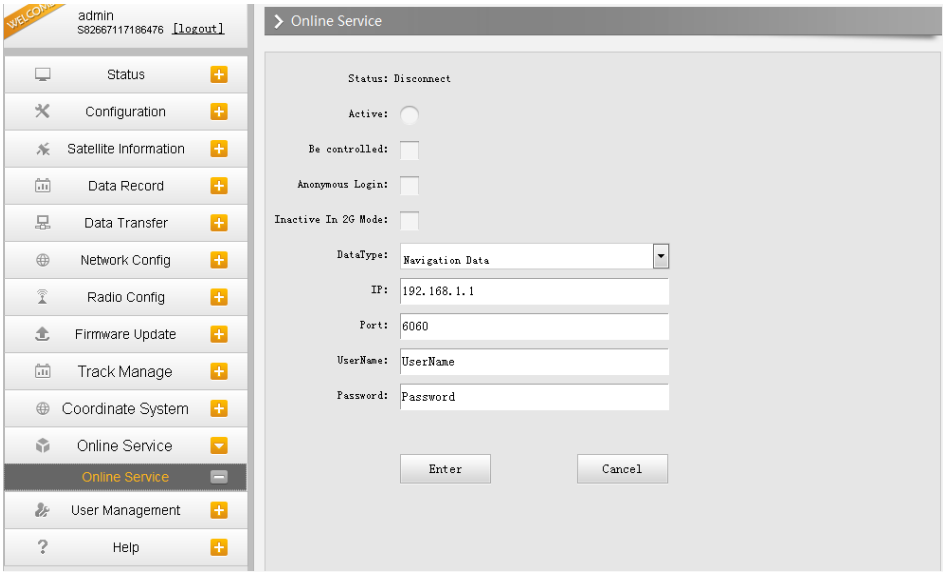
§4.4.10 Coordinate System(reserve)

G7Q 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.



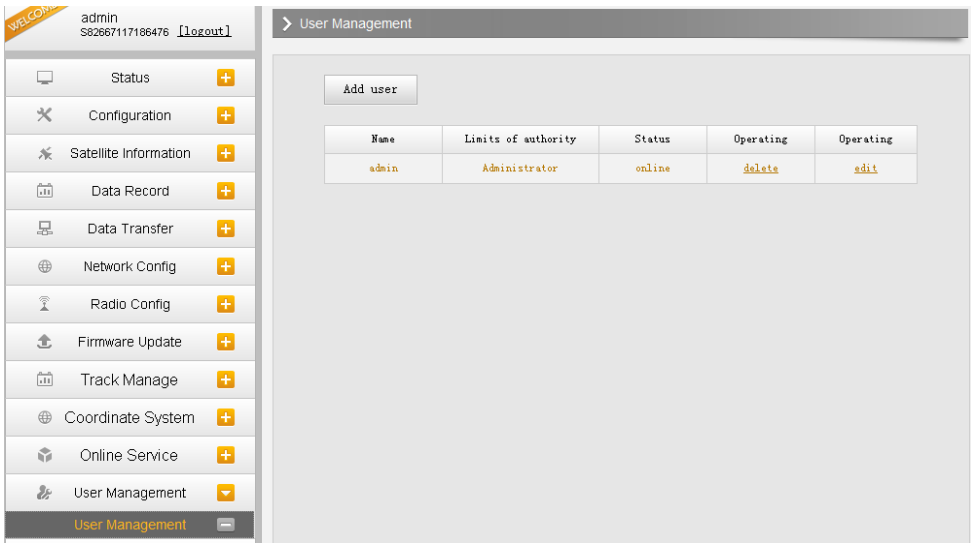
§4.4.11 Online Service(reserve)

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.



§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.

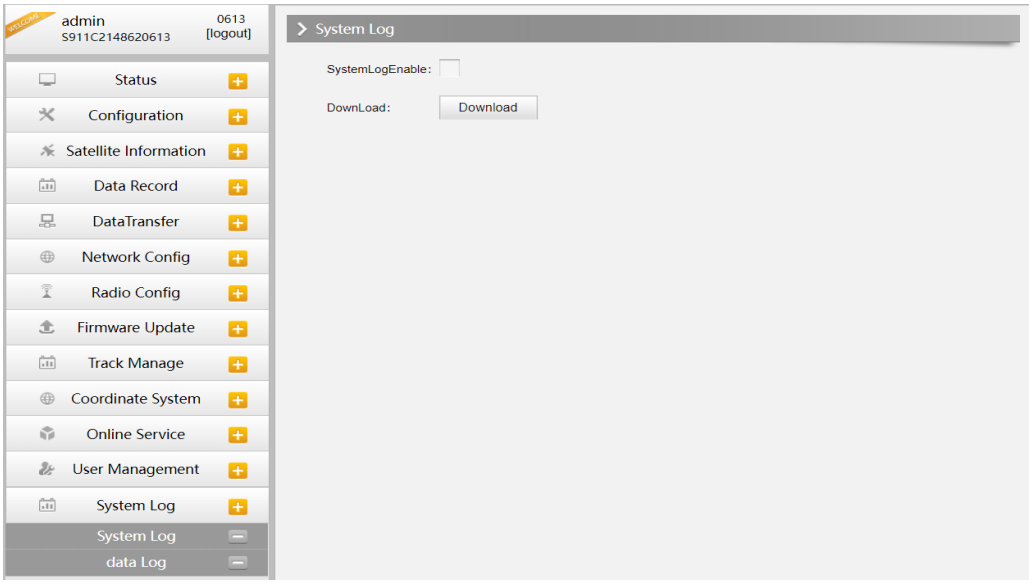


§4.4.13 System log

System log

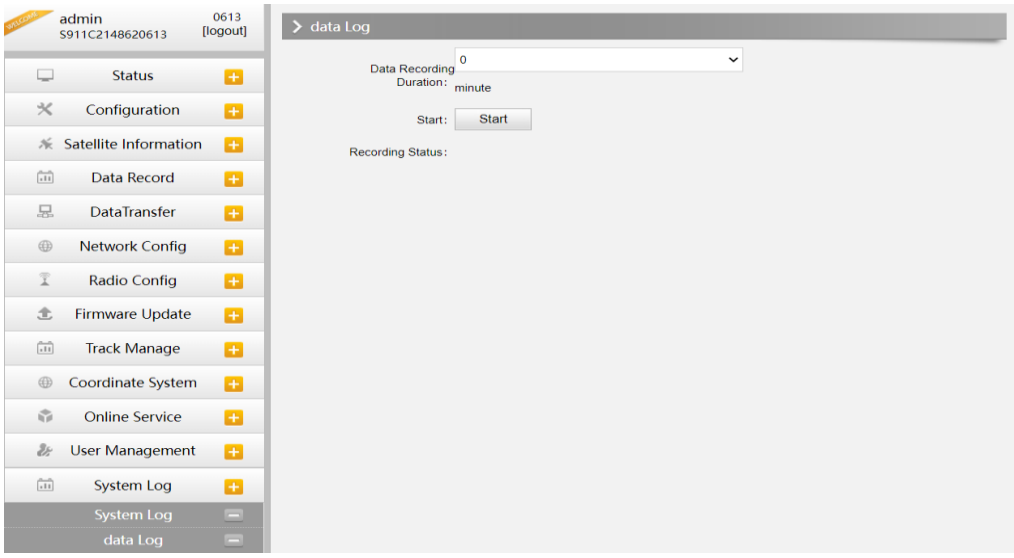
In this page, users can download the system log book of receiver (the log book can help to backtrack the working status of receiver).

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



Data log

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



Chapter Ⅴ Accessories

§5.1 Instrument Case



The instrument case for GALAXY G7Q 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

Galaxy G7Q is equipped with a rechargeable internal battery, it uses a typeC-typeC cable and a PD adapter for the charging.





§5.3 Differential Antennas



The differential antennas are as shown above;

The UHF differential antenna is required to install to the interface at the bottom of receiver if GALAXY G7Q is set up into internal UHF mode.

§5.4 Cables

Type-C to USB-A cable

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



Appendix A GALAXY G7Q 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	L1*
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	130mm(φ) × 80mm(H)
Weight	790g (battery included)
Material	Magnesium aluminum alloy shell
Operating temperature	-45℃ ~ +75℃
Storage temperature	-55℃ ~ +85℃
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	Inbuilt 7.2V 6800mAh rechargeable, Li-ion battery	
Battery life	15h(Rover Bluetooth mode)	
Communications		
I/O Port	5PIN LEMO external power port + RS232 Type-C interface (charge, OTG, data transfer to PC or phone, Ethernet) 1 UHF antenna TNC interface	
Internal UHF	2W radio, receive and transmit, radio router and radio repeater	
Frequency range	410 - 470MHz	26-30dBm
Channel spacing	25 kHz	
UHF Modulation	GMSK	
Communication protocol	Farlink, Trimtalk450s, SOUTH, HUACE, Hi-target, Satel	
Communication range	Typically 8km with Farlink protocol	
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)	
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 hotspot	AP mode, Receiver broadcasts its hotspot form web UI accessing with any mobile terminals	
WIFI datalink	Client mode, Receiver can transmit and receive correction data stream via WiFi datalink	
Data Storage/Transmission		
Storage	4 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	5 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.