New G1 plus Measuring System

User Manual

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ChapterI Preface

Read this chapter, you will have a brief knowledge of South Company and New G1 plus measurement system.

§1.1 Introduction

Welcome to South Surveying&Mapping 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 http://www.southinstrument.com/

This manual takes New G1 plus measuring system for example, to explain how to install, set up and uses 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 more 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 adapt 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

New G1 plus 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 New G1 plus, 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 InBuilt UHF module

New G1 plus 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.

Upgraded network module

Standard 4G module is integrated which supports WCDMA/CDMA2000/TDD-LTE/FDD-LTE

4G network and downward compatible with 3G GPRS/EDGE. Also supports all kinds of network types to access CORS seamlessly.

Dual battery hot swappable

The new G1 Plus has two battery slots, which makes the working hours double than the previous mode. And the batteries are hot swappable.

Speed Dial

Smart PPP dialing technology can auto dial which makes the New G1 plus keeping online continuously during the survey.

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.

Smart Voice Guide

The customizable iVoice technology is allowed to customize your local language. Multi-lingual and clear-tone messages enable users to understand the critical information and status of receiver such as network connection, solution status, working mode and more, which definitely helps to improve work efficiency by being acknowledged.

Full Constellations Tracking

Equipped with most advanced GNSS boards, New G1 plus 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

The internal tilt compensator and electronic bubble can correct the coordinate result automatically at the points with tilt angel and tilt direction.

Huge capacity power support

An useful external power package is supported which can load 4 standard batteries and provide up to 28 hours of power. It also can display the remaining power in real time.

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 50Hz.

Amazing Housing

New G1 plus, with and innovative design, is built with magnesium alloy materials. And the top edge is design to decrease harm for receiver in case of falling down onto ground.

NFC Function

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

Cloud Service

The function enable realize online upgrade and register, remote diagnosis in real-time

Chapter Ⅱ Hardware Component

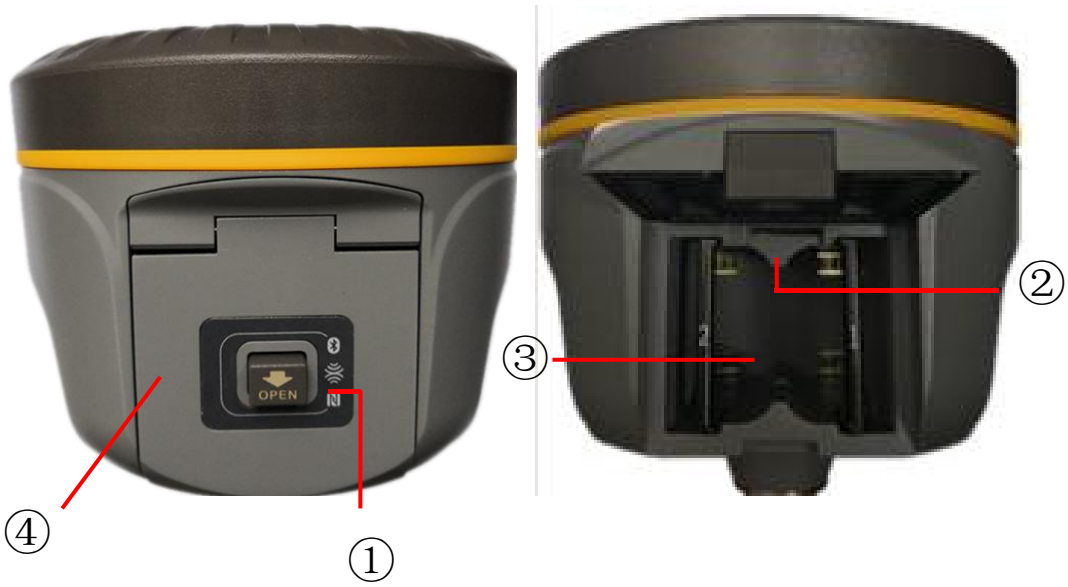
Reading this chapter, you can grasp the components, installation and the function of New G1 plus measuring system

§2.1 Front Components

Ref	Component	Description
①	**GNSS Antenna**	Grasps satellites signals
②	**Bluetooth Indicator**	Glows in red to indicate that Bluetooth connection has established between controller and receiver
③	**Data Indicator**	**UHF mode:** Flashes in red to indicate that the signal is receiving/transmitting with the interval **Network mode:** 1) Rapidly flashes in red to indicate that the receiver is dialing; 2) Flashes in red with the signal receiving/transmitting interval when successful dial **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

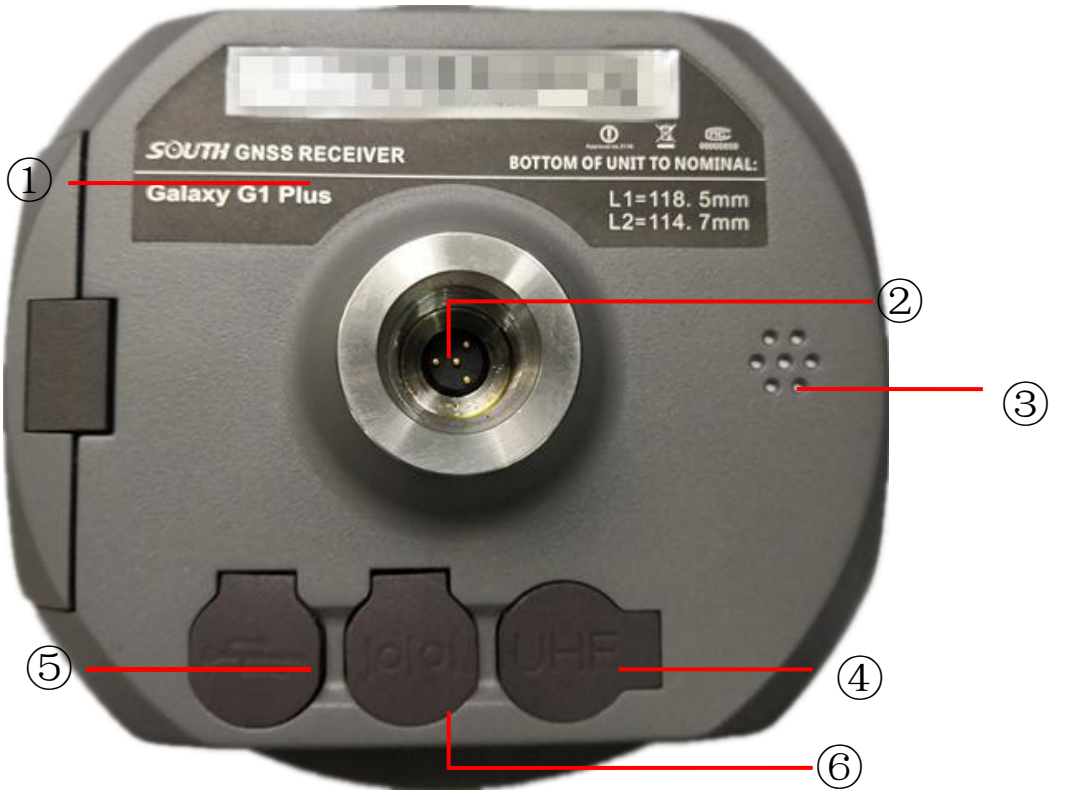
		connection
④	**Satellites Indicator**	Flashes in red to indicate that the satellites are tracking
⑤	**Function Button**	Switch the working mode, data link and USB mode
⑥	**Power Button**	Power on/off receiver, mode switching button

§2.2 Rear Components



Ref	Component	Description
①	**NFC label**	The place of NFC paired where we can stick controller to
②	**SIM card slot**	Where we can insert a SIM card when the receiver is set in GPRS mode
③	**Battery housing**	Installing the battery, supporting dual batteries hot swappable
④	**Battery cover**	Restore the cover after installing the battery to avoid the battery slips off

§2.3 Bottom Components



Ref	Component	Description
①	SN label	Apply for a registration code, Bluetooth ID
②	Screw hole/external battery socket	Fix the mainframe to the tribrach or the pole/connect to the specified battery pole.
③	Speaker	Mode setting and working status prompt
④	UHF antenna interface	Install UHF antenna
⑤	7-pin port	USB port, OTG interface and Ethernet port
⑥	5-pin 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

ChapterⅢ 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 Work Mode and data link selection

Work mode

Press F key once, the bluetooth, data and satellites indicators will blink together, and New G1 Plus will say “start to set work mode”, at this moment, press power key once to confirm, and then press F key one by one, NEW G1 Plus will say “base mode, rover mode and static mode” one by one, when you hear the working mode you need, press power key to confirm.

Data link

After confirming the work mode, for example, we set the New G1 Plus into base mode previously. Press F key once, the bluetooth, data and satellites indicators will blink together, and New G1 Plus will say “start to set work mode”, at this moment, press F key once again, New G1 plus will say “select data link”, and then press power key once to confirm, and then press F key one by one, New G1 plus will say “base internal radio mode, base gprs mode, base external mode and base wifi mode” one by one, when you hear the data link you need, press power key to confirm.

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

§3.4 USB and WIFI mode selection

USB mode

Press F key once, the bluetooth, data and satellites indicators will blink together, and New G1 plus will say “start to set work mode”, at this moment, press F key one bye one until New G1 plus says “start to set USB mode”, and then press power key once to confirm, and then press F key one by one, New G1 plus will say “USB disk, USB network port mode” one by one, when you hear the USB mode you need, press power key to confirm.

USB disk is used to connect New G1 plus’s internal memory; USB network port mode is used to connect to New G1 plus’s WEB UI by cable connection

WIFI mode

Press F key once, the bluetooth, data and satellites indicators will blink together, and New G1 plus will say “start to set work mode”, at this moment, press F key one bye one until New G1 plus says “set WIFI working mode”, and then press power key once to confirm, and then press F key one by one, New G1 plus will say “Access point mode, Client mode” one by one, when you hear the WIFI mode you need, press power key to confirm.

Access point mode is for New G1 plus to allow other devices to connect New G1 plus’s WEB UI by WIFI connection; Client mode is for New G1 plus to connect other WIFI hot spot so that it’ll have access to the internet.

§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 New G1 plus 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
- Network module checking (GPRS module checking)
- UHF module checking
- Sensors checking
- WiFi module checking
- Bluetooth module checking

If all the modules are normal during self-check, the instrument will get into the state of power-on.

§3.6 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), New G1 plus will get into factory reset progress with voice message saying “start to restore factory default”, at this moment, release power button, the instrument will perform factory reset automatically. After this progress complete, the instrument will restart automatically with the factory default settings.

ChapterⅣ Web UI Management

§4.1 Overview

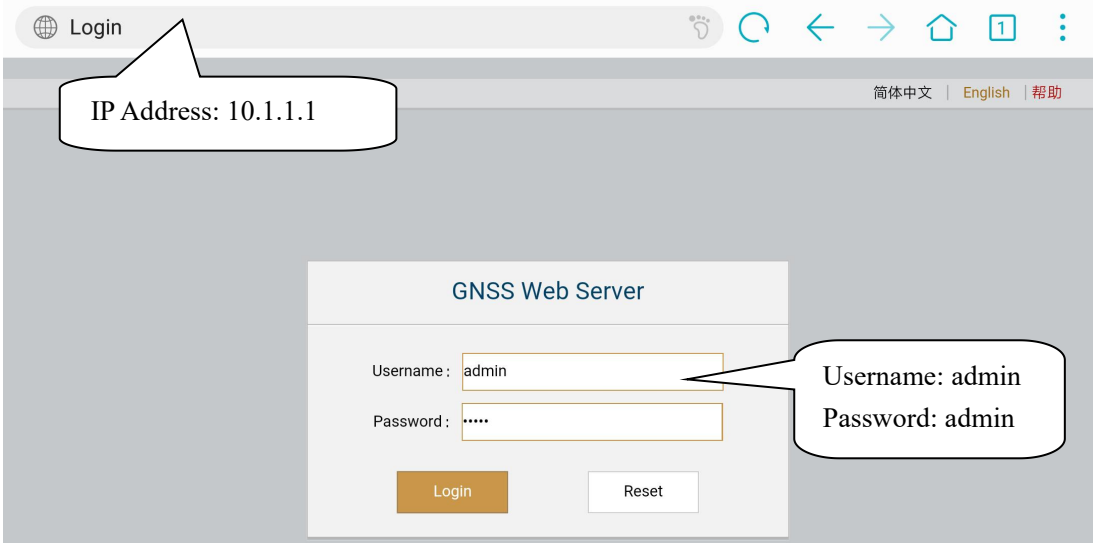
Because of using the smart embedded Linux operating system and SOUTH intelligent cloud technology, the web UI allows users to configure and monitor the status of New G1 plus in real-time. The accessing way is not only by WiFi connection, but also can be USB mode.

§4.2 Access by WiFi

The WIFI hotspot is default broadcasted by New G1 plus, 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 New G1 plus 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

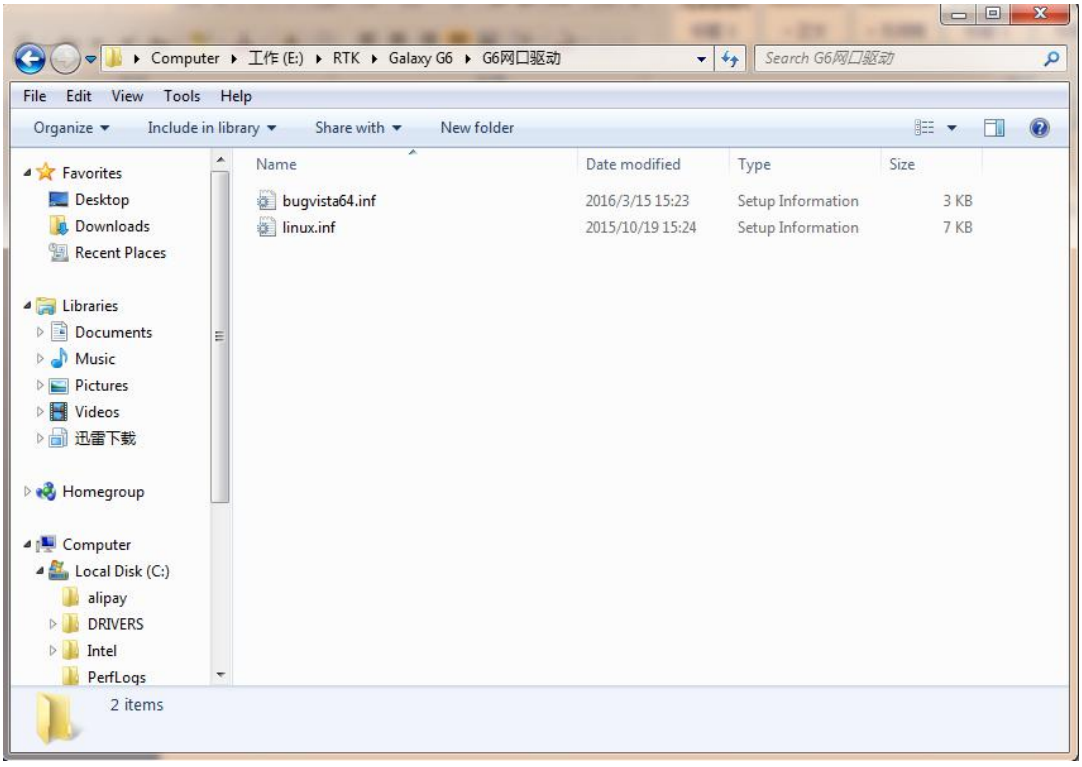
On this mode, the USB port (7-pin) of New G1 plus must work as an Ethernet port, then internal

web UI shall be accessed via USB cable connection with computer.

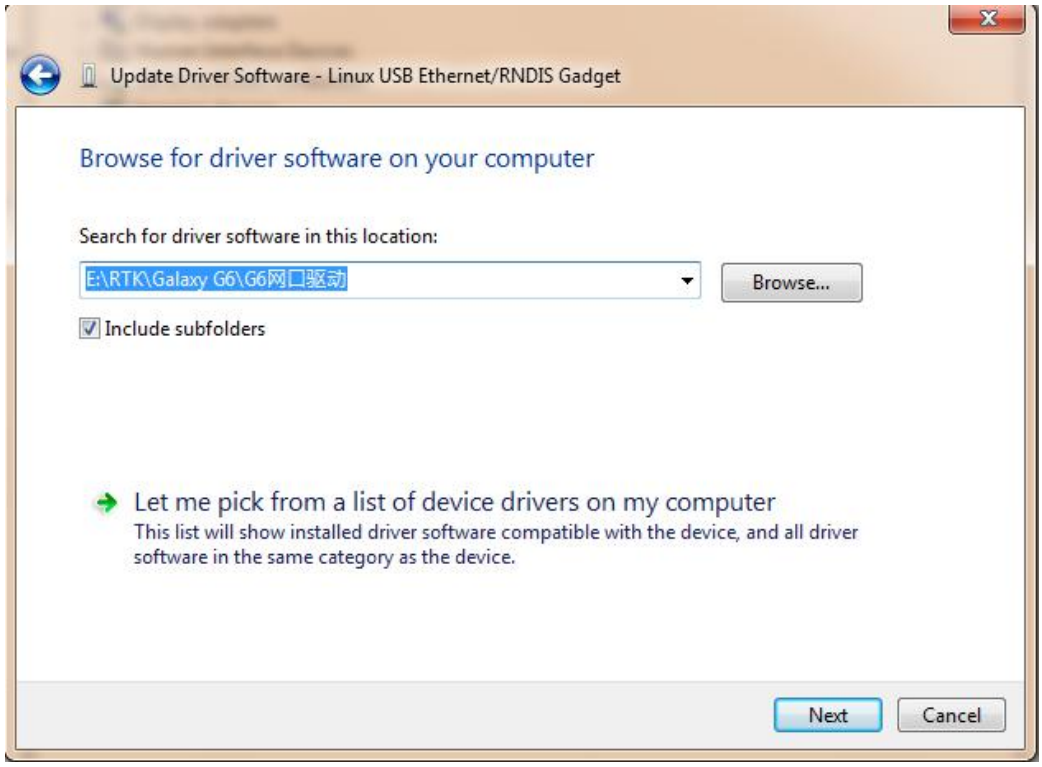
First of all, a corresponding driver is required to install to the computer, then this function could be activated.

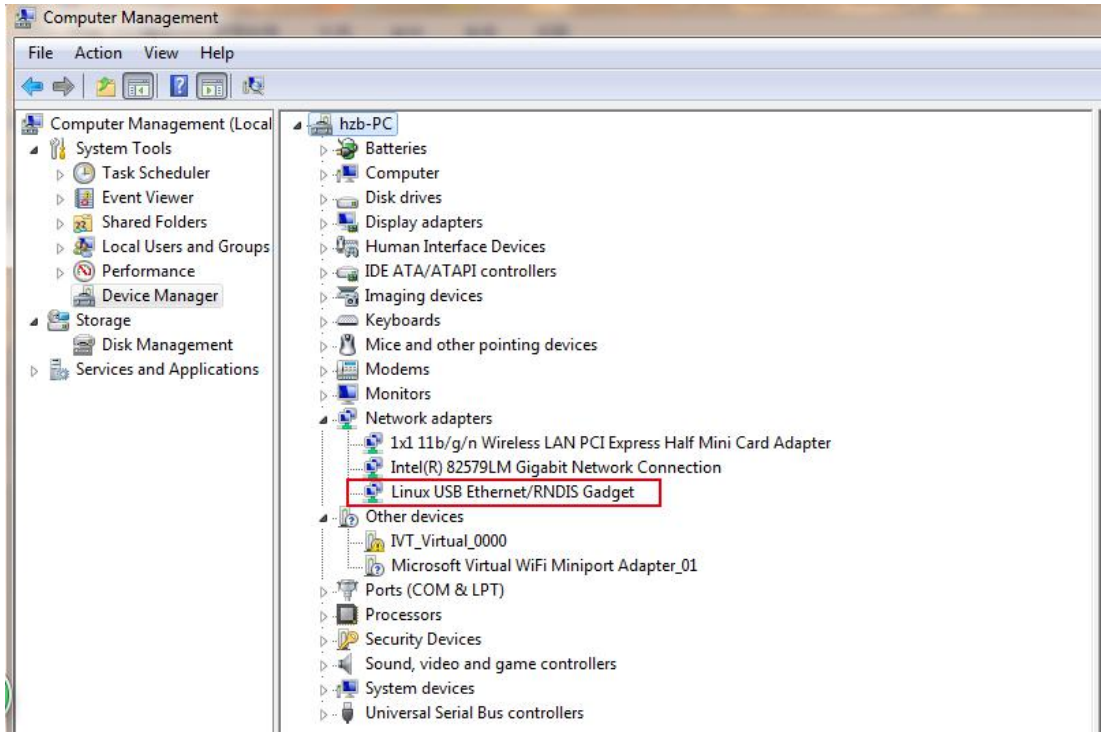
Due to different operating system is installed on computer, the drivers should be applied to a suitable one. The file bugvista64.inf is applied to 64bit operating system, and linux.inf is for 32bit operating system.

Make sure that the USB port (7-pin) is switched into USB network port (please refer to section 3.5, USB mode setting).



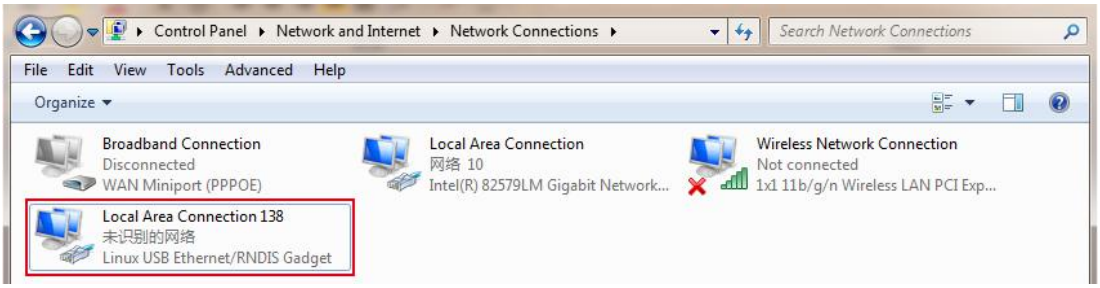
Choose the folder which contains the drivers





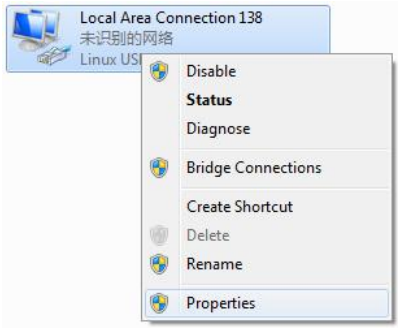
NOTE: *The driver can be downloaded from official website automatically or please contact with us for more supports.*

If the driver has been successfully installed, the USB port of New G1 plus 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 New G1 plus receiver to computer via USB Ethernet port.

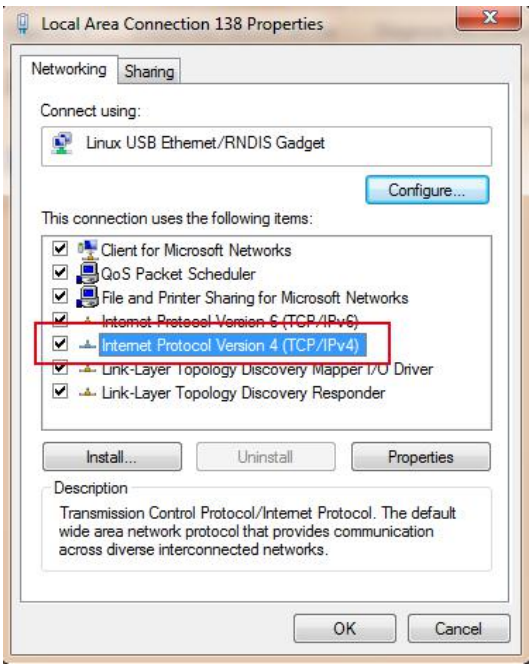


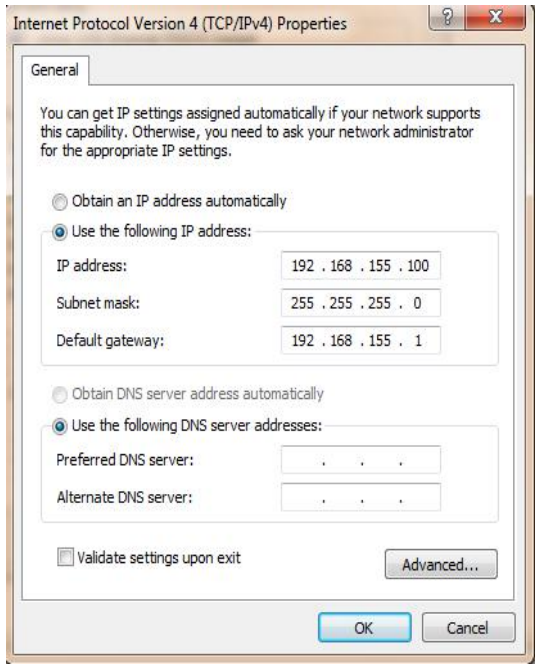
However, sometimes the computer cannot detect the receiver by USB Ethernet port because there is something wrong with acquiring IP automatically, therefore, we need to do something to avoid such problem, that is to set a fixed LAN IP for the connection:

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

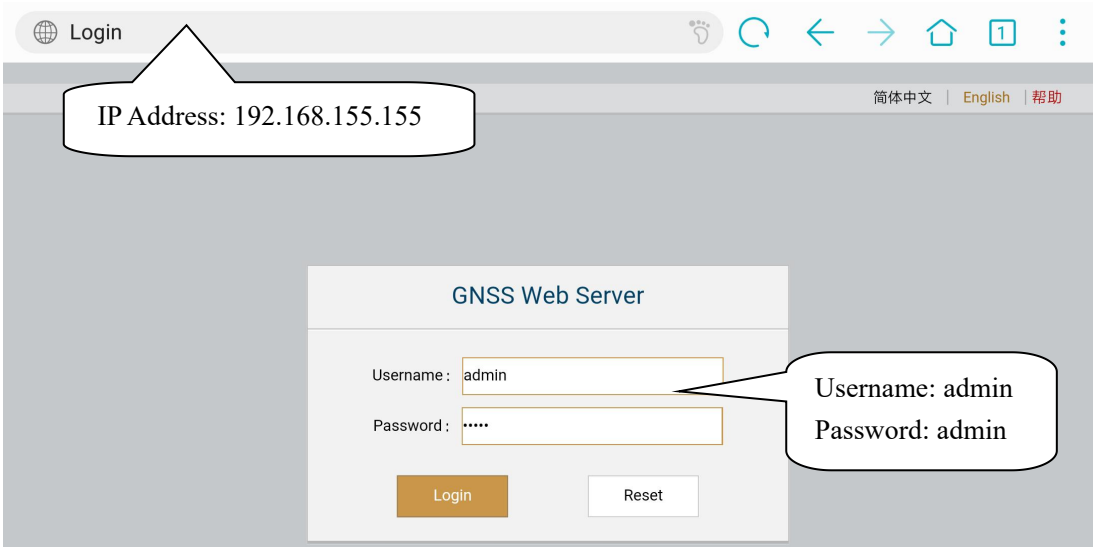


Then double click on Internet Protocol Version 4 (TCP/IPv4) option or click on properties button to call out Internet Protocol Version 4 (TCP/IPv4) properties window, set the fixed LAN IP address as shown in following, then click OK button and confirm the settings, return to the IE browser and use the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



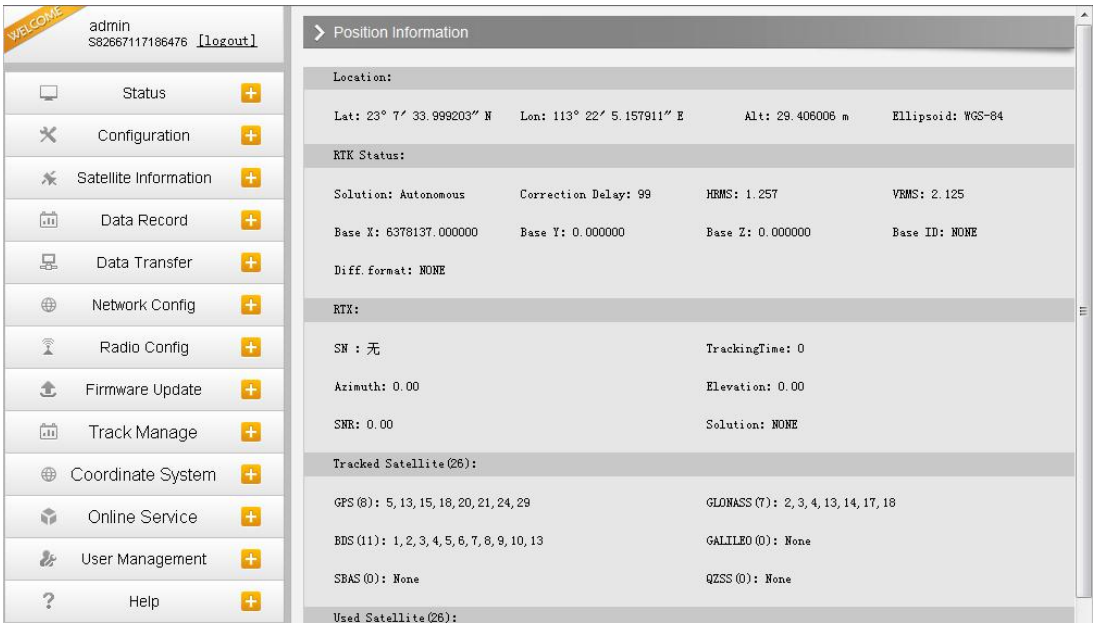
Remote Login

If users would like to remote login the web UI of New G1 plus, then New G1 plus has to connect to the internet and forward its 80 port to the public network. For example, if the IP address 222.196.35.76 is the public network IP which New G1 plus has connected, and the 80 port of New G1 plus has been bounded with 8000 in public network, then users can input the public network IP address into IE explorer along with the forwarding port for login. (http:// 222.196.35.76:8000)

NOTE: The IE explorer is recommended to use for the Web UI login.

§4.4 Web UI main interface

After login the Web UI management of New G1 plus 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 for New G1 plus

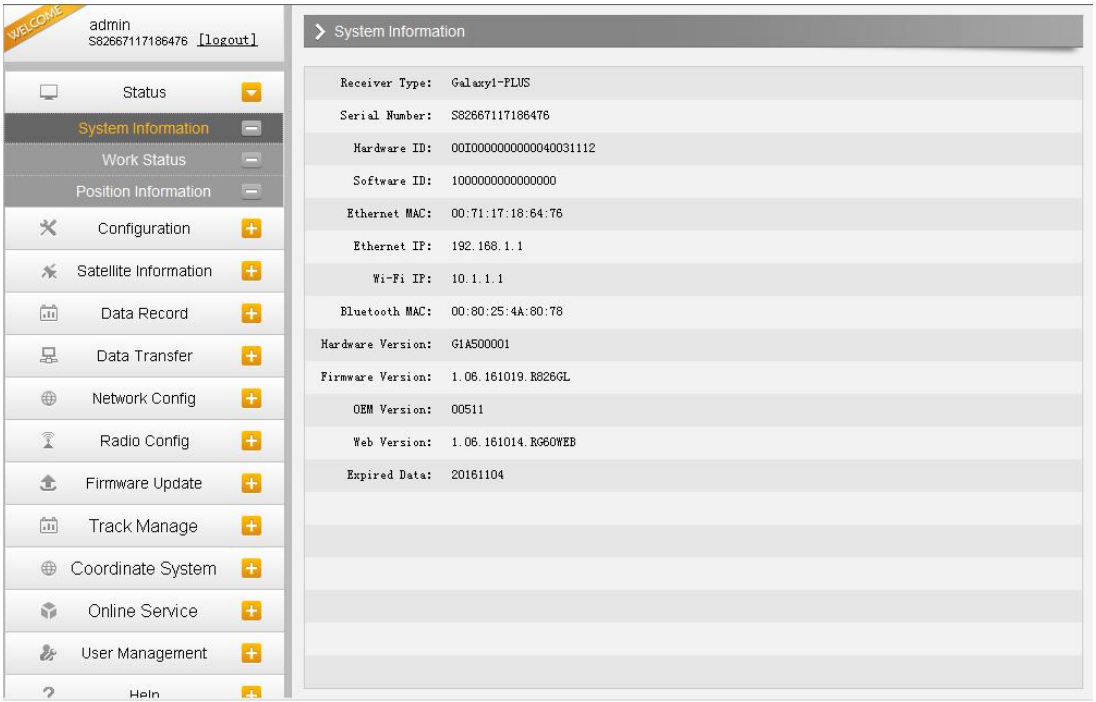
	Online Service	Upload data onto a server in real-time
	User Management	Add and manage the Web UI users
	Help	Offers solutions

§4.4.1 Status

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

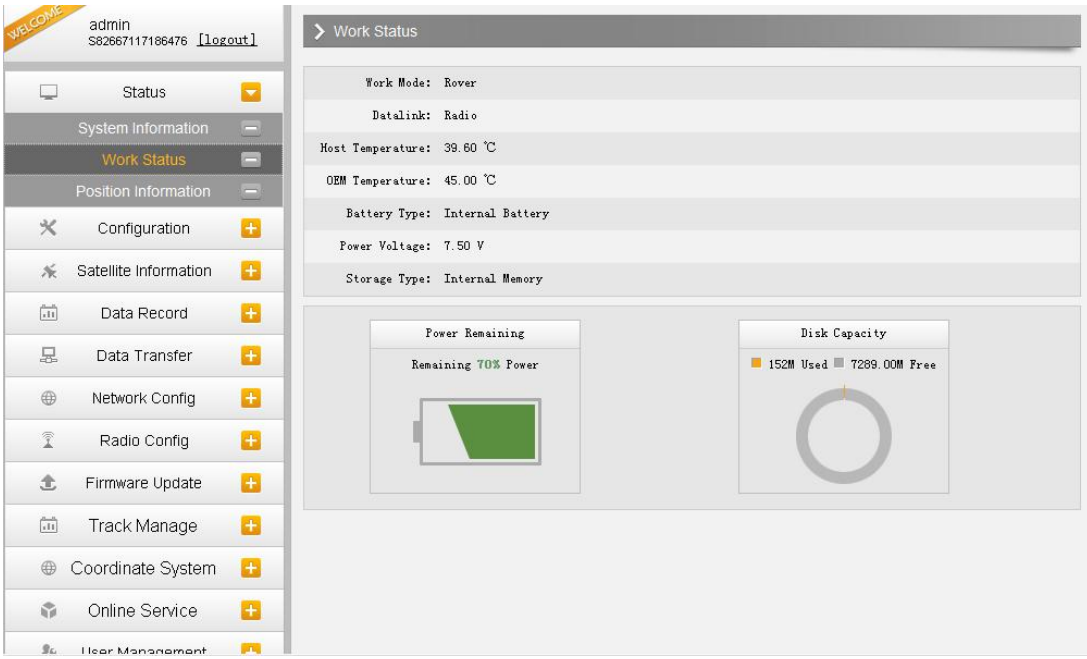
System Information

In this page, all the information of New G1 plus is diplayed such as serial number, hardware ID, MAC address, firmware version and so on.



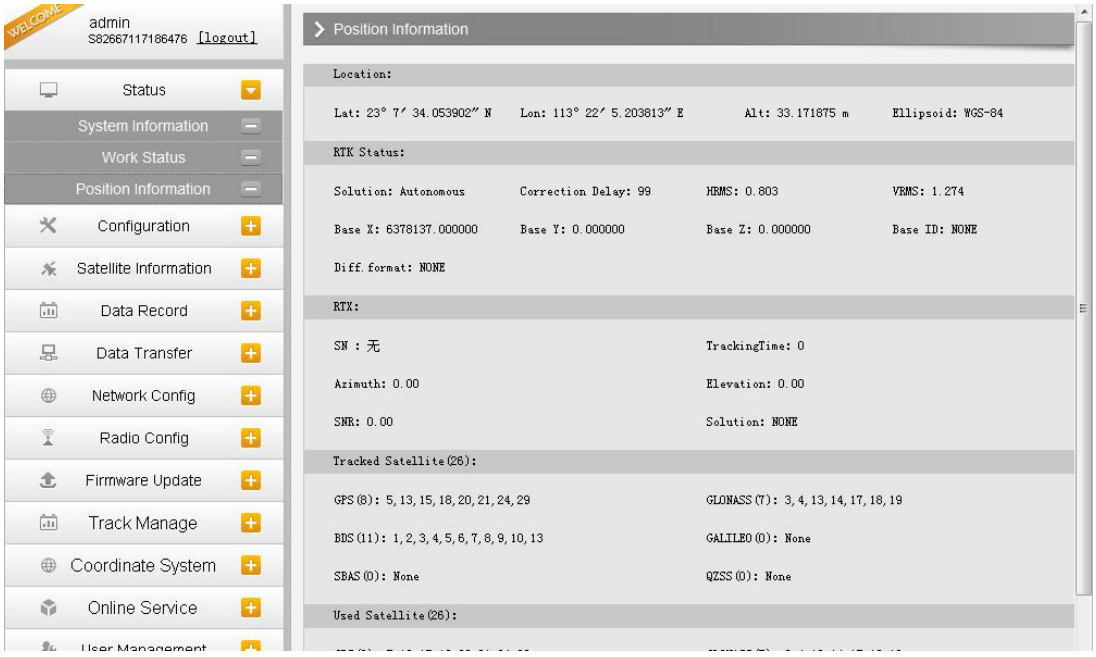
Work Status

The physical state of New G1 plus 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

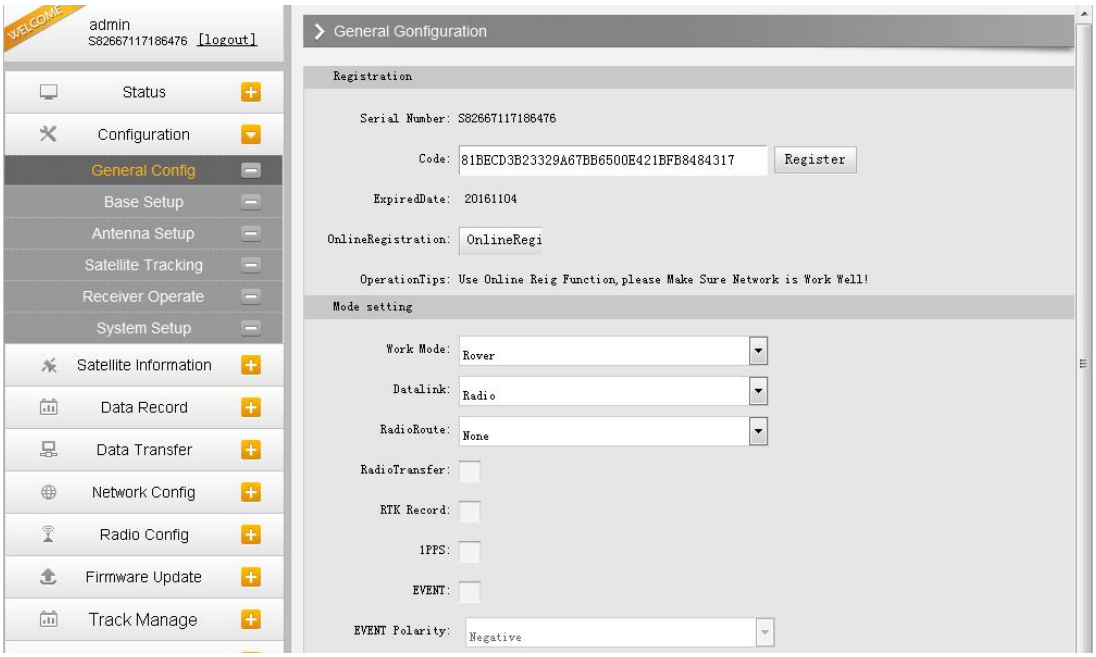


§4.4.2 Configuration

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 New G1 plus under Configuration menu, and all the settings are immediate effect after saving.

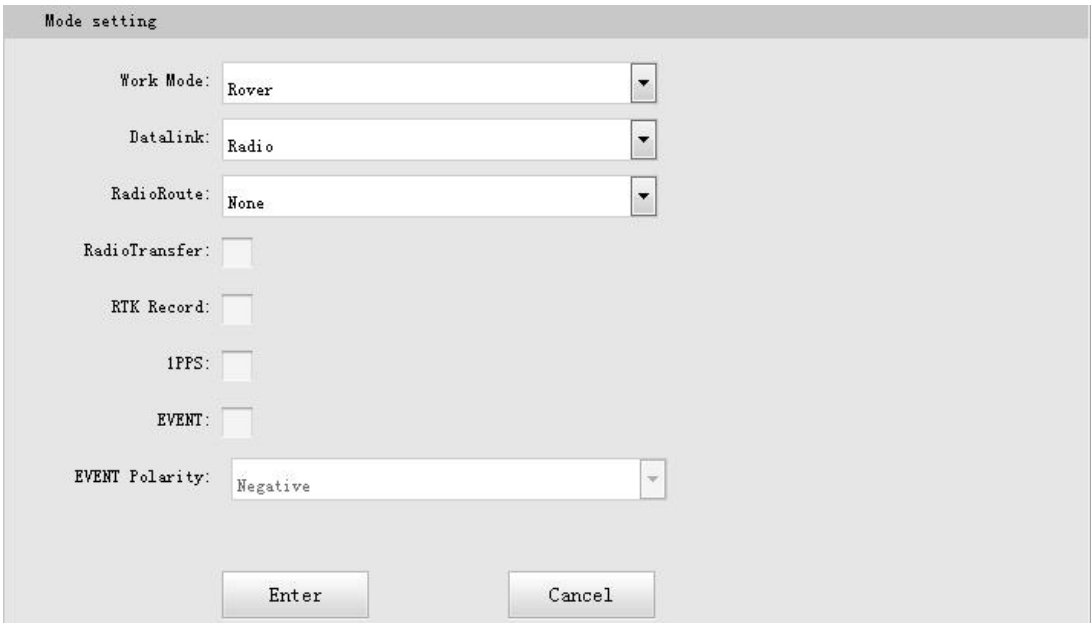
General Config

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



If the code of New G1 plus has expired or is going to be run out, please provide the serial number of your New G1 plus for us to apply for another available code, then input the code into the blank or register the receiver online.

New G1 plus 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 New G1 plus.



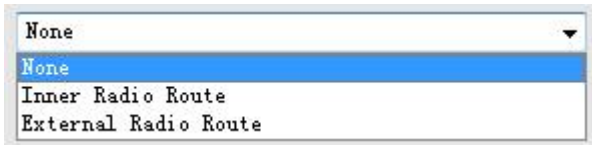
Work Mode: There are Rover, Base and Static contained in this dropdown list

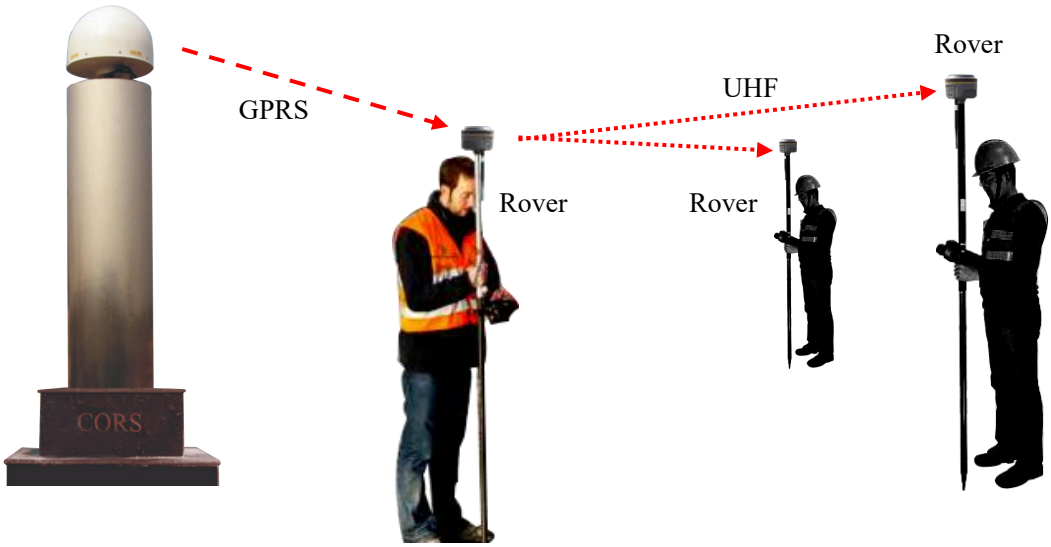
Datalink: Pull down the list, there will be all kinds of options for datalink, such as radio, Network, External, Bluetooth, WIFI and CSD.

Radio 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.

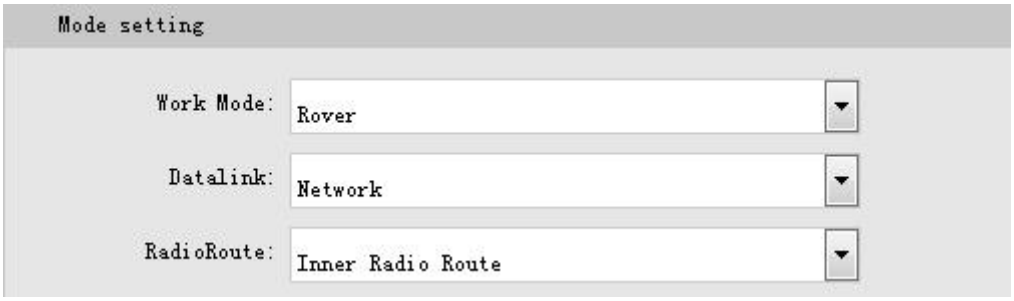
This feature is only available on Rover mode.



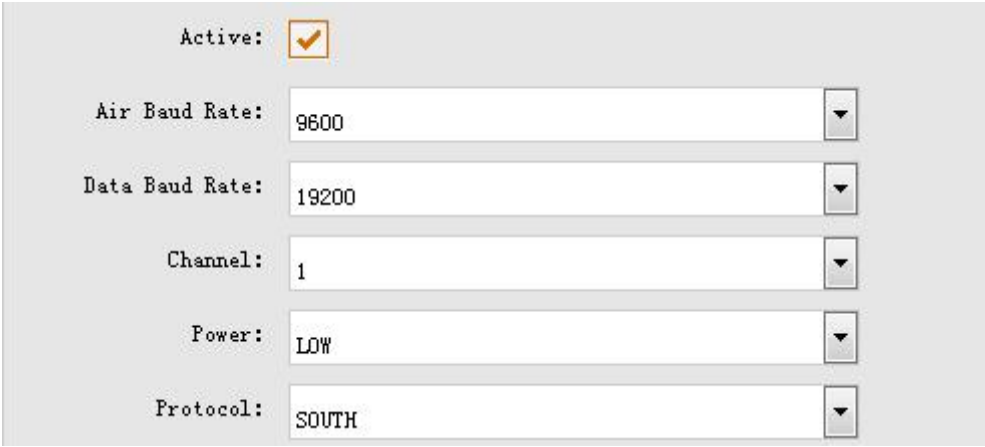


Operation:

1, choose “Inner Radio Route” and click “Enter” button to confirm the settings.

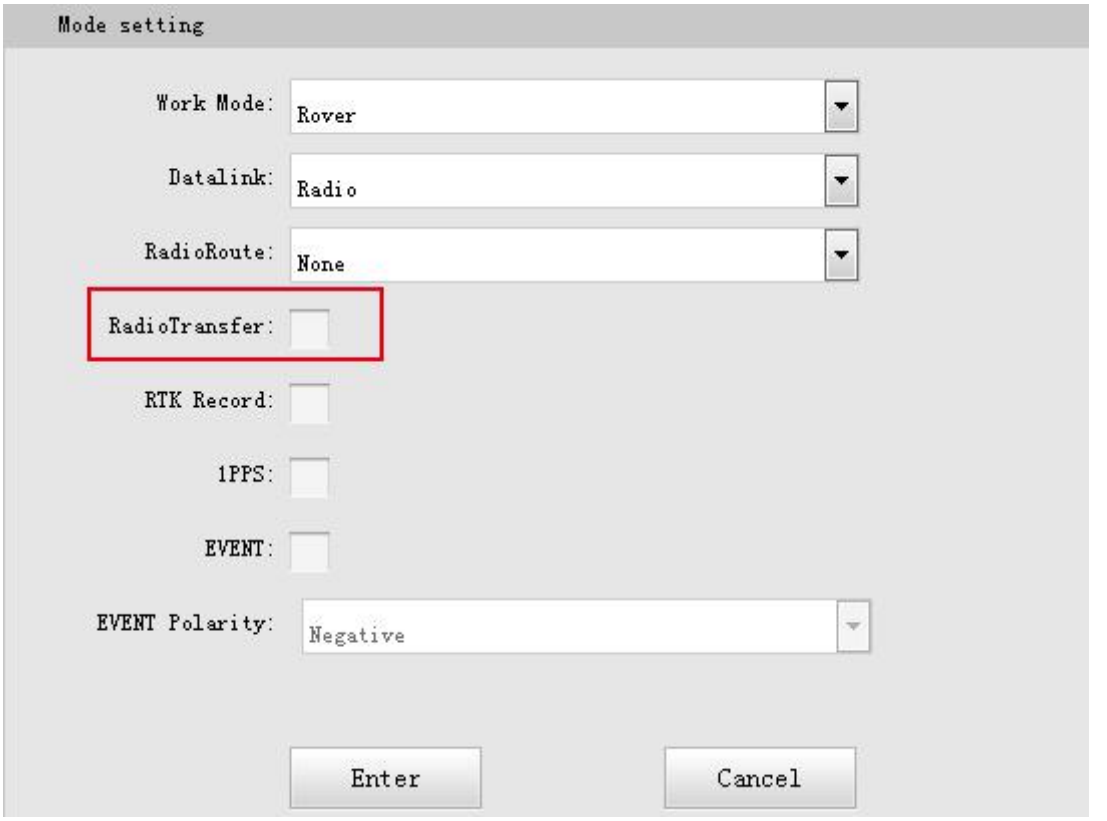


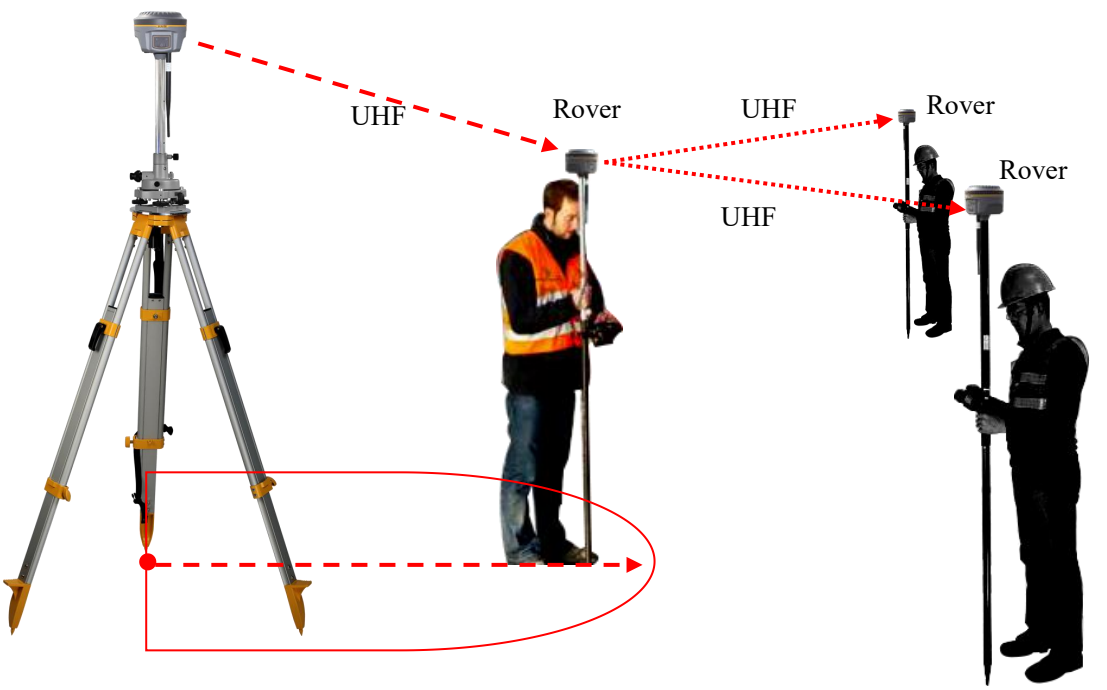
2, go to “Radio Config” page, check the channel, communication protocol and the frequency point of each channel.



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

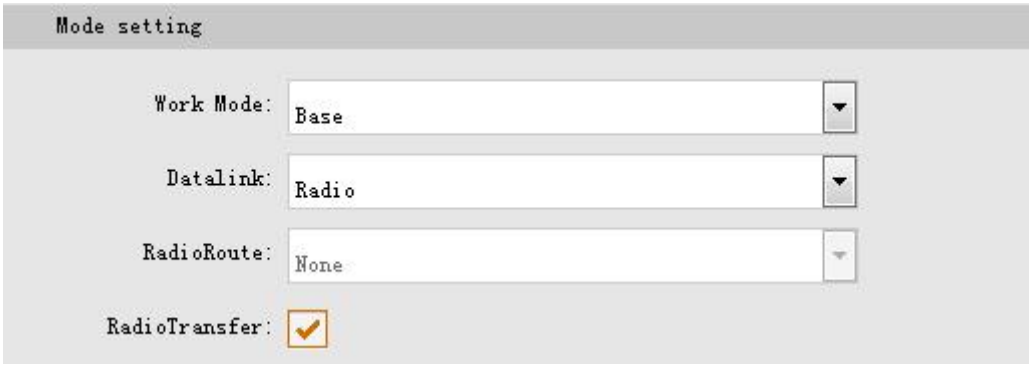
RadioTransfer: This is the function that New G1 plus is able to transfer the correction from Base station to the other rovers with the internal UHF, definitely, New G1 plus can work as a radio repeater.



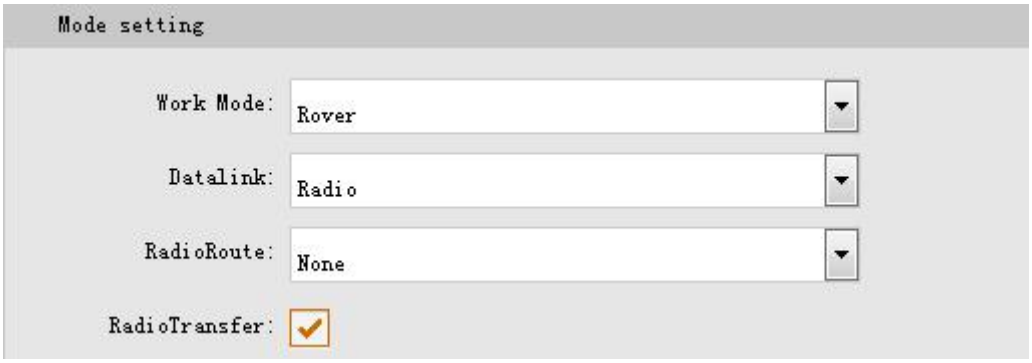


Operation:

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 recording in base mode or rover mode for post-processing

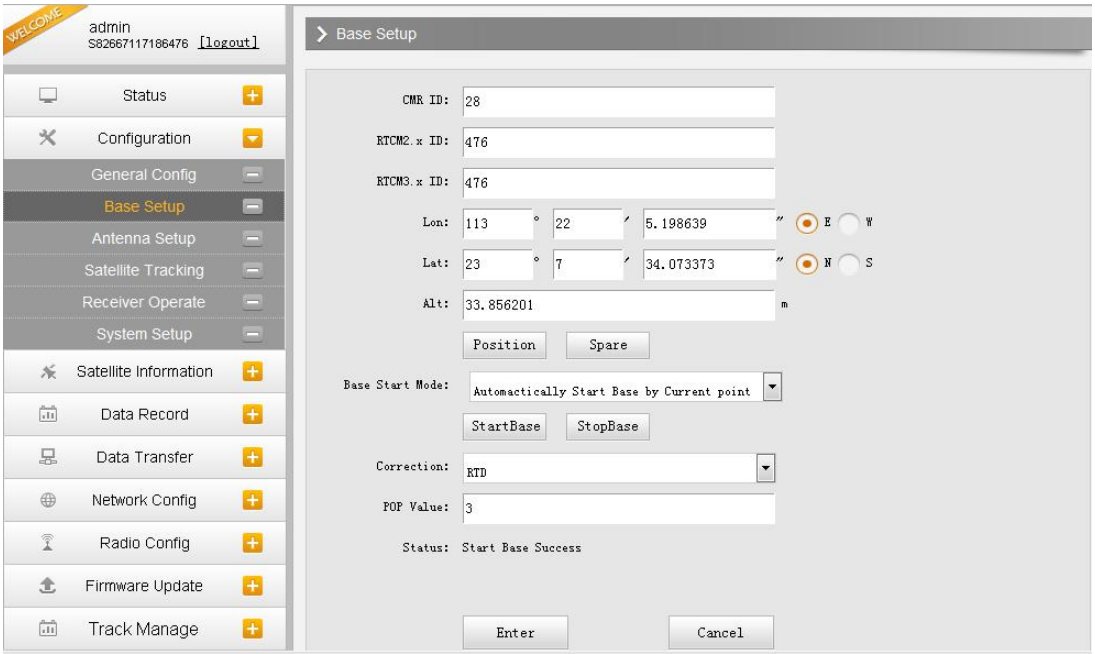
1 PPS: This option is for the 1 pulse per second output

EVENT: This option is for the EVENT marker input

EVENT Polarity: EVENT input method.

Base Setup

When New G1 plus 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.

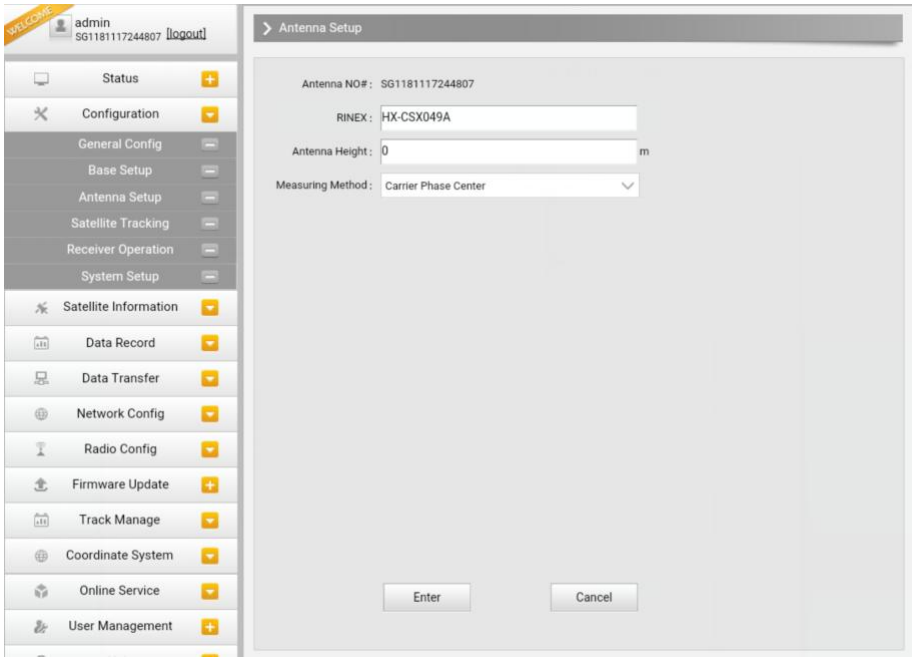
Correction: Here contains the global general used correction formats including RTD,RTCM23, RTCM30, RTCM32, CMR and SCMRx

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

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

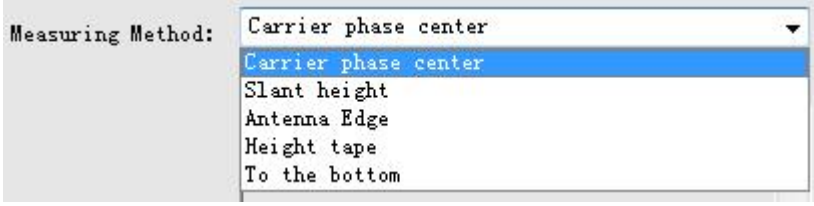
Antenna Setup

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



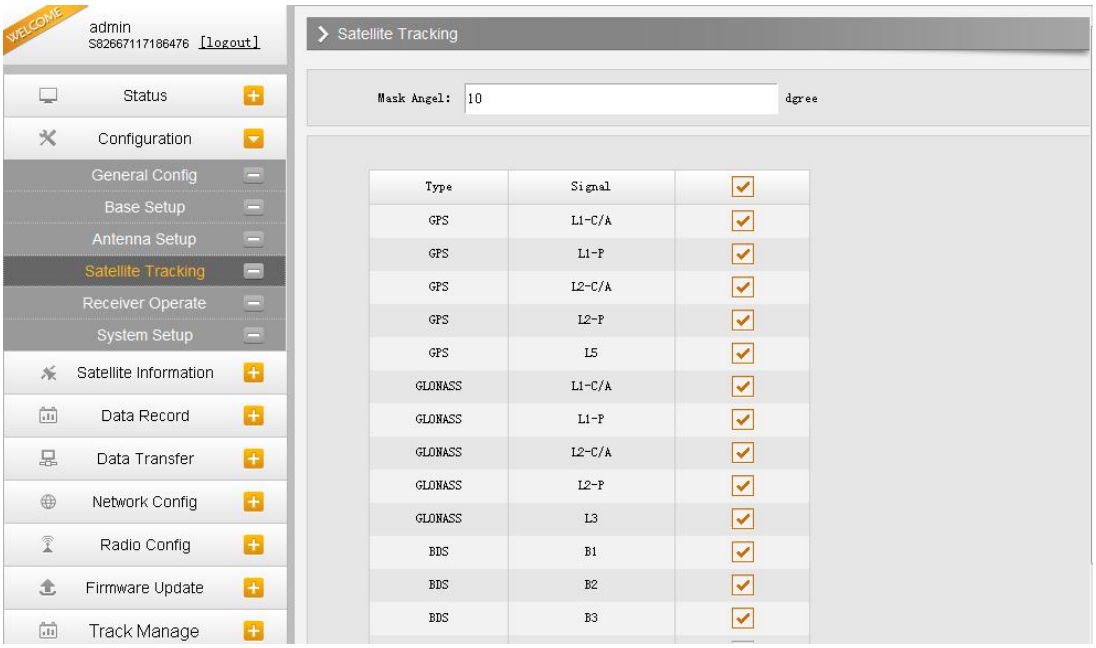
Antenna Height: This is the value for height of antenna while surveying.

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



Satellite Tracking

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



Receiver Operate

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

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

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

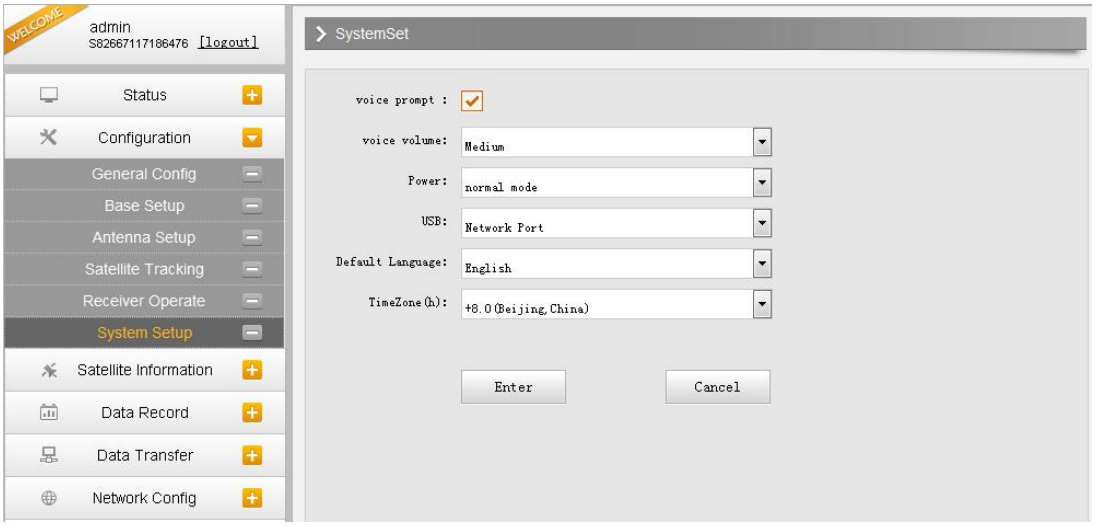
Factory Default: Click this button to bring the receiver back to factory default setting.

Reboot: Click this button to restart the receiver.

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

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 New G1 plus, uncheck it to turn off the voice guid.

V**oice Volume:** Define the voice volume for New G1 plus's speaker.

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

USB: This is used to configure New G1 plus 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 New G1 plus which associates with voice guid.

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

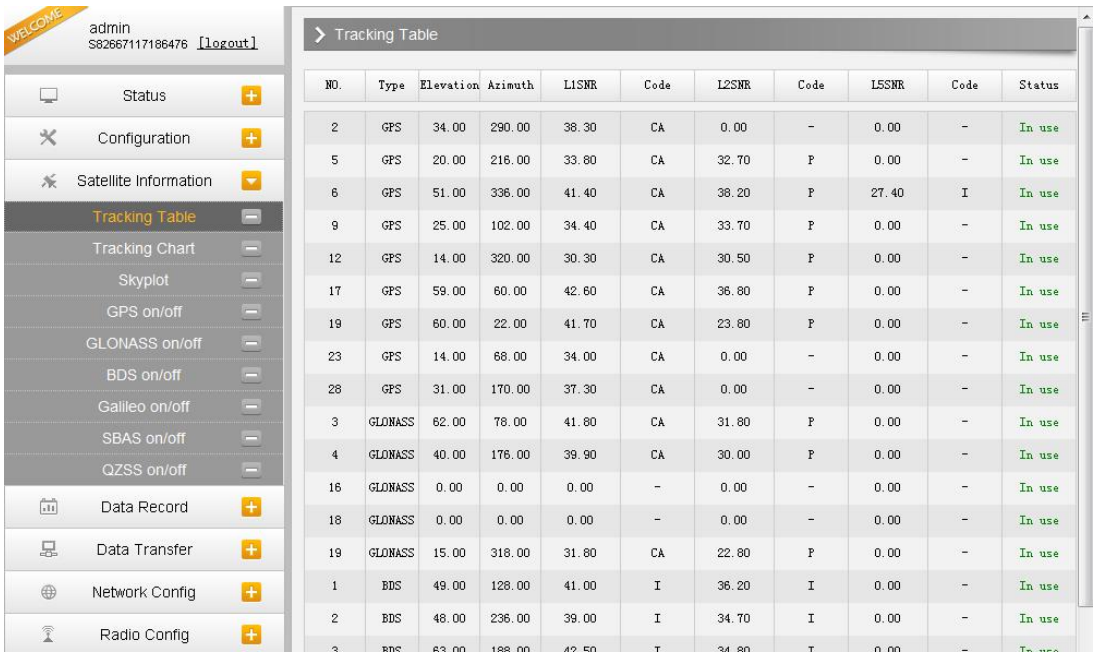
TimeZone(h): Use this to setup the corresponding time zone for your country or area.

§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

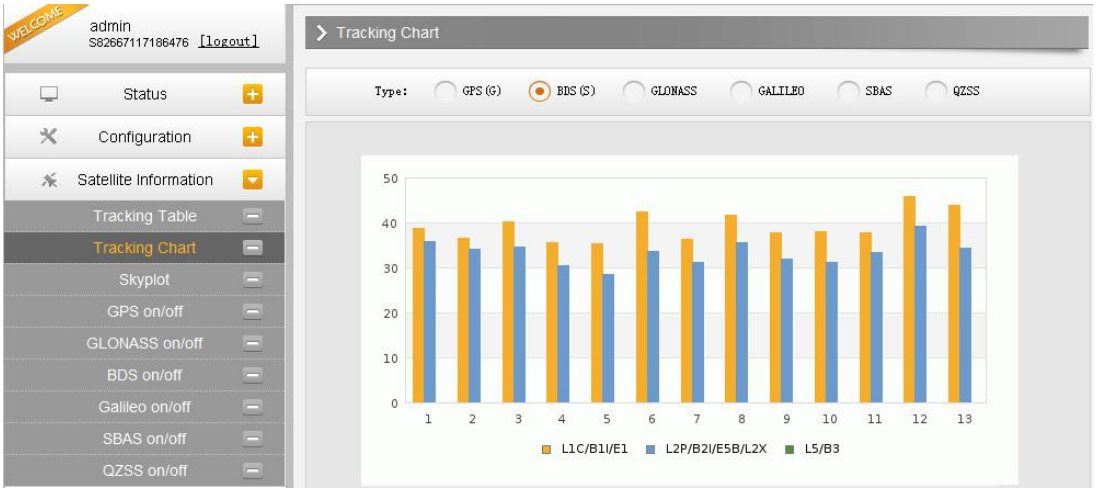
Here is the table to list all current used satellites and the other information for these satellites.



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

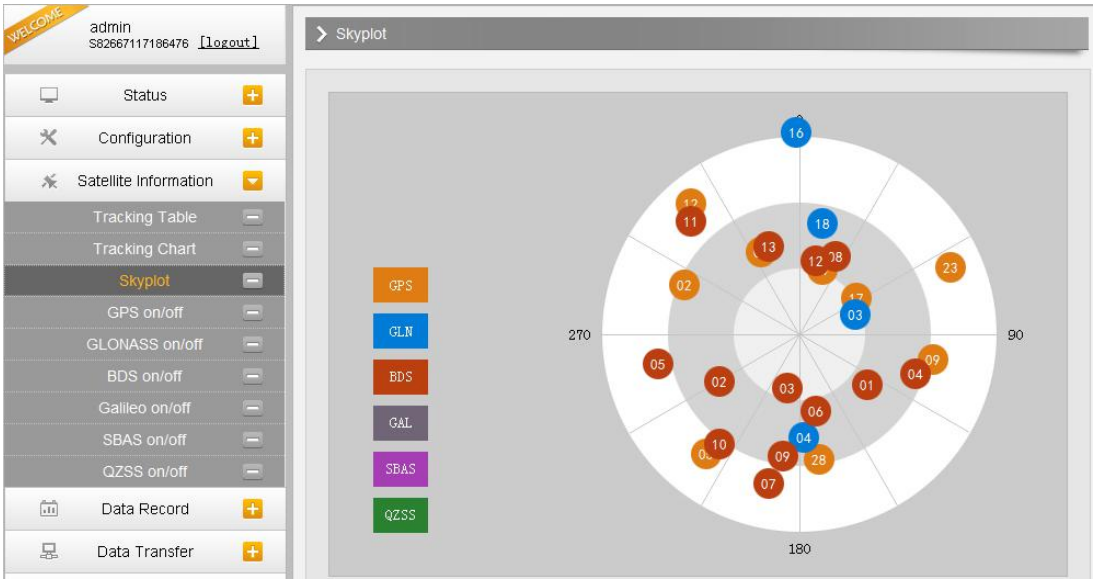
Tracking Chart

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



Skyplot

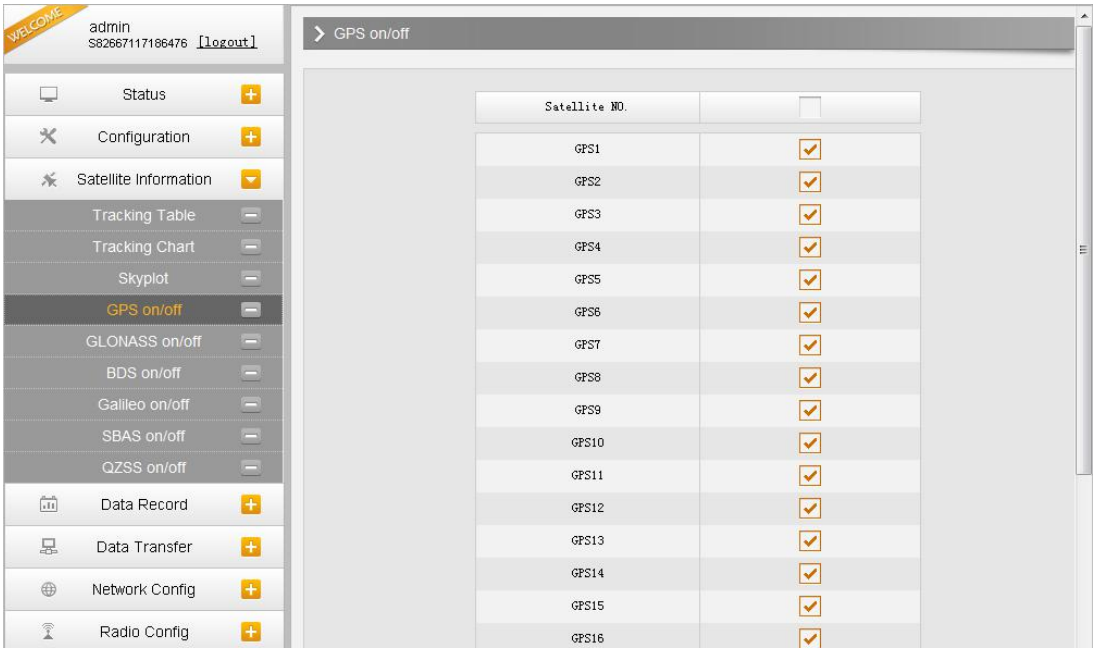
In this page, all the tracking satellires are shown on the skypolt, this let users intuitively view and know where the current position of satellite is.



GPS on/off

For all the running GNSS constellations or the augmentation system, New G1 plus 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.

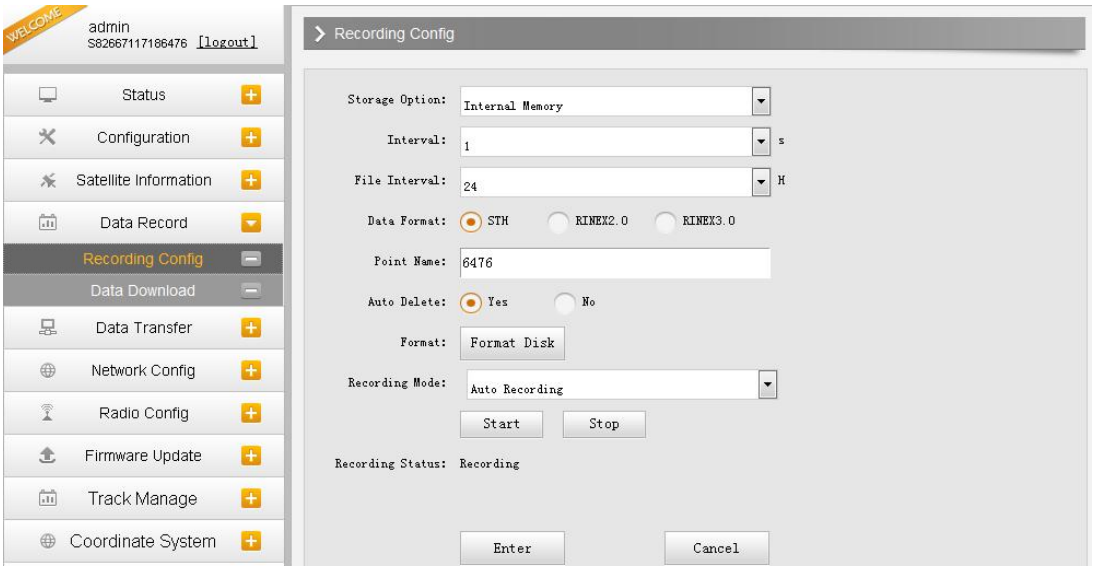


§4.4.4 Data Record

The “Data Record” performance is mainly used to configure all the parameters for receiver in static mode. Much more operations can be done on New G1 plus 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 New G1 plus.

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

Data Format: Here are 3 options to selected for New G1 plus 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 New G1 plus to delete the previous data files automatically if the memory is full.

Format: Click this button to format the internal memory for New G1 plus.

Recording Mode: Here are 2 options to configure New G1 plus to record raw data automatically or not if it achieves the sampling conditions.

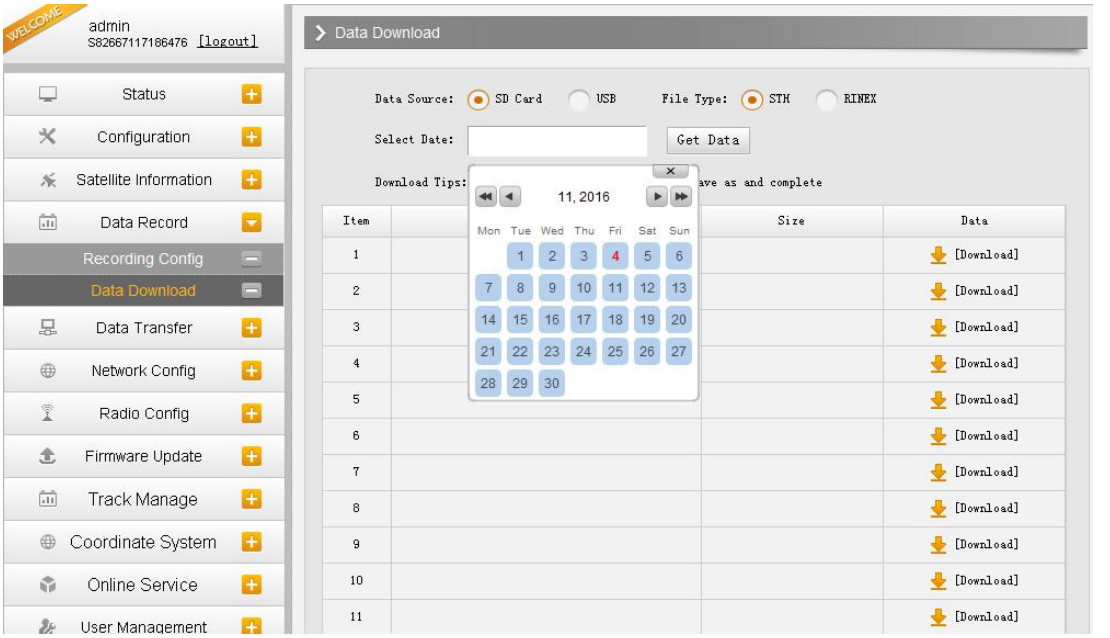
Start/Stop: Click these buttons to start recording or strop recording the raw data.

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

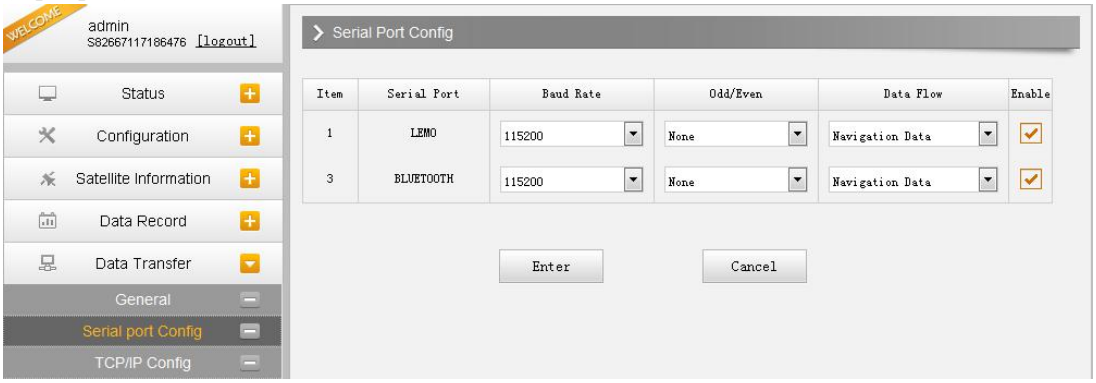
This performance contains General, Serial Port Config, TCP/IP Config, NTRIP Config and Data Flow Config. The "Data Transfer" allows to configure the output mode for raw observation data and differential data, as well as to the NTRIP performance configuration.

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.

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.

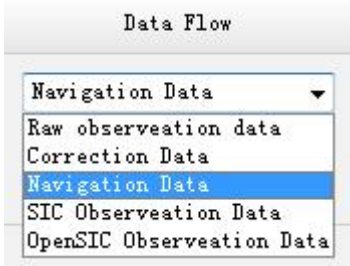
Raw observation data: This is the raw observation data straight from OEM board.

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.

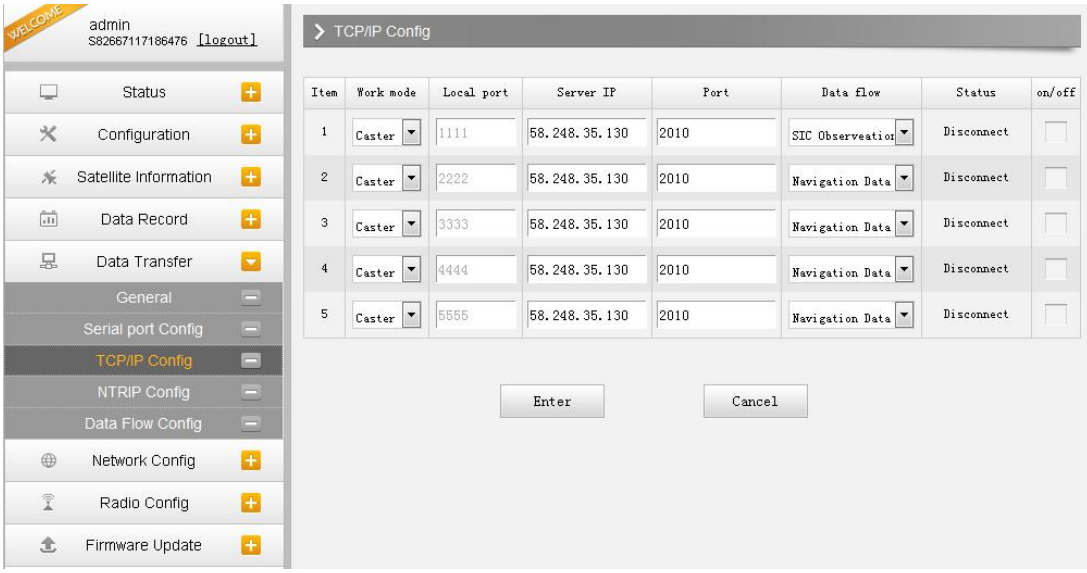


TCP/IP Config

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.

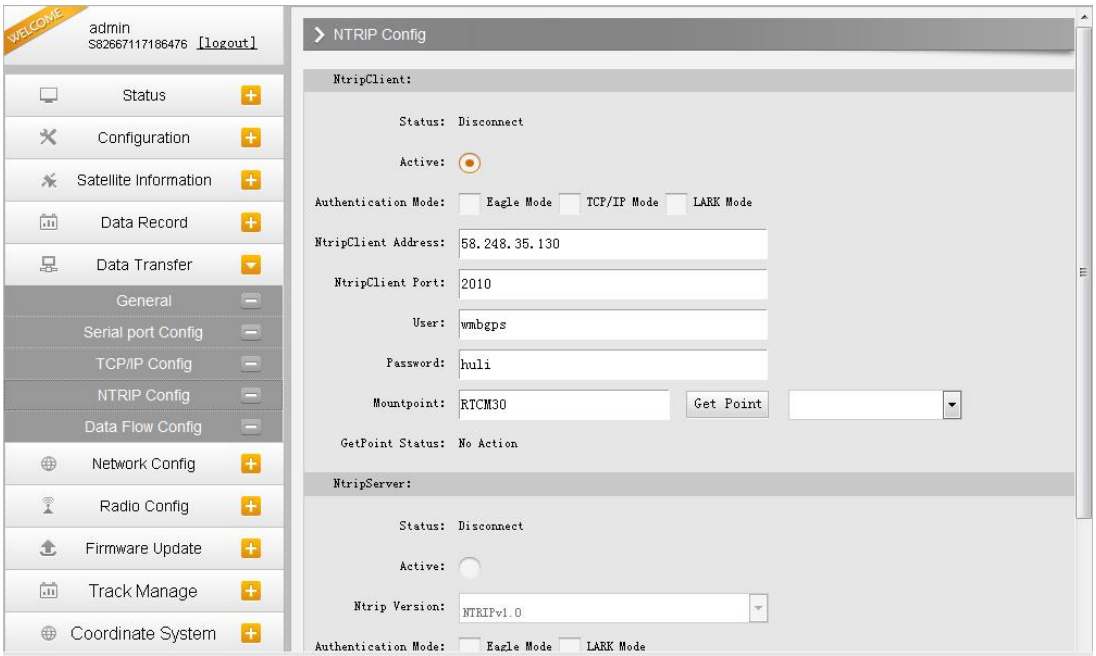
Caster: If this working mode is selected, NEW G1 PLUS will be a client to upload the data to a specify server if it connects to the internet by WIFI or GPRS connection with SIM card inserted. Input the specified IP and port for server, and the data format what is uploaded. Then users are able to see the uploaded data on server.

Server: New G1 plus 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 NEW G1 PLUS through the IP from receiver.



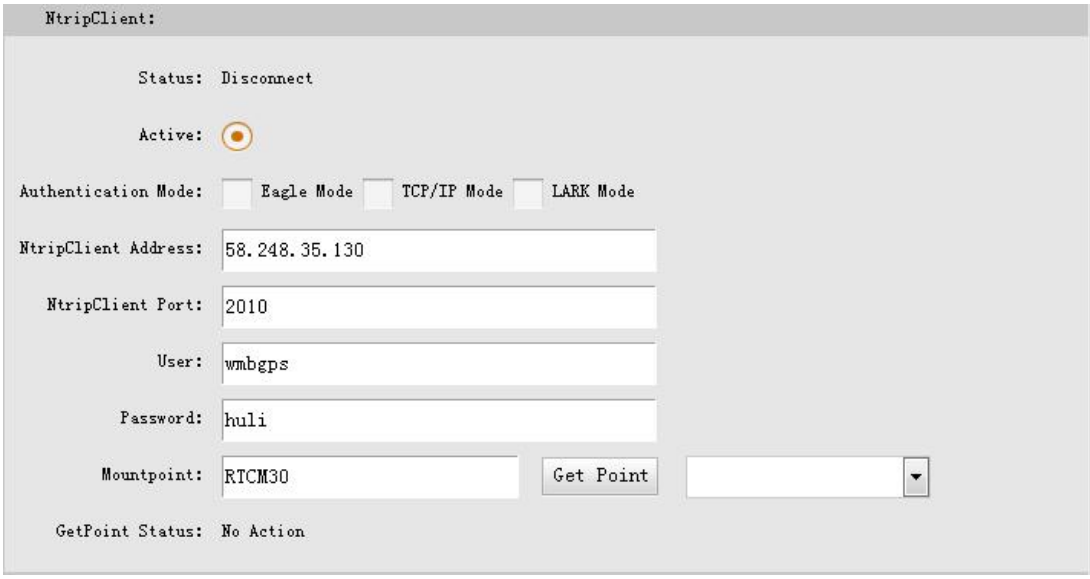
NTRIP Config

This is used to configure the NTRIP performance while receiver is going to connect to internet. New G1 plus supports complete NTRIP performance including NTRIP Client, NTRIP Server and NTRIP Caster.



NtripClient

This is the general used function for rover set in GPRS mode. At the field of NtripClient, the specify IP address, access port of reference station, as well as the assigned username and password shall be input for the NTRIP connection.



Status: This field will display the status of NTRIP connection, connect or disconnect.

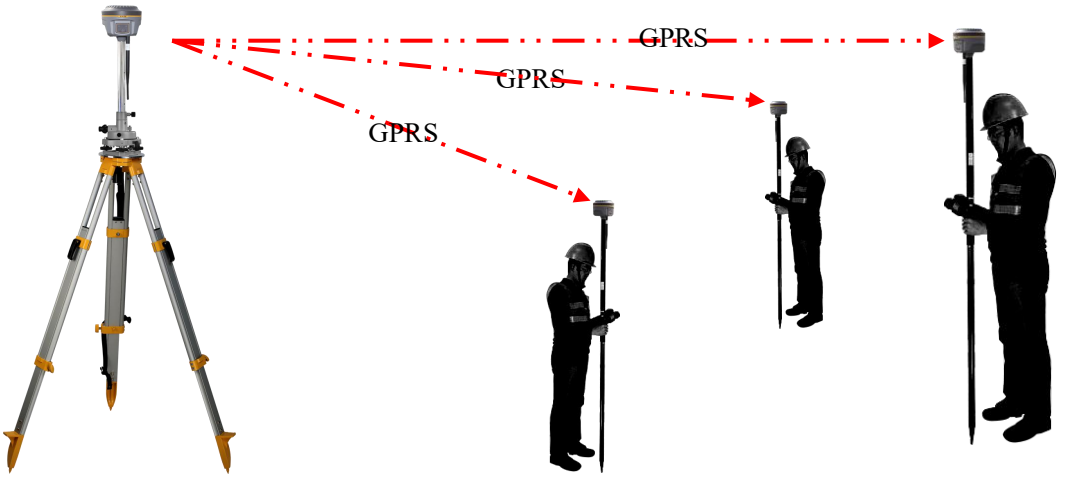
Active: Check on this circle to activate this function.

Authentication Mode: This includes Eagle Mode, TCP/IP Mode and LARK Mode.

① Eagle Mode is SOUTH standard mode, usually, this mode is used on the case of both Base and Rover are using GPRS mode.

② TCP/IP Mode is for private network use.

③ LARK Mode, which is a new technology on GPRS use, it is similar to GSM dial. This mode no longer rely on a CORS server that the corrections are transmitted by GPRS network. Besides, it is different from the feature of Caster.



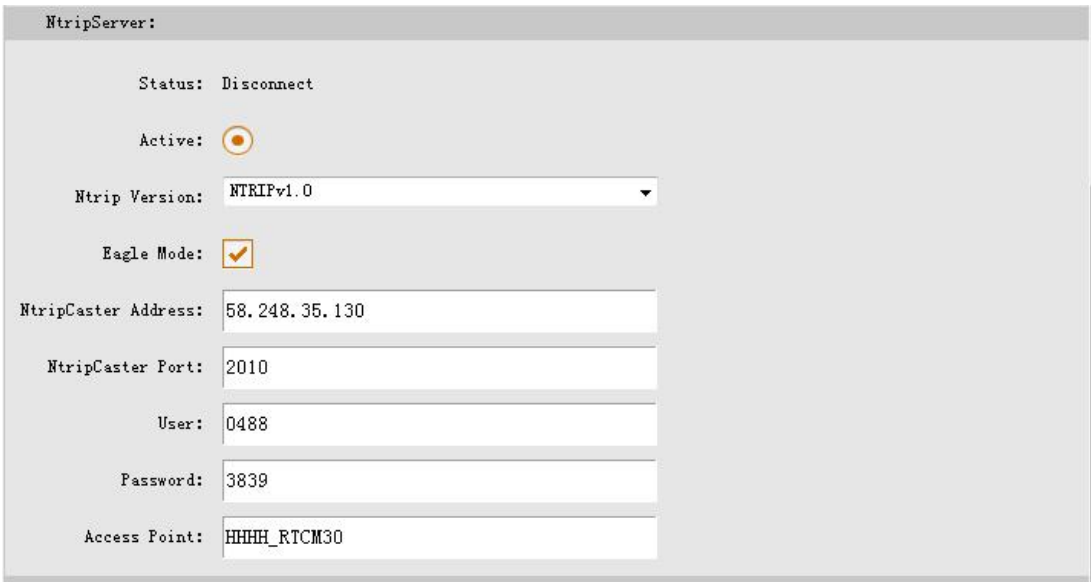
The other fields are the standard configuration for NTRIP connection, IP, port, username and password, after this information is input into the corresponding field, click on Get Point button to download the source table from server, then choose a proper mountpoint to access.

NtripServer

This configuration is used in Base+GPRS mode that Base station will transfer its correction onto the server as long as it connects to internet, then Rover can download the base's correction from server for use. Or use the LARK mode.

Ntrip Version: This field provides NTRIPv1.0 and NTRIPv2.0 for optional.

Access Point: This field is allowed to user-defined the correction format which base will transfer to the server, such as HHHH_RTCM30

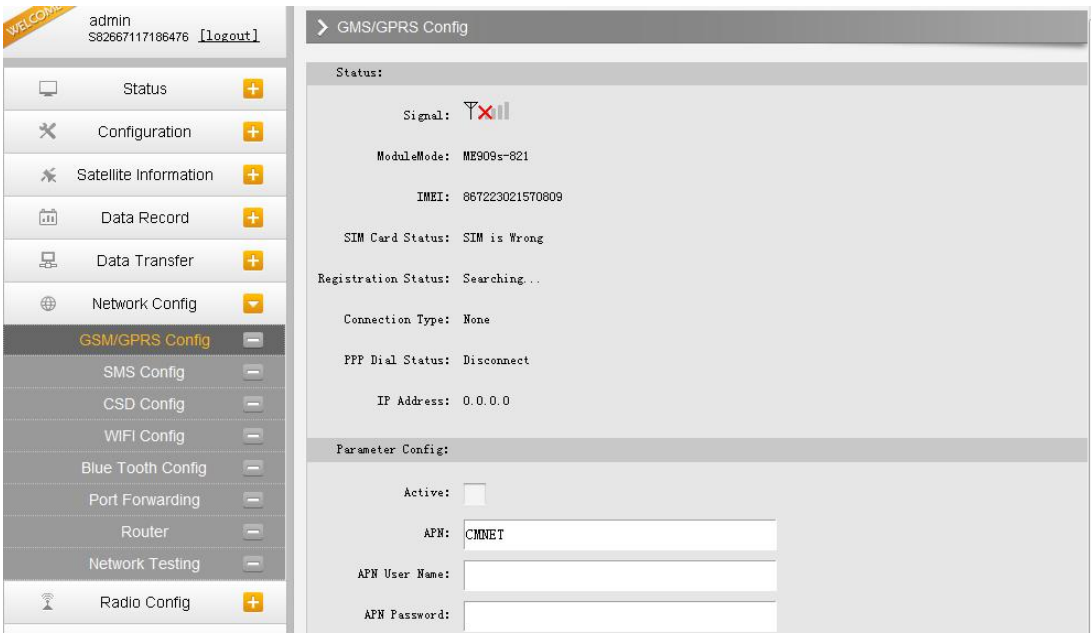


Operation on LARK

a) Setup the Base station on a known position or an unknown position.

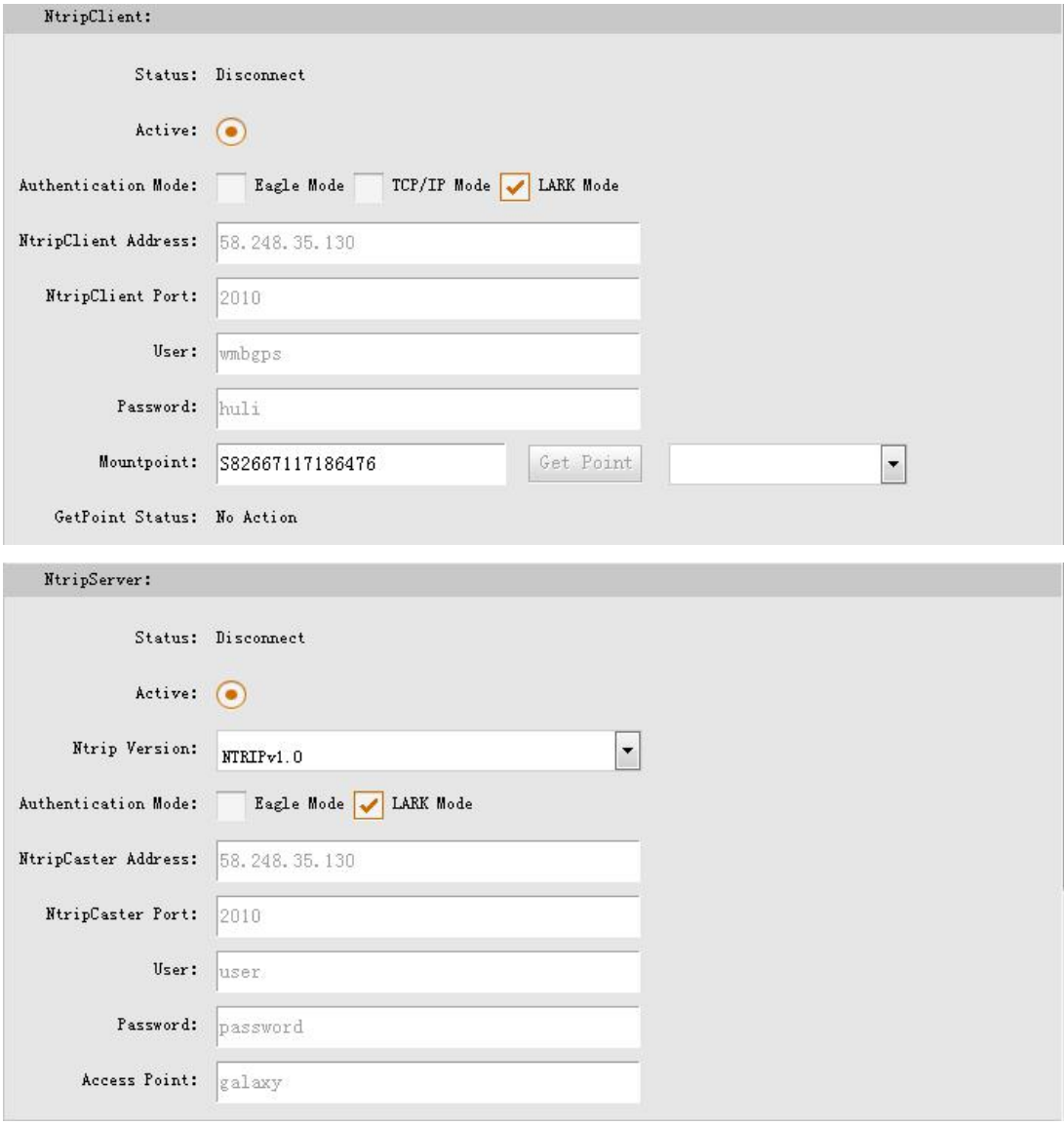
b) Insert SIM cards into both Base and Rover receiver

c) Input the correct APN and the assigned username and password on Network Config page, then make sure both of them have connected to internet.



d) Check the box of LARK for both Base and Rover, then we can notice that after checking LARK for Base, all the fields turn into grey and unable to input anything, and there is only Mountpoint field available for Rover.

e) The key step is that input the **Serial Number** of Base into Mountpoint field, then click "Enter" button to confirm all the settings.

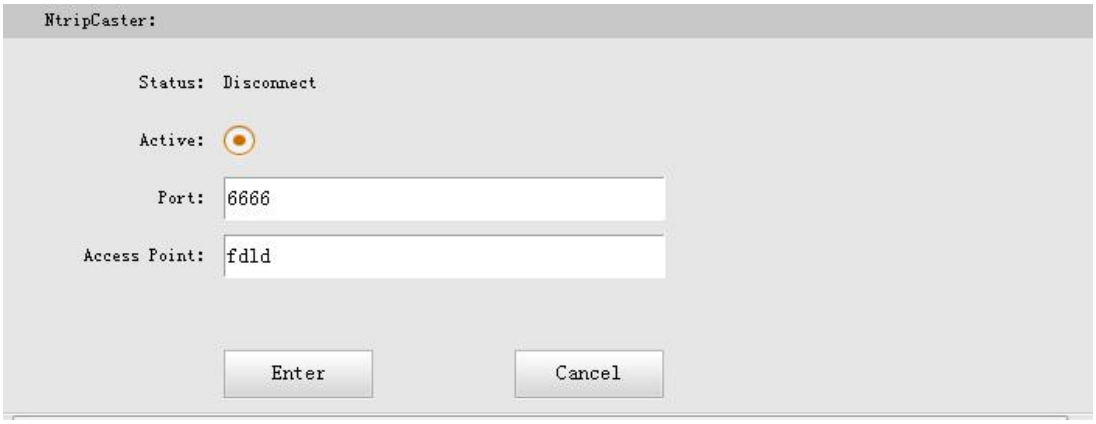


NtripCaster

This feature is finally realized on New G1 plus, the receiver is equivalent to a CORS system that it generates and broadcasts the user-defined correction for rover if NEW G1 PLUS connects a static IP address.

Port: This is the specify port for the access.

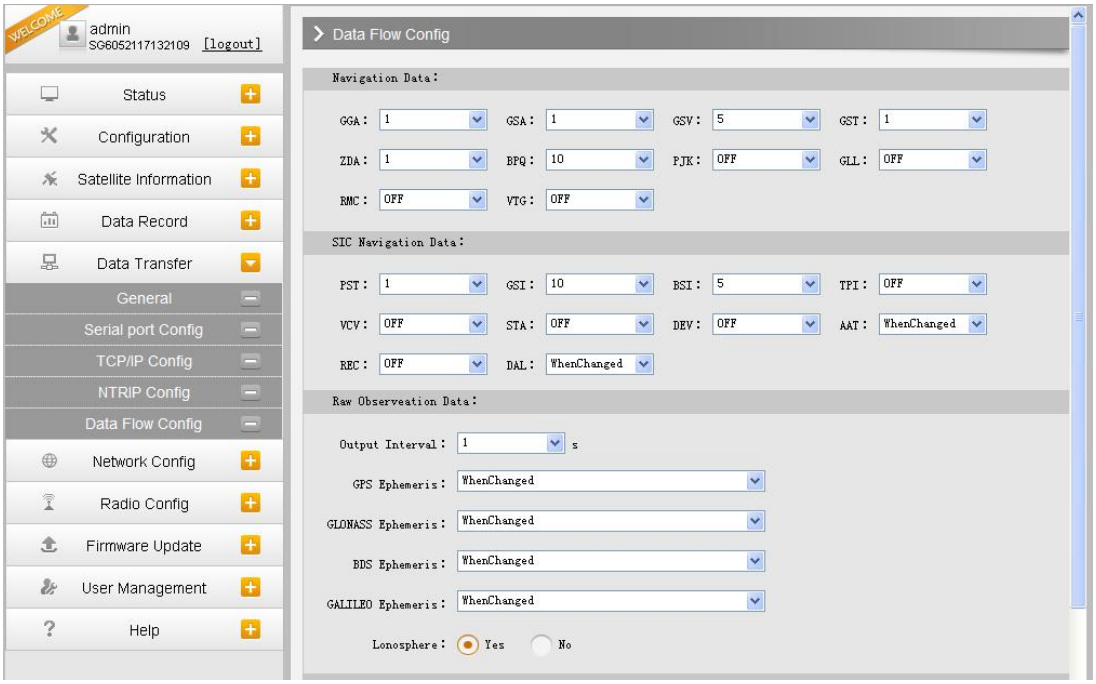
Access Point: This is mountpoint which can be user-defined.



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



§4.4.6 Network Config

The “Network Config” is able to configure the ways and the contents for internet access of New G1 plus. GSM/GPRS Config, CSD Config, WIFI Config, Bluetooth Config, Port Forwarding, Router and Network Testing are under the list of Network Config.

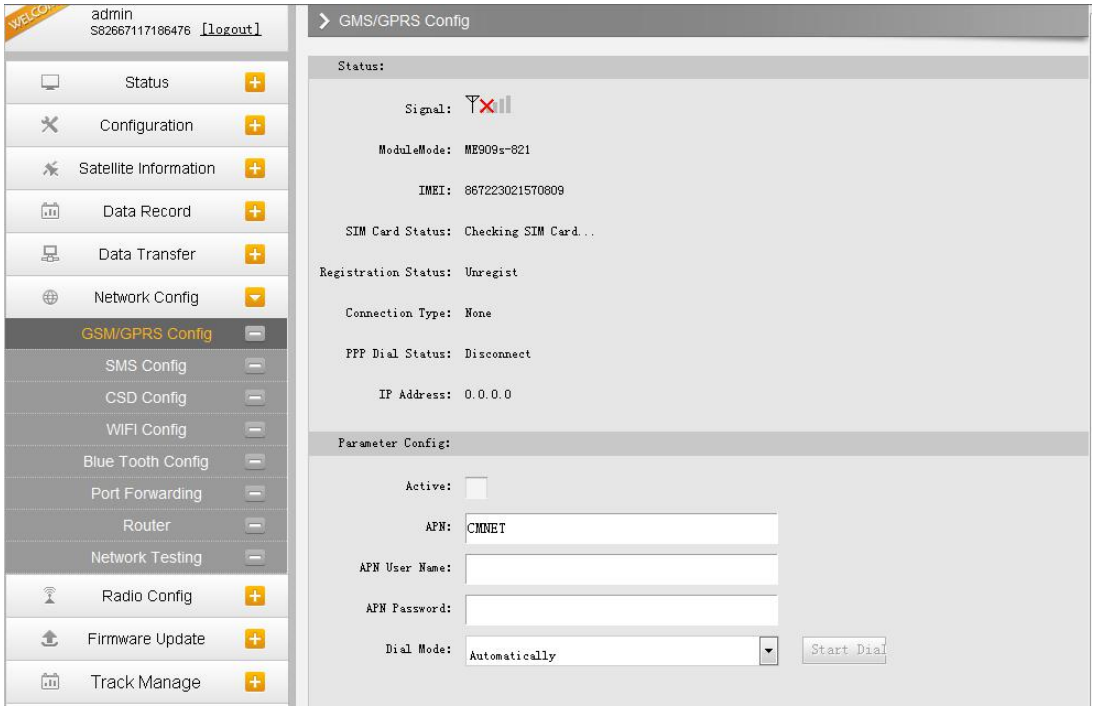
GSM/GPRS Config

In this page, all the information of receiver under GPRS mode will be displayed including the

hardware information and dialing status.

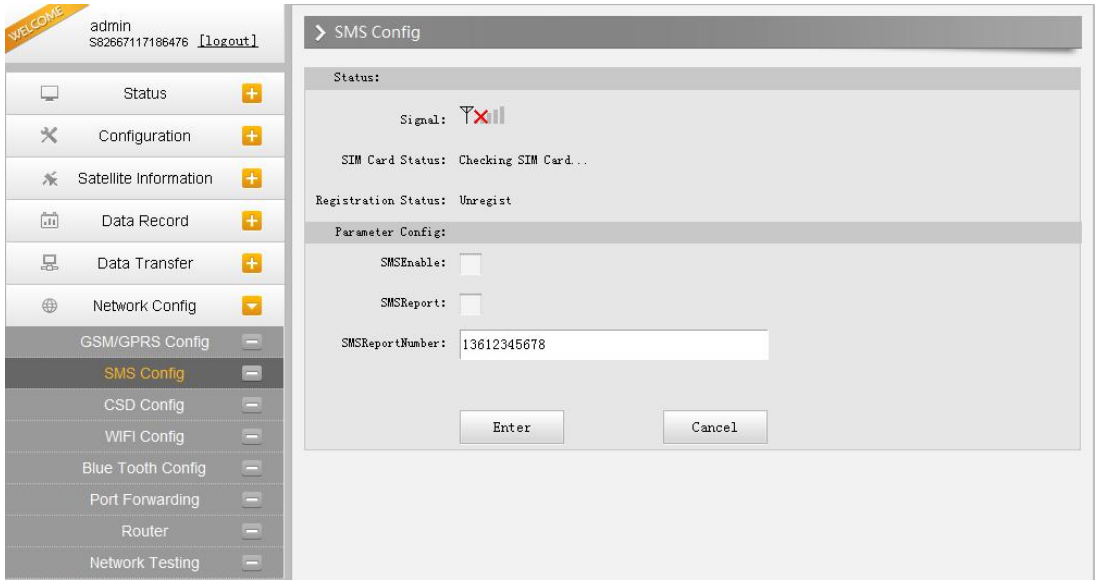
Status: The dialing status and hardware information are displayed in this field that users can intuitively to view the signal of network, module model and the IMEI number of the module.

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



MSM Config

On this configuration dialog, input a phone number into the blank, New G1 plus will send text message onto the phone which number is written.



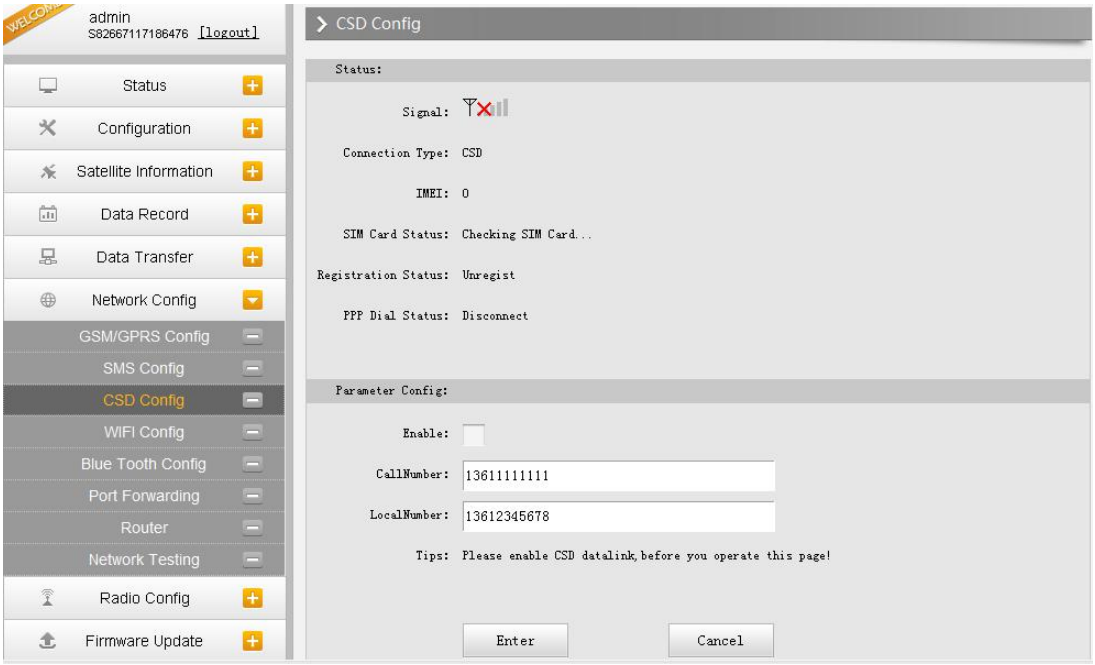
CSD Config

CSD is the meaning of direct dial between Base and Rover with SIM card inserted (the CSD function should be activated on local SIM card), this function is mainly used in the area where there is very poor internet signal coverage.

Status: This field displays the dialing status when CSD is used on New G1 plus.

Parameter Config: To enable the CSD function with checking the box of Enable option in this field, then input the phone number for Rover and Base in CallNumber and LocalNumber.

Tips: please choose CSD as datalink for receiver in General Config.



WIFI Config

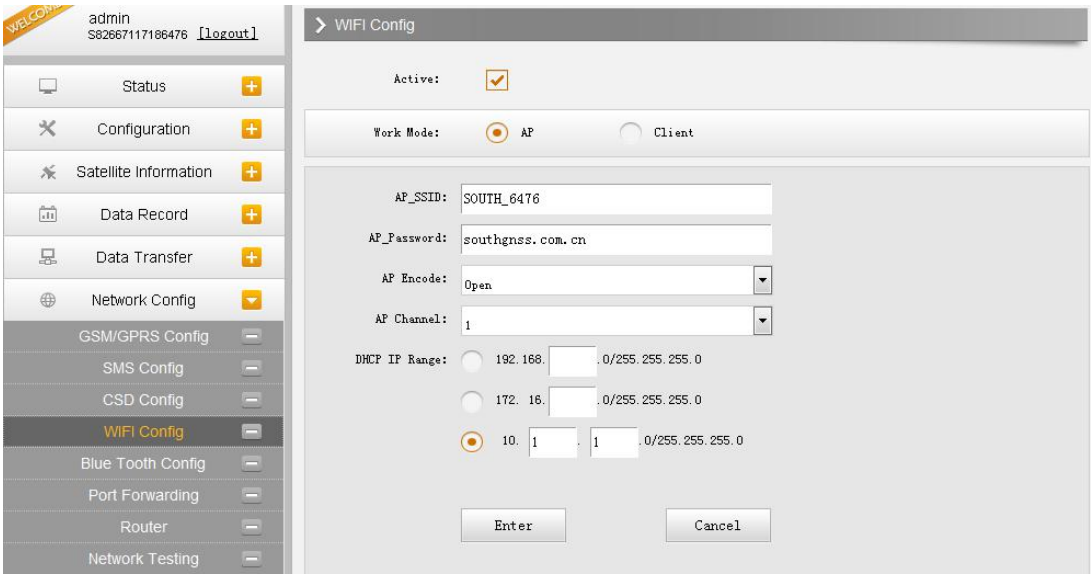
This is mainly used on the WIFI configuration for New G1 plus, there are AP mode and Client mode for optional.

AP:

This is used to enable the WIFI hotspot for New G1 plus 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 New G1 plus, 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 New G1 plus 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.

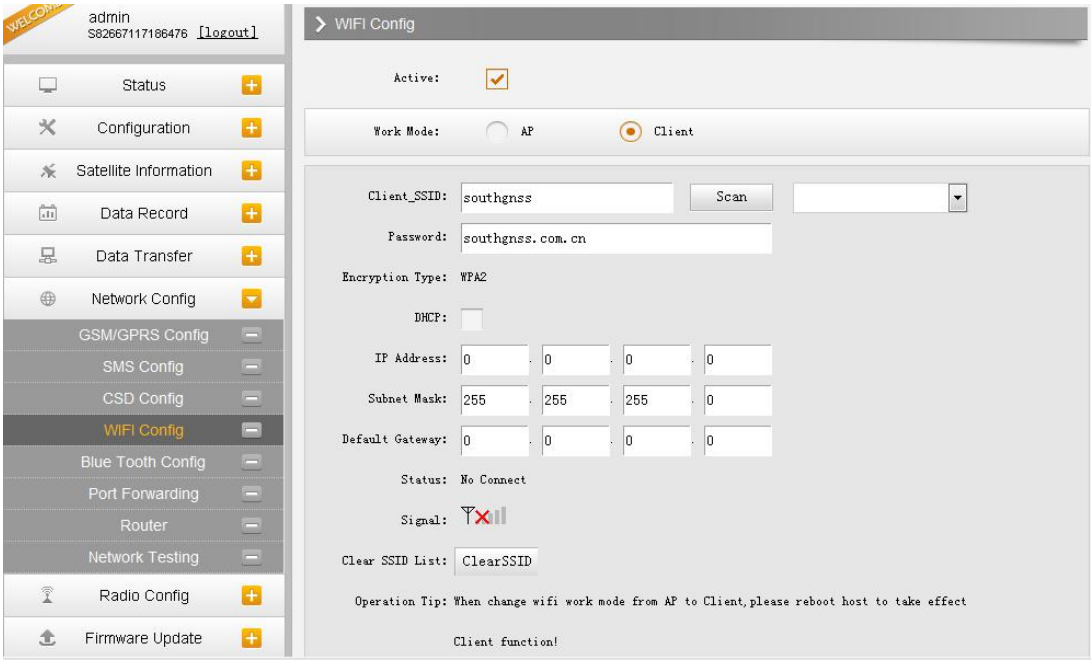
Client_SSID: This is the WIFI hotspot which New G1 plus is going to connect

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

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

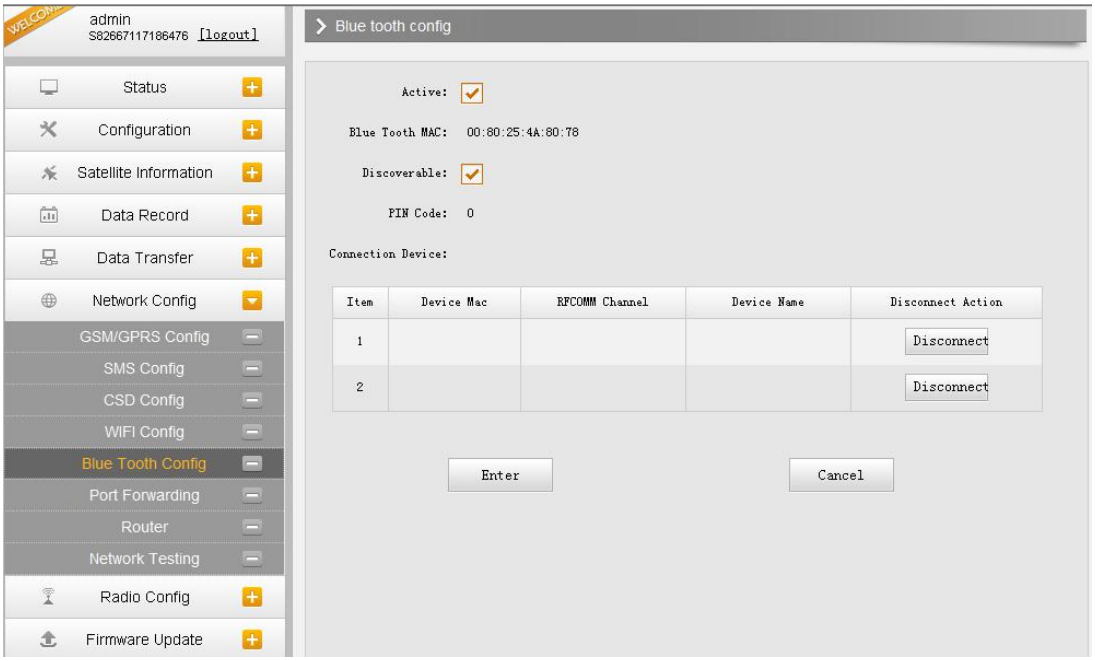
IP fields: If New G1 plus successfully connects to the WIFI, there will be an LAN IP address generated by New G1 plus.

ClearSSID: Click this button to clear the SSID list.



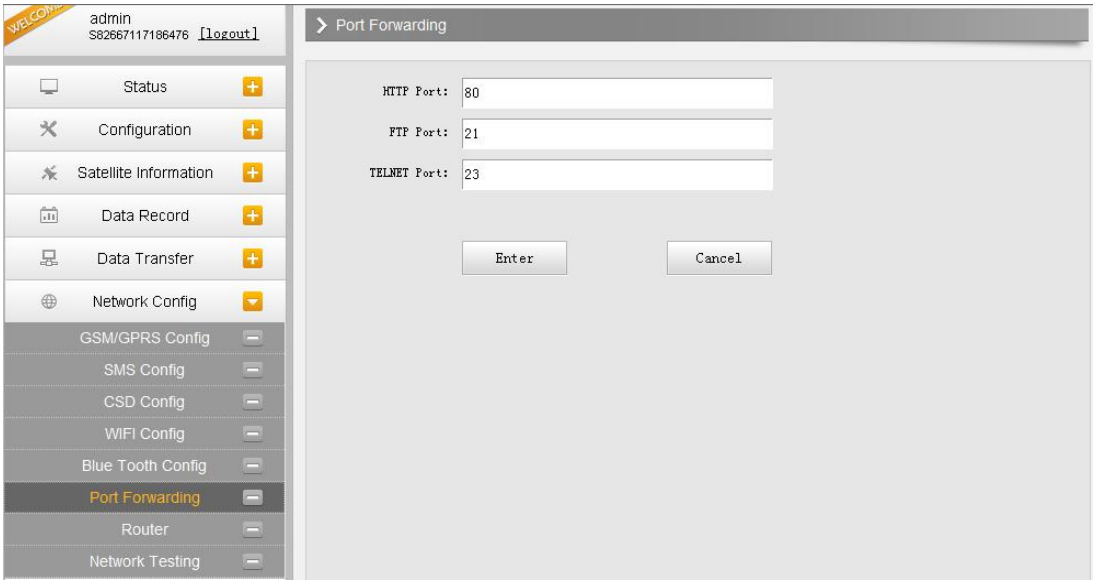
Bluetooth Config

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

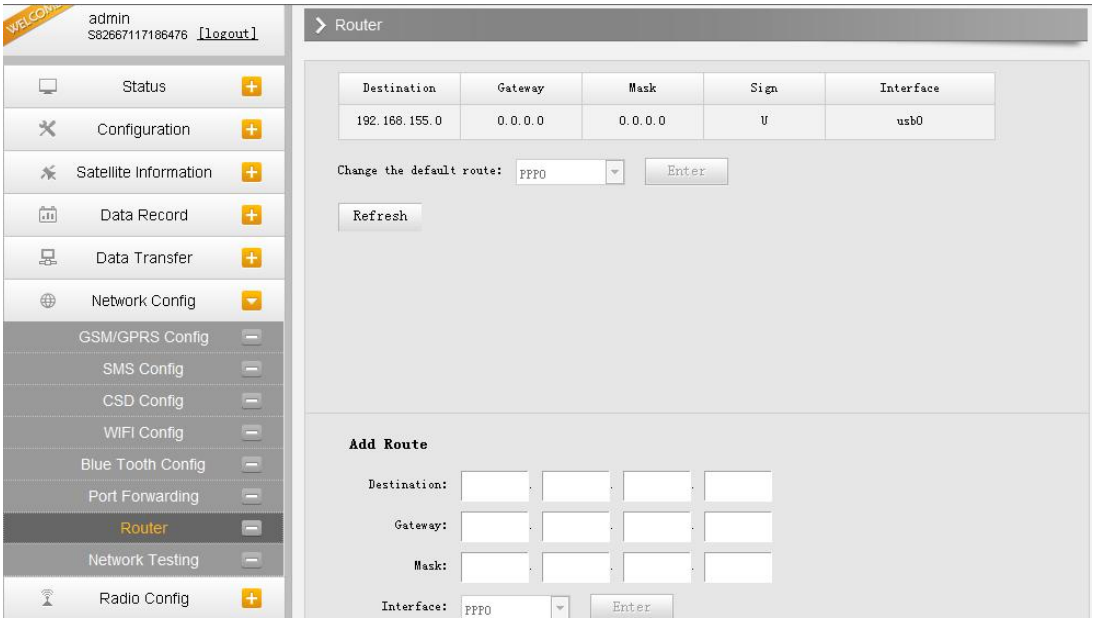
This page is mainly used to view and configure the internet transmission port for New G1 plus, customize and debug receiver.



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.

Router

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



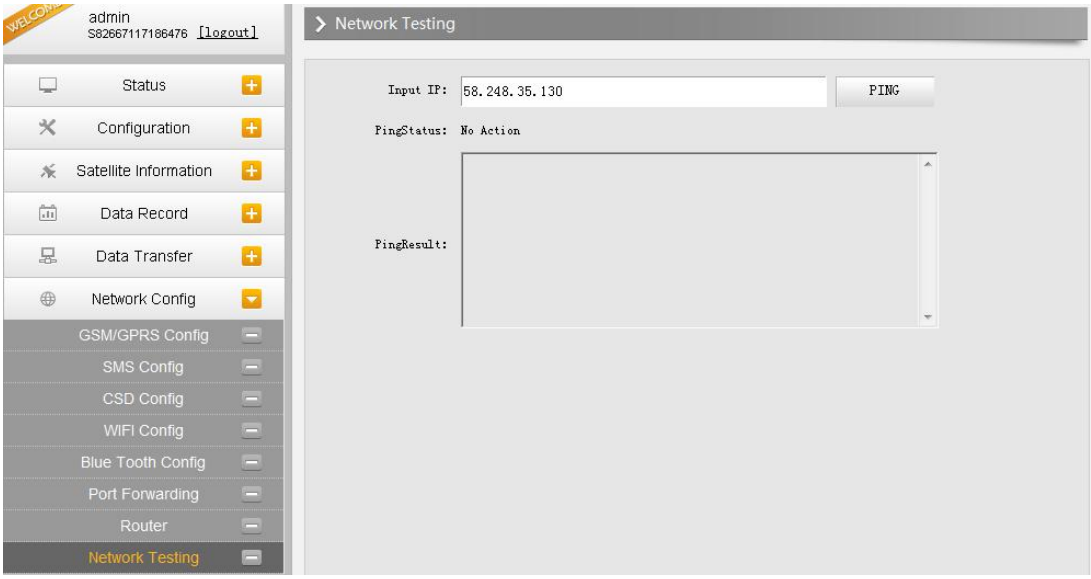
NOTE: Usually we will keep the default setting in this page, if you would like to modify it, please contact with SOUTH technician for more supports.

Network Testing

This function is mainly used to test network status for New G1 plus after logging on the internet.

How to do:

Input the IP address which New G1 plus already connected, then click PING button, the testing information will be displayed in the following window.

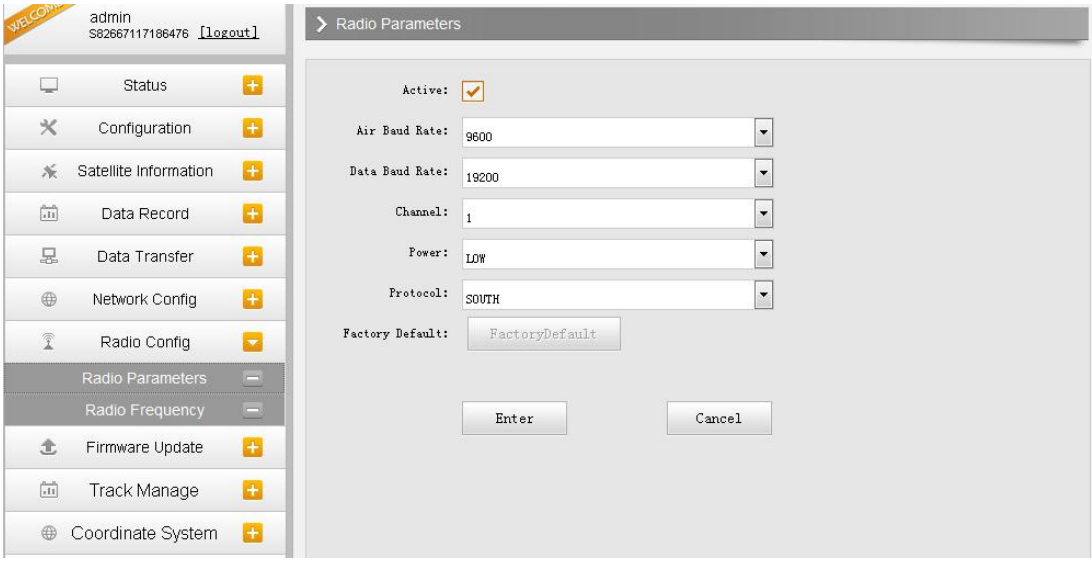


§4.4.7 Radio Config

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 New G1 plus.



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, this 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 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.

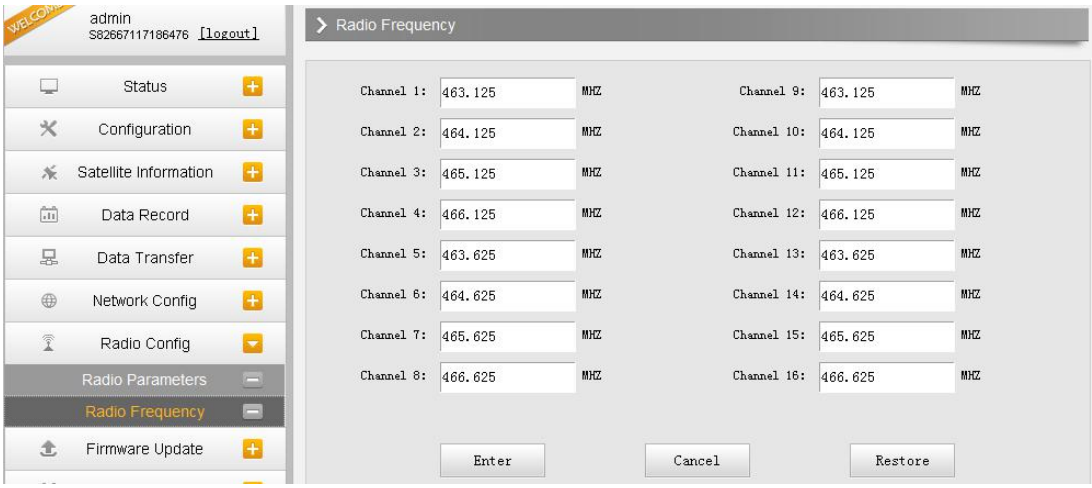
Factory Default: Click this button to restore the factory default for internal UHF module.

Radio Frequency

For New G1 plus, 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.

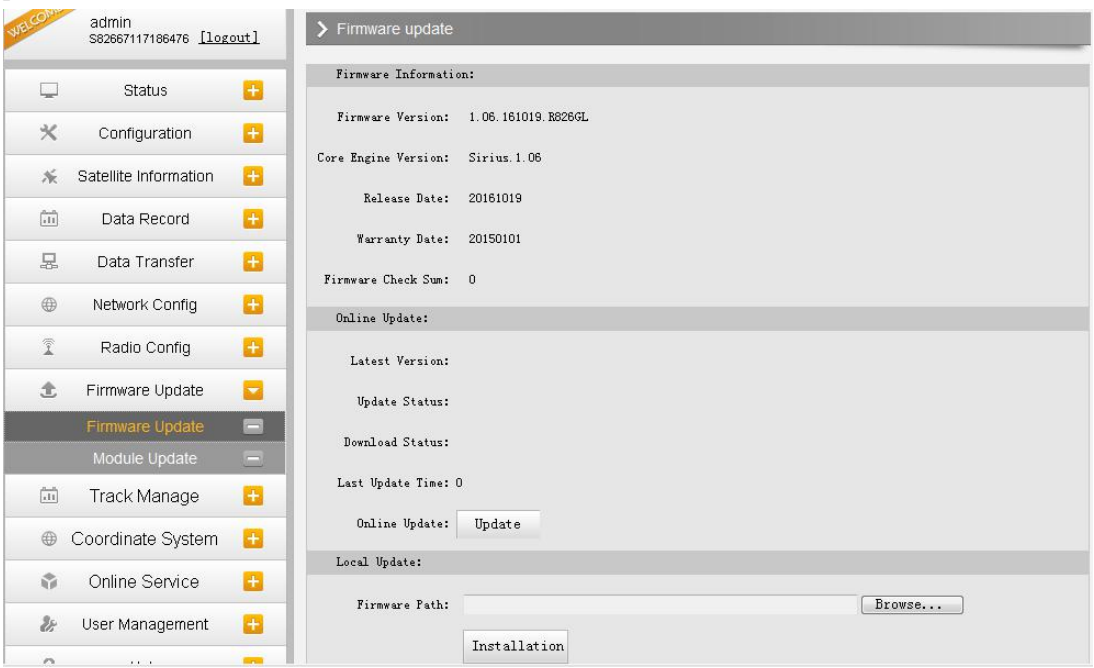


§4.4.8 Firmware Update

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 New G1 plus, and allows to update the latest version firmware for receiver. To get latest version firmware please contact with SOUTH technician.



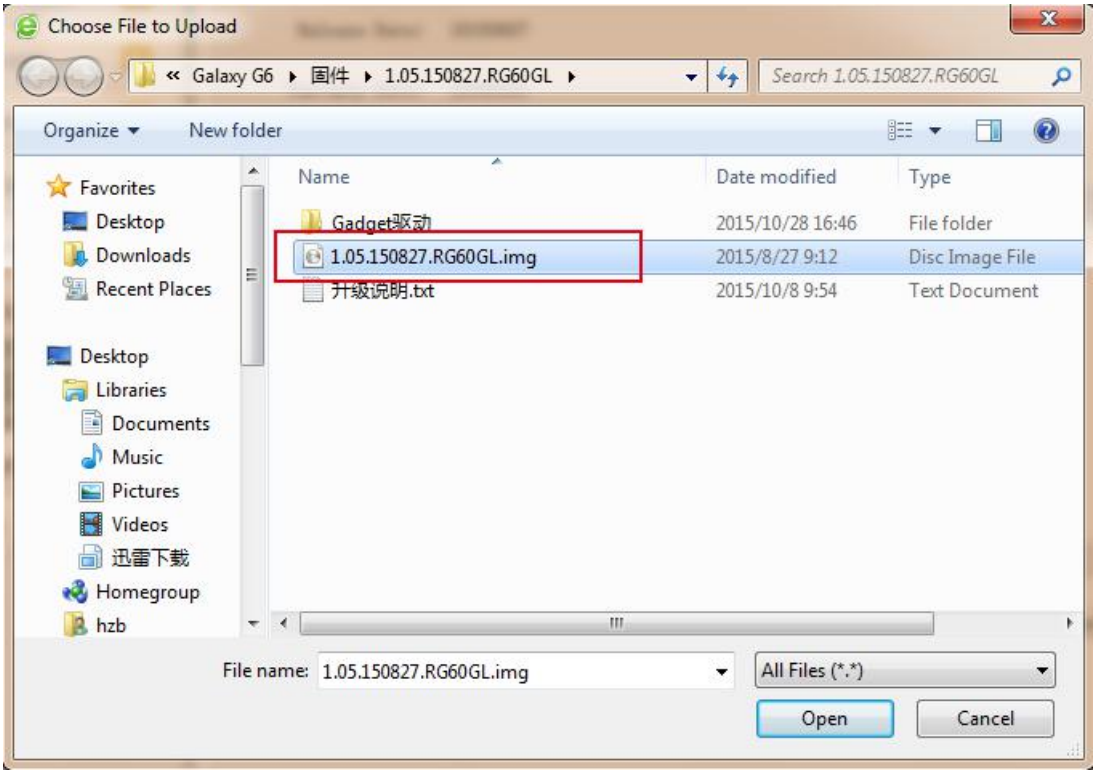
Online Update: New G1 plus supports to update the firmware online anytime if there is

something update or optimized.

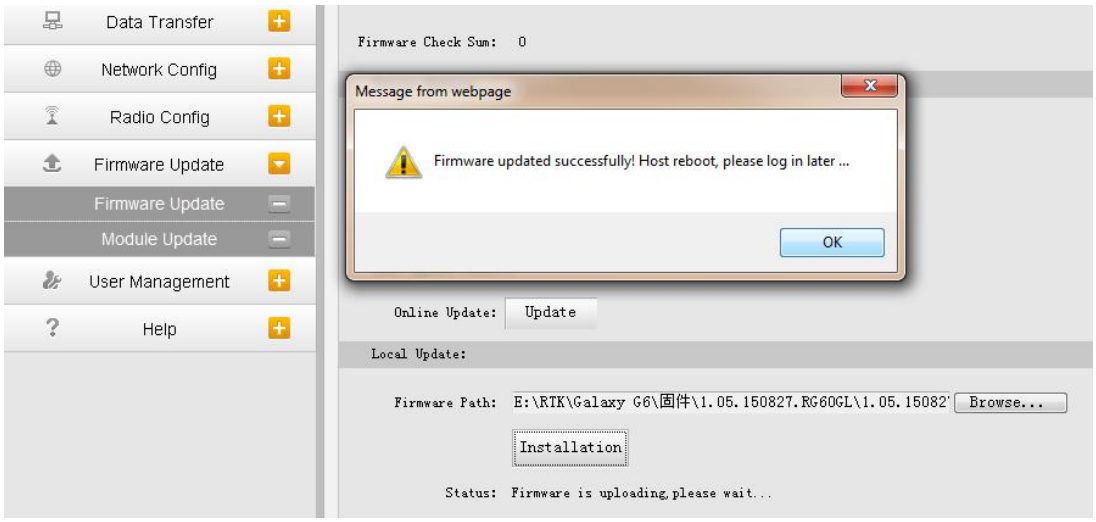
Local Update: Update the latest firmware by using a firmware file.

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).

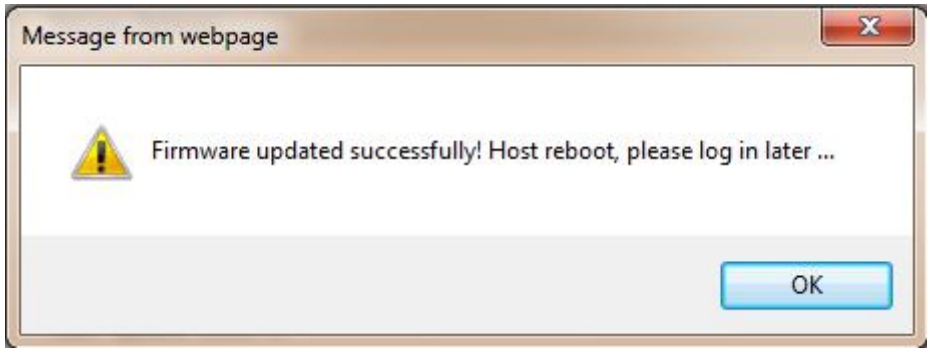


b) And then click “Installation” button to start upgrading.



c) After the firmware is completed upgrading, a dialog will appear saying “Firmware updated

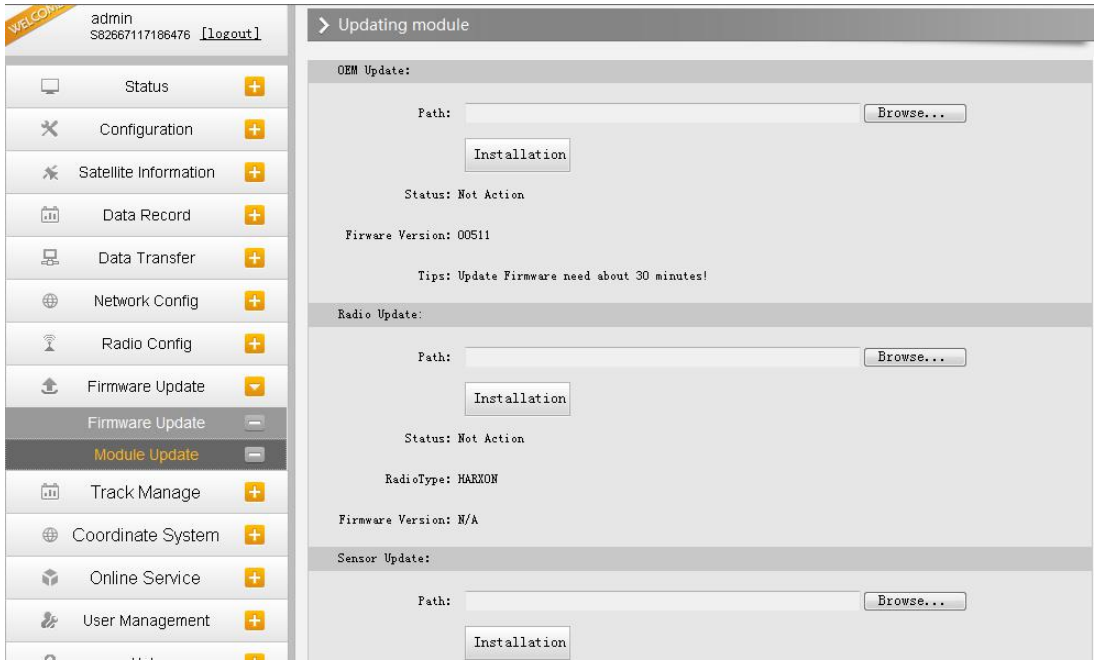
successfully! Host reboot, please log in later…", then the receiver will restart automatically.



SPECIAL REMIND: New G1 plus doesn't support to update the firmware with the help of INstar program any more, in the future, update the firmware for New G1 plus shall be done through the Web UI.

Module Update

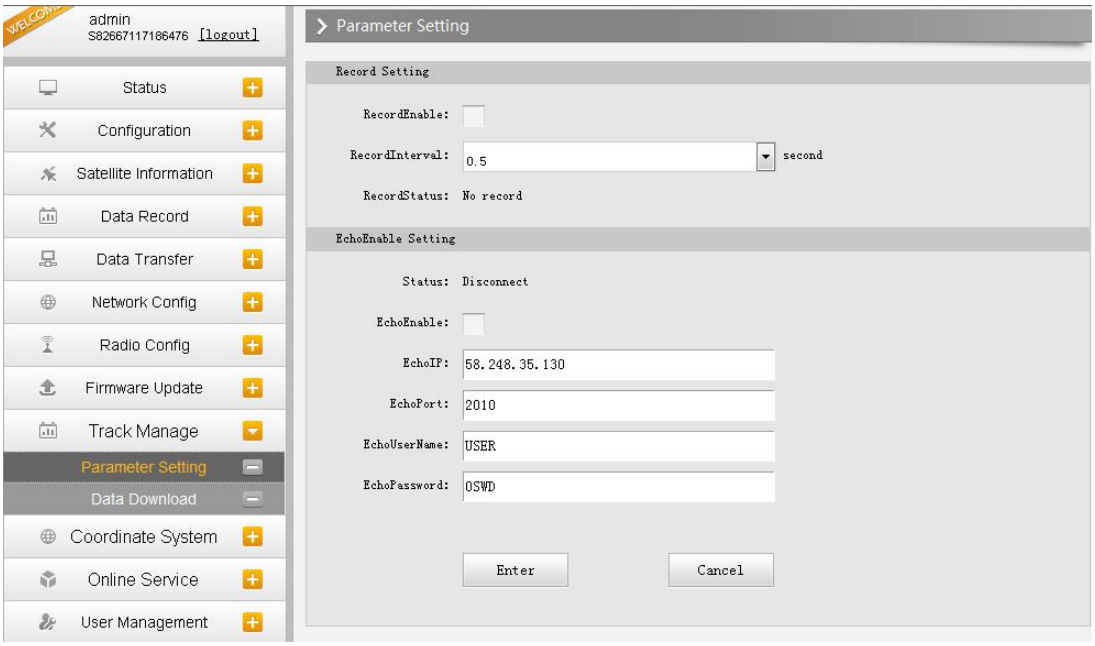
This page is used to update the firmware for corresponding modem such as OEM board, radio module and sensor.



§4.4.9 Track Manage

New G1 plus now supports to record the track while doing measurement, and upload the data onto the server.

Parameter Setting

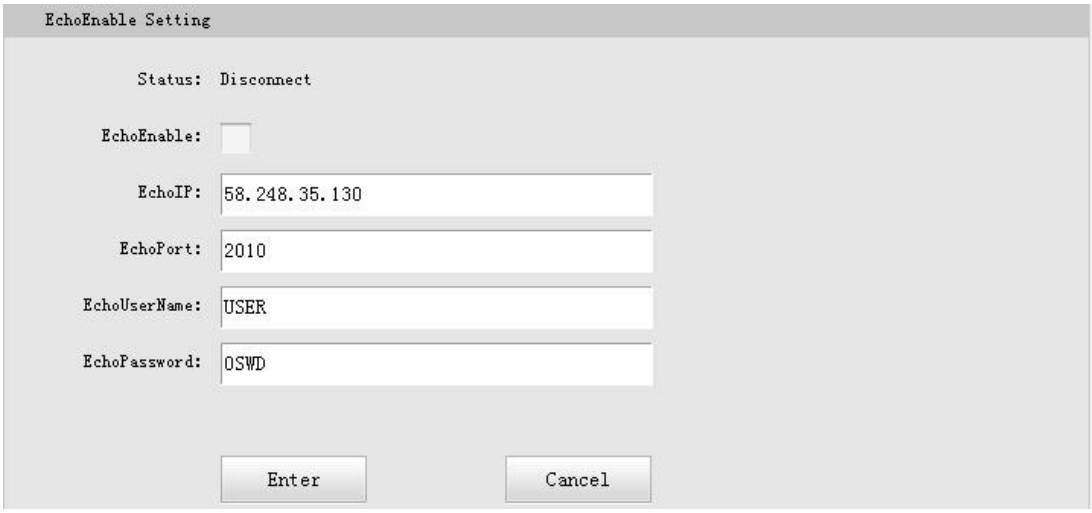


Record Setting

Check on the box of "RecordEnable" to activate track recording function, and choose a proper recording interval in dropdown list of "RecordInterval".

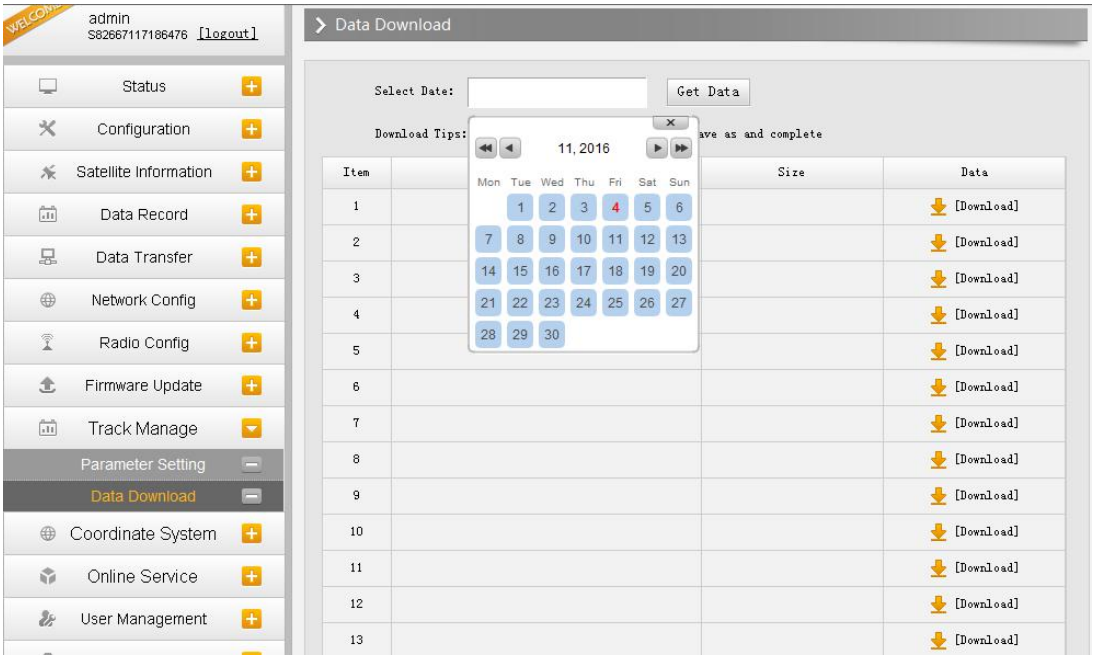
EchoEnable Setting

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



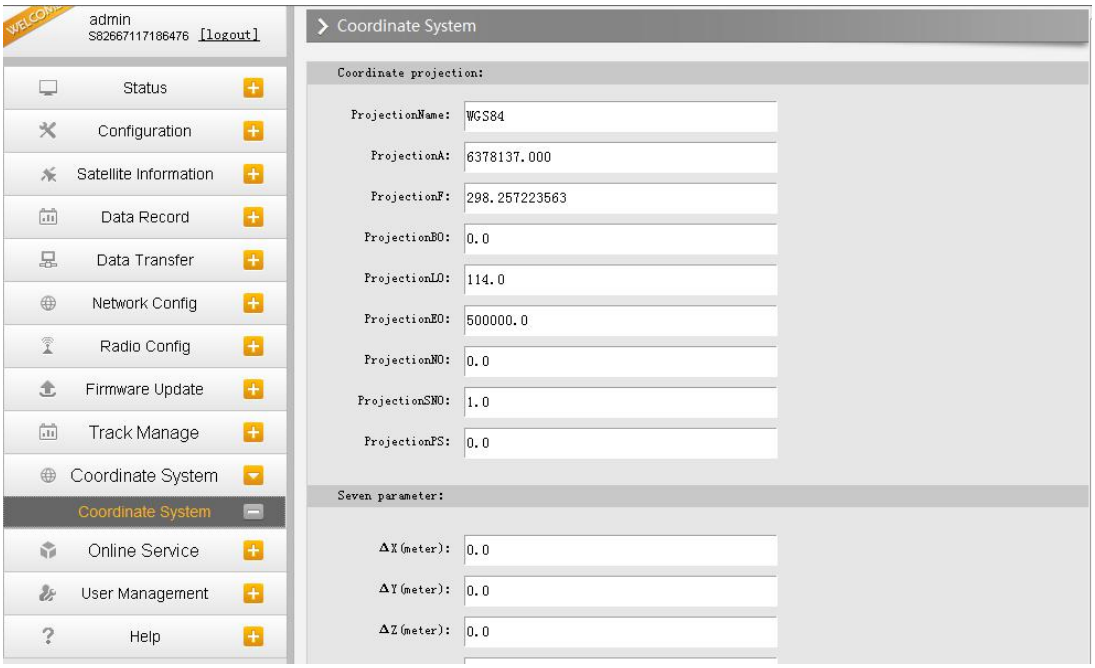
Data Download

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.



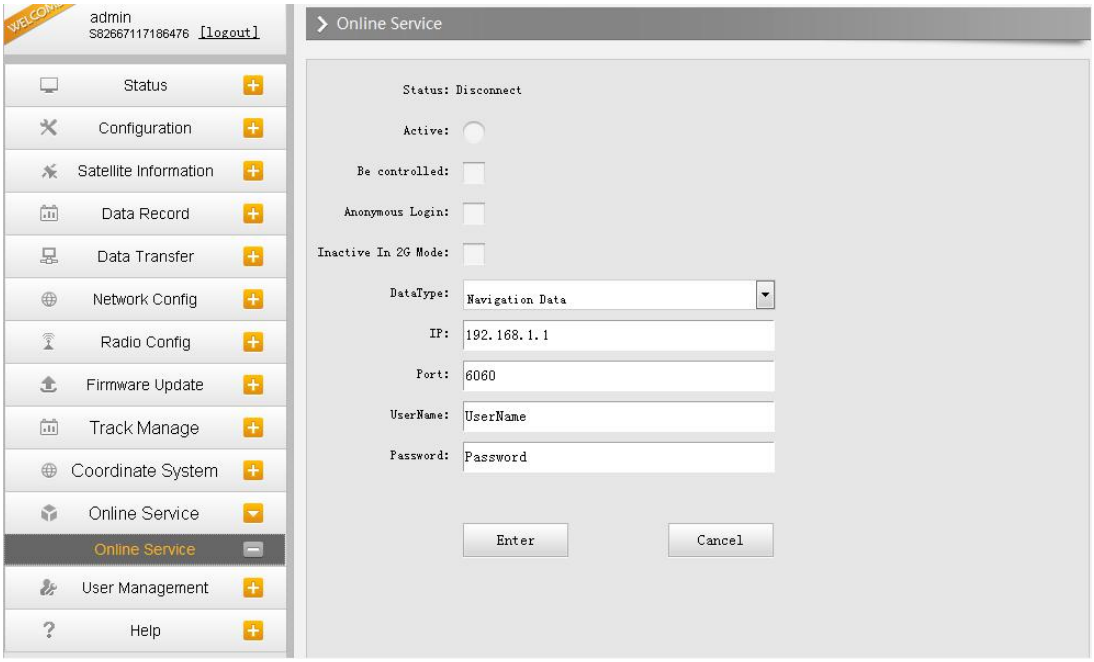
§4.4.10 Coordinate System(reserve)

New G1 plus 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.



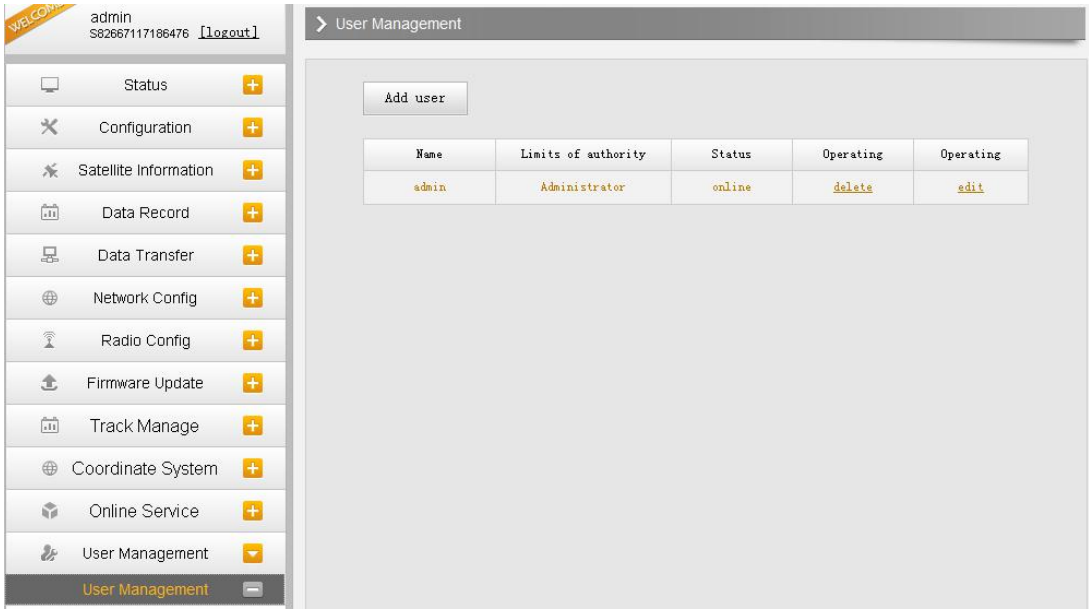
§4.4.11 Online Service(reserve)

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

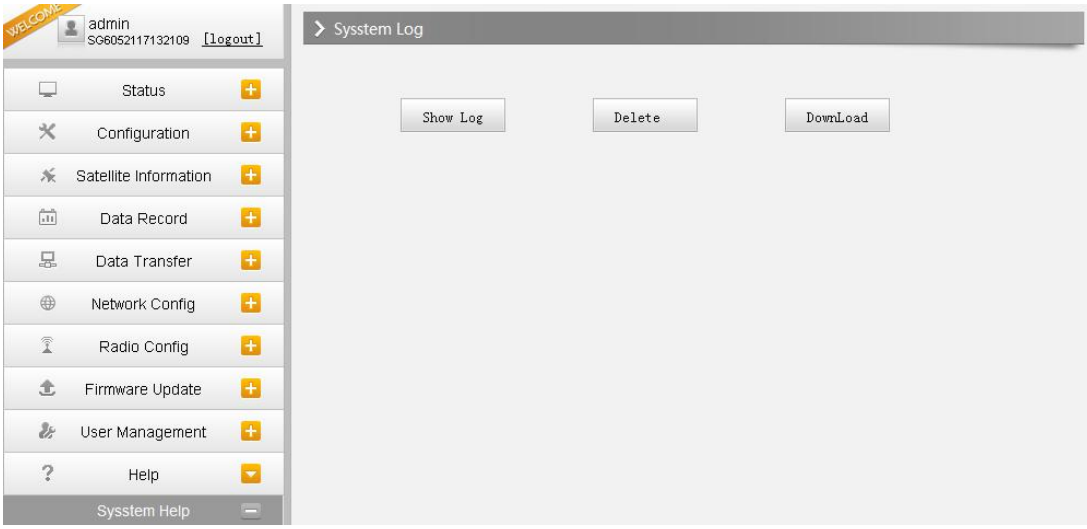
This page is used to manage the authority of login Web UI for users, including the username, password and add users.



§4.4.13 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 Data Collector X11

§5.1 Basic introduction to the handheld

Here takes X11 for example (If you want to know more controller options, please contact local agency or SOUTH team directly), appearance of X11:

Standard Configuration	Description
Li-ion Battery	7.2V/ 24.4Wh
Size	193x91x42mm(L*W*D)

Waterproof/Dustproof	IP67
Display	Blanview TFT, LED backlighted
ROM	8GB, up to 32GB
X11 pro	72 channel,5MP camera

1. Charging

Connect the charger with collector by the USB Link cable to recharge.

Main Screen (Upper right corner) will show the Charging Icon in power off (on) status.(Once you connect Collector with PC to recharge; the charging time will be longer).

2. Power on/off

Make sure that the battery is fully charged or you can connect the Collector to PC via the USB Cable. (Collector should be with battery).

Press Power Key for 3-5 seconds to power on/off.

(If there is no any response from Collector or other unusual situations happened, press the Reset Key besides the USB socket in the bottom of Collector with the Touch Screen Pen).

3. Connect to PC

Make sure that you've installed **Microsoft ActiveSync 4.5** or higher version, if your computer equipped with win7 or win8 system, please make sure that you have installed **Windows Mobile Device Center** program.

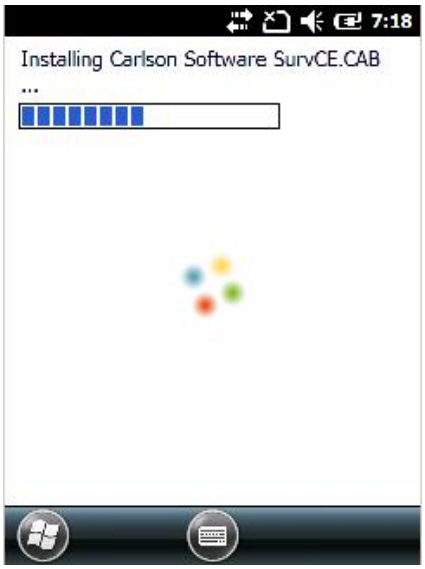
Connect the Collector to PC via the Mini USB Data Cable.

Connection will be preceded automatically by Microsoft ActiveSync. Icon will turn green and an interface of Setting will come out, you can just click "Cancel". After this, you can manage and edit the data in Collector.

4. Installing Program

Make sure that collector is synchronized with PC. Run the Installation file at PC side.

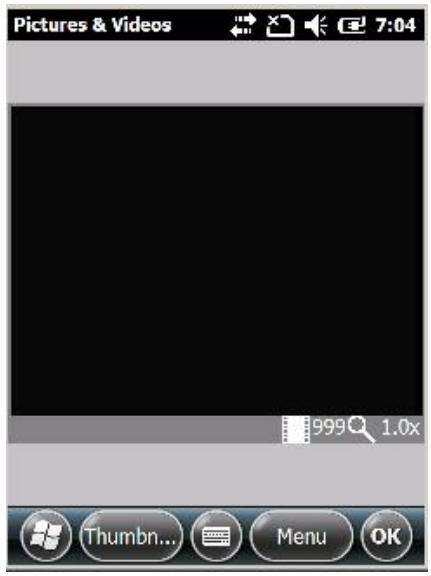
If the installation program is also suitable for collector, you can copy the installation program into collector to install. You can just copy the folder into collector when you need.



We suggest you installing programs into Flash Memory and save data into Storage Card.

5. Camera

Get into the Camera Mode by pressing the Camera Key for 3 or more seconds.
Press Camera Key to take a photo and click “OK” on the screen to save.



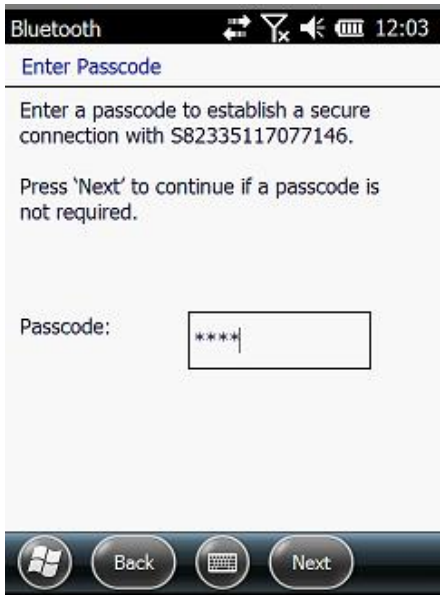
Note: If you want to know more information about X11, Please refer to X11 manual.

§5.2 Bluetooth Connection

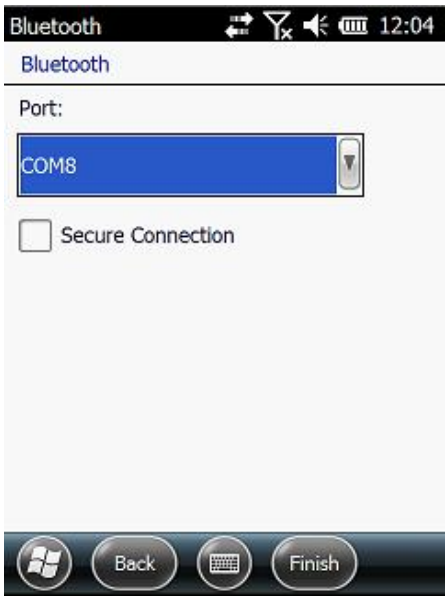
The short-range wireless Bluetooth communication facilities are for the wireless exchange of

information among a variety of Bluetooth-enabled devices.

Tap on the Start menu (Settings) → (control panel) to open (Bluetooth Device Manager). tap on the(scanning device) after setting the Bluetooth device, and the surrounding Bluetooth devices will be listed in the search list. And then input the passcode 1234 to have pair between controller and receiver. As shown below:



After the pair, select an available com port for the receiver (usually COM 8 and COM 5 are OK). As shown below:



After the establishment of the virtual serial port, other applications can use the serial port for data communication with a Bluetooth device.

§5.3 Software installation and connecting

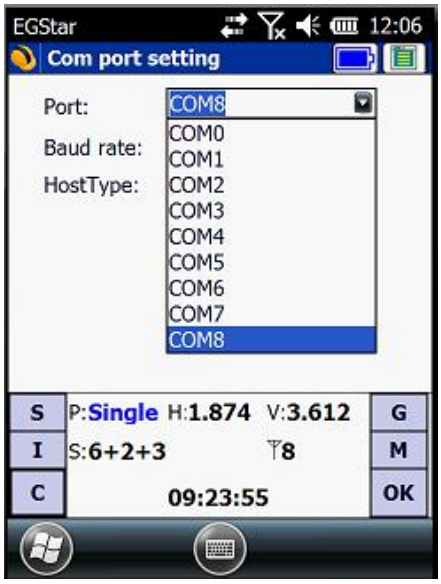
Professional surveying and mapping software are made for measurement applications for different industry:"EGStar", "Power Star", "Mapping Star", "Navigation Star" and so on. Here takes EGStar for example:

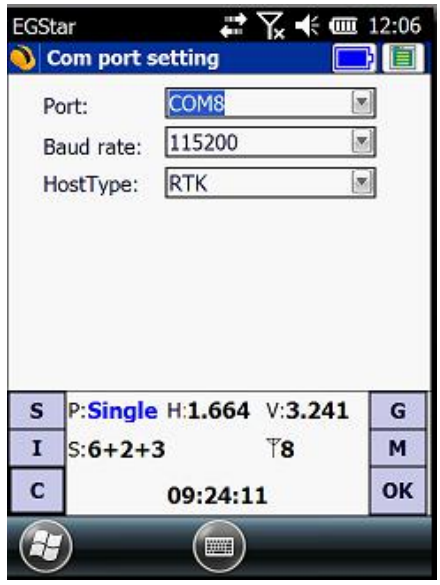
EGStar is the specific software for NEW G1 PLUS measuring system, mainly for the collection and calculation of the measuring points.

Before installing of EGStar, you need to install Microsoft Active Sync. After installing it on your computer, connect handheld to computer with a cable, and install EGStar into the handheld, at the same time, keep the mainframe power on, then set as follows:

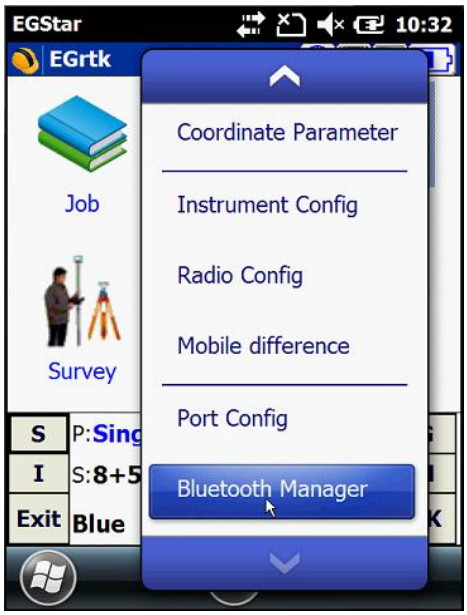
Open EGStar software and enter the main interface. Click "OK" on the "prompt" window.

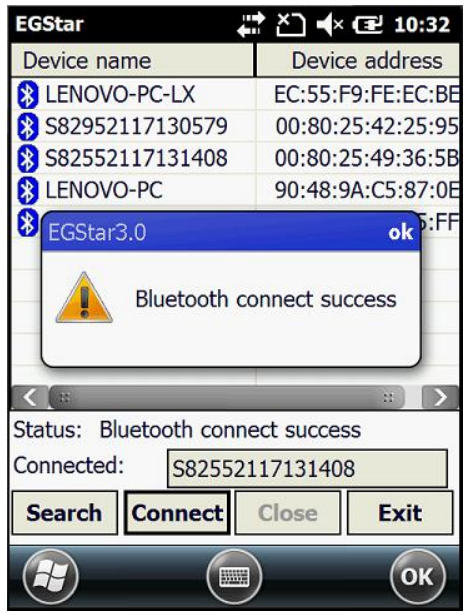
1. "Configure" → "Port Config", in the "Port Configuration "dialog box, select the port "COM8 ", with the same serial number which you use to connect the Bluetooth serial port service. Click "OK." If the connection is successful, the status bar will display related data. If there is barrier, exit EGStar to reconnect (If the above settings are correct, then link directly). Handheld connecting with the host PC can do the follow-up measurement.





2. Or go to "Bluetooth Manager", in this interface tap on "Search" button and the controller will search the surrounding Bluetooth devices, select the correct serial number from the list and click on "Connect" button, controller will connect to receiver without setting any COM port. If the prompt message "Bluetooth connect success" appears, that means that controller has successfully connected with receiver, then please check the Bluetooth indicator on receiver.





ChapterⅥ External Radio

§6.1 Overview

The radio Hx-U202 is a high-speed semi-manual wireless data transmission radio, whose air transfer rate can be up to 19200 bps and the RF transmitter power is larger, used in SOUTH RTK measurement system.

Radio Hx-U202 adopts GMSK modulation, 19200bps transfer rate, low bit error rate. RF frequency can cover 410-470MHz band. Data transmission mode of Hx-U202 is transparent

mode, that is, the received data is sent to the RTK GPS system unchanged.

Radio Hx-U202 data interface is a standard RS-232 interface, which can be connected to any RS-232 terminal equipment for data exchange.

Hx-U202 digital radio research employs advanced radio frequency technology, digital signal processing technology and baseband processing technology, carefully selected high quality components to organize production, to ensure the long-term stable and reliable operation;

Have a forward error correction control, digital error correction function.

It has eight transmitting and receiving channels. Can be changed according to the actual use of the channel frequency, transmit power adjustable interval is 0.5MHz.

§6.2 Frequency Table

Channel number	Frequency（410-470MHz）
Channel 1	463.125
Channel 2	464.125
Channel 3	465.125
Channel 4	466.125
Channel 5	463.625
Channel 6	464.625
Channel 7	465.625
Channel 8	466.625

§6.3 Radio Appearance

① Control panel ②SN number

Control Panel

Control panel lights display the status of the radio, the key operation is simple and convenient, one-to-one interface can effectively prevent connection errors.

① Channel indicator light.
② Power indicator light,
③ ON / OFF power key: This key controls the unit's power switch. The red light on the left indicates the power status of the machine.
④ TX red light indicator: This indicator flashes once per second means that the radio is transmitting data with the transmitting interval in 1 second;
⑤ AMP PWR indicator: Indicates the level of radio power, light on indicates low-power, light off indicates high-power
⑥ CHANNEL button: By pressing this switch, you can switch channels 1-8.

§6.4 Radio Interfaces

Mainframe Interface: 5-pin jack for connecting a GPS receiver and power supply

Antenna interface：For connecting the transmitter antenna

§6.5 Transmitting Antenna

The UHF transmitting antenna is particularly suitable for field use, the receiving antenna is 450MHz Omni-directional antenna, light and durable.

§6.6 Application Notice

The battery power is too low: When the flashing channel indicator appears on the control panel, which means the lack of battery power, replace the battery in time, otherwise there would be data link unstable or unable to launch.

radio power supply: voltage 12-15V (typical 13.8V) RF transmitter power 25W, current 7.0A.

Radio transmits power: radio transmits power based on the voltage of the power supply, check the voltage before use.

High and low power use: use low-power transmitter when low power can satisfy the operation as high-power transmitter will exponentially consume battery power, excessive use will reduce battery life. Install the radio station as high as possible.

Power corrugated coefficient: power ripple coefficient must be less than 40mV, the smaller the ripple factor is, the smaller will the beam spectrum be and the higher communication quality will be.

Power Connection: Power of positive and negative connected correctly.

Electromagnetic environment: Before using the radio, it is better to perform electromagnetic environment measurement, to avoid the communications blackout.

Radio match antenna: the basic parameters of the antenna selection are the band width, frequency, gain, directivity, impedance, VSWR and other indexes .Usually the effective bandwidth of the antenna is 3-5MHz,antenna selecting should be based on the frequency bands

used by the to be selected channel. For the long-distance transmission, it is better to use a directional antenna and high-gain antenna, and pay attention to the impedance of the antenna and feeder to match with the Radio antenna interface (50 ohms).

We recommend:

Recommend that you use plug-in battery which is more than 12/36Ah,the use of maintain a regulated current of 10A during the operation.

Recommend that you charge it in time, do not overuse the battery, otherwise it will reduce battery life.

Recommend that you replace the batteries after six months to a year, to ensure the radio distance.

ChapterⅦ Accessories

§7.1 Instrument Case

The instrument case for New G1 plus 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

§7.2 Batteries

2 pcs of large capacity Li-ion batteries are the standard configuration for New G1 plus that to make sure New G1 plus has enough power for whole day work.

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

§7.3 Charger&Adapter

§7.3.1 Charger

Model: CH-SA3002
INPUT: 12VDC＝1.25A
OUTPUT: 2*8.4VDC＝550mA
Please use the standard battery.

§7.3.2 Adapter

Model: DSA-20CA-12
INPUT: 100-240V~50/60Hz 0.8A
OUTPUT: +12V＝1.5A

NOTE: If CHARGE indicator glows in red, it indicates the battery is being charged, If FULL indicator glows in green, it indicates the battery is full charged.

§7.5 Differential Antennas

The differential antenna is as shown above;

If the receiver is set up to use GPRS mode, the receiver has internal GPRS antenna, so don't need install external GPRS antenna.

The UHF differential antenna is required to install to the interface at the bottom of receiver if New G1 plus is set up into internal UHF mode.

§7.6 Cables

7-pin to USB cable

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

L7U50

7-pin to OTG cable

This cable is used to connect an external storage directly to New G1 plus for static data storage and copy.

L7U40

Communication cable

This cable is used to connect the receiver to computer for receiver debugging, differential data checking and firmware update.

L5930B

§7.7 Other Accessories

Other accessories include rover station centering rod, handheld bracket, base point, connectors, measuring plate and measuring tape.

Measuring plate

Measuring tape

Support pole

Bracket for controllers

Carbon fiber pole

NOTE: The models and types of instrument accessories will vary with the instrument upgrade.

ChapterⅧ Measuring Operation

Reading this chapter, you can grasp in detail how to use the New G1 plus measurement to do system static, RTK operations.

GPS measurement operation scheme refers to the operating scheme used to determine the relative position between the stations with the help of GPS technology. Point coordinate precision obtained is not the same; its operating methods and observation time are also different, thus having different range of applications. GNSS receiver operating program is divided into two types: static measurement and RTK dynamic measurement (including the base station and rover station).

Test environment requirements:

(1) Observation stations (ie, the receiving antenna settlements) should stay away from high-power radio transmitters and high voltage transmission lines in order to avoid the magnetic field around the GPS satellite signal interference. Receiver antenna and its distance shall not be less than 200 m;

(2) Observation stations should not be near to the large area waters or objects which can strongly reflect (or absorb) electromagnetic wave to weaken the effects of multi-path;

(3) Observation stations should be located in places where the receiving device can be installed easily, and good vision available. Elevation angle of obstacles in view should generally be greater than 10° to 15°, in order to weaken the effects of troposphere refraction;

(4)Observation stations should be selected in a convenient place, and easy to use other means of measuring, joint measurement and expansion;

(5) For the long baseline GPS network, should also consider the vicinity good communication facilities (telephone and telegraph, post and telecommunications) and power supply, for power between the stations and equipments.

§8.1 Static Operation

§8.1.1 Static Measurements Profile

Static measurements

GPS positioning measurement by installed three (or more) GNSS receivers to perform simultaneous observation and determine the relative position between the stations.

Scope

The establishment of a national geodetic control network (second or less);

The establishment of precision engineering control network, such as bridge measurement, tunnel measurements, etc;

The establishment of a variety of encryption control network, such as city measurements, Drawing Point measurement, road surveying, demarcation measurements.

For the GPS measurements of small and medium-sized cities, towns, as well as mapping, cadastral, land information, real estate, geophysical exploration, surveying, construction and other control measurement, should meet the accuracy requirements of the D, E grade GPS measurements.

§8.1.2 Operating Procedures

Pre-measurement

Project approval

Program design

Construction design

Surveying and mapping data collection and arrangement

Instrument test, test

Reconnaissance, choice of site, buried stone

Measurement

Operating team stationed in

Satellite status Forecast

Observation planning

Dispatch of operation and field work observation

After the measurement

Data transmission, dump, backup,

Baseline Solution and quality control

Network adjustment (data processing, analysis) and quality control

Finishing results, technical summary

Project acceptance

§8.1.3 Field Operation Notes

1)Static mode of New G1 plus receiver is able to be set on receiver, and also can be set on software (Such as EGStar3.0), please refer to the EGStar manual for more information.

2)Set up a tripod on the control point, leveling and centering strictly on the measuring point.

3)Measure the instrument height three times, the difference of the results shall not be more than 3 mm, and average the results. The instrument height should be measured from the center of the control point to the mark line on the instrument.

4)Record instrument number, point name, instrument height, and start time.

5)Power on, confirm the static mode, the mainframe begins to search satellites and satellite lights begin to flash. Recording condition reached, the status light flashes in accordance with the set sampling interval, flashing once indicates the acquisition of an epoch.

6)After the test, the mainframe shut down, and then begins data transmission and data processing.

§8.1.4 GPS Net Design

The net design mainly subject to the users' requirement, but outlay, time interval of observation, type of receiver and the receiver amount, etc also relate to the net design.

In order to satisfy the users' requirement, we should keep the principle as follows:

1. GPS net normally forms closed graph by independent observation borders, such as triangle, polygon or connecting traverse, etc, to add checking conditions and to improve the net consistency.

2. When designing the net, the net point should be superposition with the original ground net points. The superposition points are generally no less than three and distribute evenly on the net in order to ensure the changing parameters between GPS net and local net.

3. GPS net point should be superposition with the level points, and the other points are normally united—surveyed with level surveying way or the equivalent way. You can also set some level united—surveying points in order to offer geoid's information.

4. In order to observe and level united survey, we often set GPS net points at a clear and easy arriving field.

5. We often distribute some well eyeshot azimuth points around GPS net to ensure united survey direction. The distance from azimuth to observation station should be more than 300 meters.

According to different purpose of GPS surveying, independent observation borders of GPS net should compose definite geometry graph. The basic graphs are as follows:

Triangle net

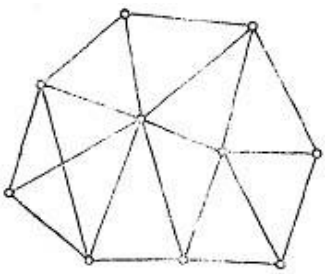
The triangle in GPS net is composed of independent observation borders, it has strong geometry structure and well self-checking ability, it can also find out the coarse difference of result and to share the difference to each baseline with adjustment.

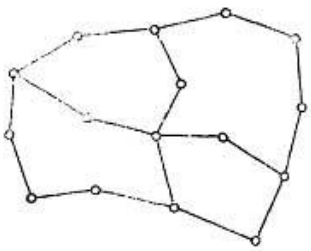
But this net need a lot of observation, especially when receivers are lacking it will greatly prolong the observation time. So only when accuracy and security are required very high, and receivers are more than three, we can use this graph.

Circle net

Circle net is composed of many loops which are formed of many independent observation borders. This net is similar with one of the classical surveying-- lead net. Its structure is a little worse than triangle net. The amount of baselines in closed loop decides the self--checking ability and consistency. General speaking, the amount of baselines has such limit as follows:

The advantage of circle net is the small workload, good self-checking and consistency. But the main disadvantage is that the accuracy of indirect-observed border is lower than that of direct-observed border, and the baseline accuracy of neighbor points distributes unevenly. In field surveying, we usually use annexed traverse as special example according to practical situation and the net usage. This requirement for this traverse is the high accuracy for the known vectors between two point ends. Furthermore, the amount of annexed traverses cannot exceed the limits.

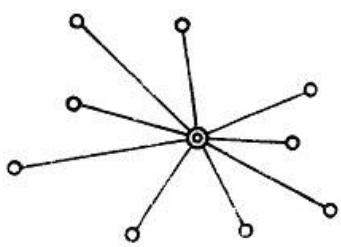




Star shape net

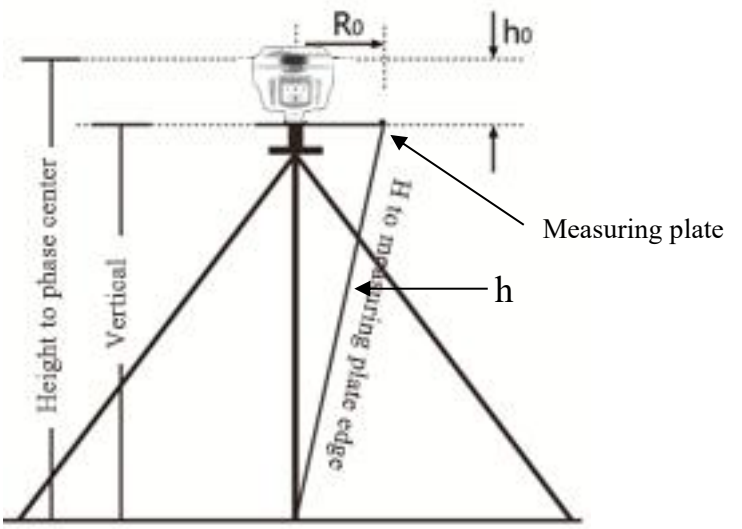
Star net has simple geometry graph, but the baselines of it mostly don't compose a closed graph, so it has a bad checking ability and consistency.

The advantage of this net is that it only needs two receivers, the work is very simple, so it is mostly used in the quick surveying as quick static orientation and kinematical orientation. This working mode is widely used in project layout, border surveying and GIS surveying, etc.



§8.1.5 Antenna Height Measurement

After fixed the instrument, user should measure antenna height at the beginning and the end of every period of time to ensure the accuracy "mm" level. We usually measure from the center point on the ground to the center waterproof loop of antenna. That is an inclined height. Please refer to the following figure.



We use a formula to calculate antenna height.

$$H = \sqrt{h^2 - R_0^2} + h_0$$

"h" is the inclined height that measure from point on the ground to the measuring plate edge.

R_0 is the distance from middle of antenna to the edge of measuring plate.

h_0 is the distance from antenna phase center to the bottom of receiver (measuring plate).

H is the calculation result. We usually measure antenna height twice and adopt the average.

Attention: *We input the inclined height as the antenna height, which is the inclined distance from point on the ground to the waterproof loop of antenna.*

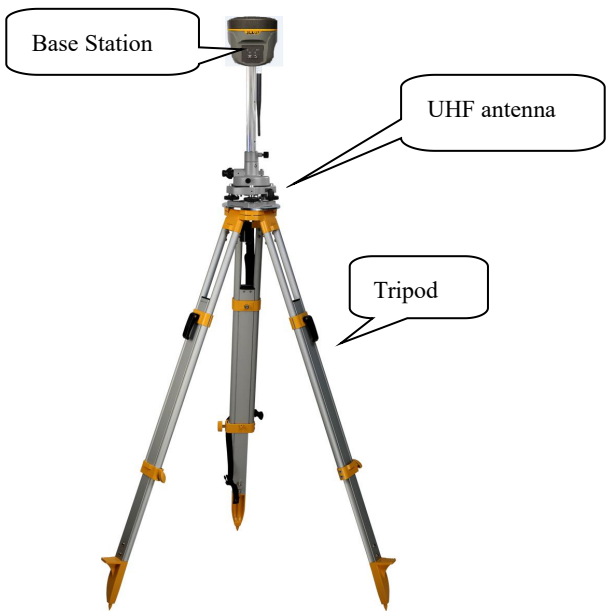
§8.2 RTK measurement

RTK is the abbreviation of Real-Time Kinematic measurements.

RTK technology is the real-time dynamic differential carrier phase positioning technology, combining global satellite navigation and positioning technology with data communication technology which includes base station and rover station. Base station transmits the data by radio or network to the rover station, which will perform differential analysis, thus providing real-time coordinates of the measurement point in the specified coordinate system.

Depending on the different ways of differential signals transmission, there are two methods for RTK operation by using the radio and internet (GPRS).

§8.2.1 By using radio (Internal radio)



§8.2.1.1 Base Station Set up

Base station shall be set up in the broad view, unobscured and higher places; avoid the vicinity of the high-voltage power transmission equipment and the transmitting and receiving antennas of radio communication equipment, the shade of trees, and the sides of waters, all of which will produce different degrees of impact on the GPS signal reception and emission of radio signals

1) Set a tripod to the location with known coordinates (or unknown), attach base receiver to the tribrach adapter set (the measuring plate is recommended to install under base receiver).
2) Install the transmitting antenna onto the receiver.

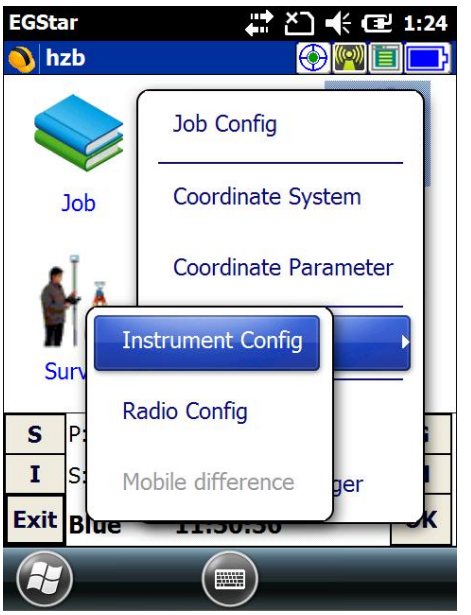
3) Make sure all connections are alright, then power on receiver.
4) The receiver is set as base with internal radio mode. (set on the control panel, or on internal Web UI or on the software installed on data collector).

§8.2.1.2 Start the Base station

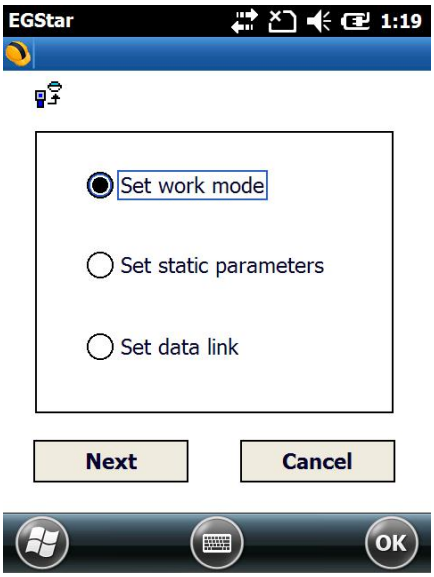
First time to start the base station, all the relative parameters are completely configured before starting.

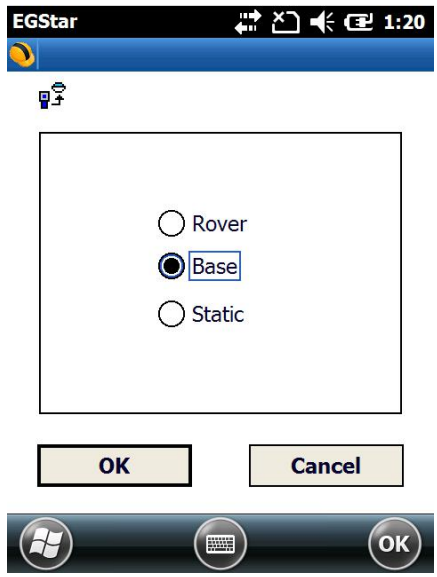
Using EGStar3.0

1) Run EGStar3.0 program on data collector;
2) Go to "Config—Device Config—Instrument Config" page to configure the working mode and datalink for base receiver.



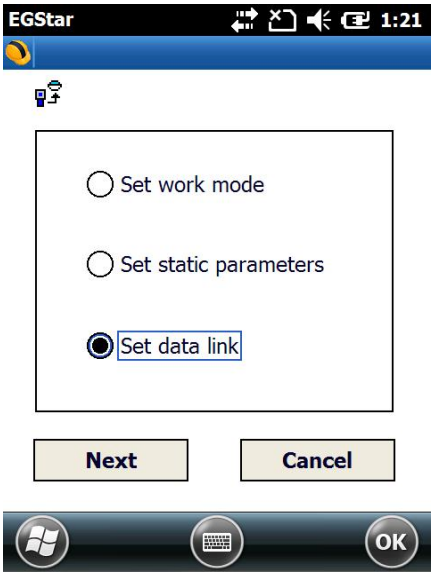
3) Tap on "Work mode setting" and then check the box of "Set work mode", then click on "Next" to continue;
4) Check the box of "Base" option and click "OK" and return to Instrument setting page. At this moment, New G1 plus prompts the correct working mode with voice guide.

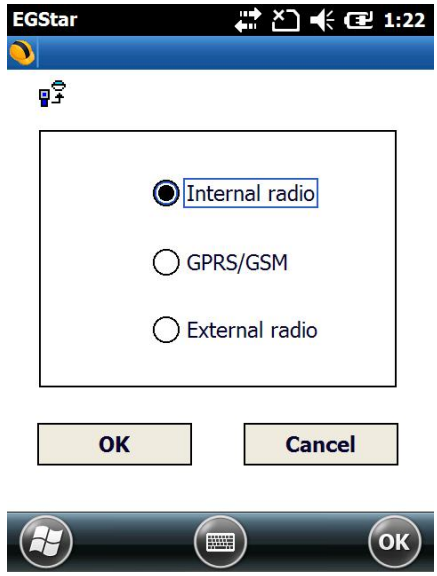




5) Then tap on "Work mode setting" and then check the box of "Set data link", then click on "Next" to continue;

6) Check the box of "Internal radio" option and click "OK" to complete the settings.





7) Return to the main interface and again get into instrument config page, tap on "Base setting" to get into Base configuration page.

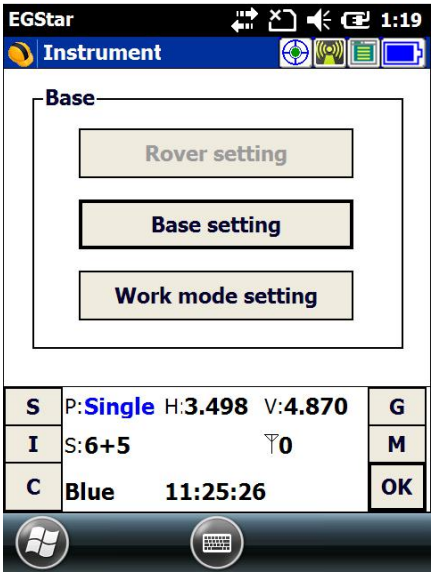
8) Choose the correction format in Msg,Type, choose the antenna measuring method and input correct antenna height in Ant,H, input the proper value for Interval time, Mask angle and PDOP limit.

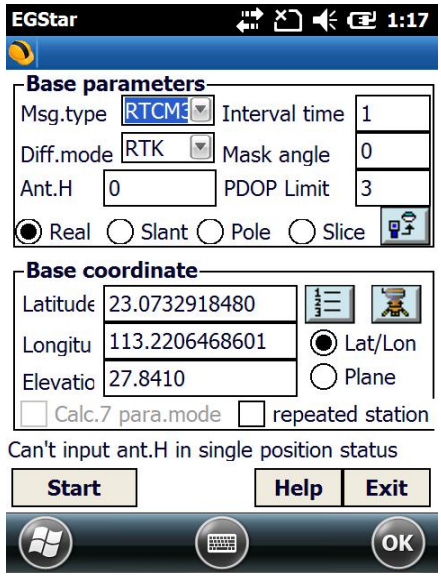
9) Then tap on the symbol to save and complete the parameters.

10) Input the coordinates for base location or tap on the symbol to obtain a single

position for base.

11) After all the parameters are completely set, click on “Start” button to start the base station.

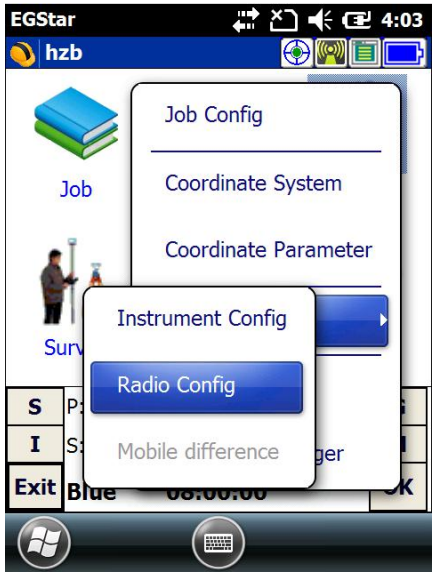


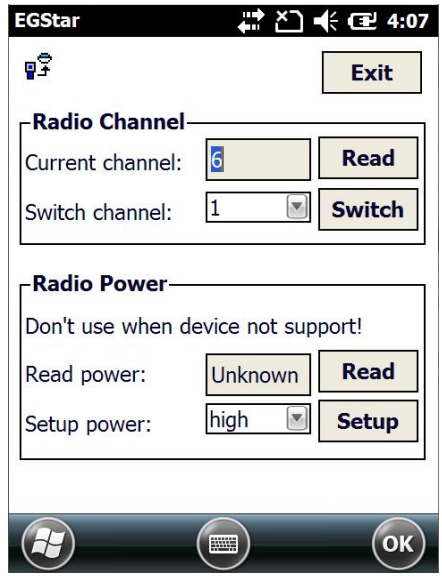


REMIND: If the base station is still set up on the same position next time, check the box of “repeated station” option and the base station will start automatically with known coordinates.

Radio channels setting

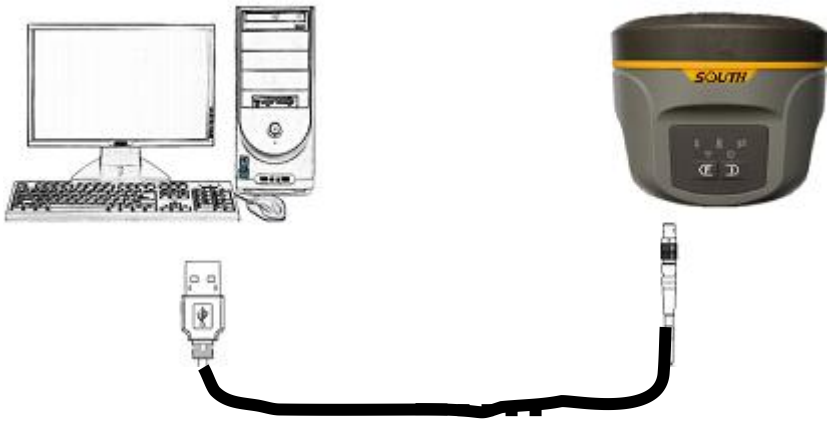
1) Go to “Config—Device Config—Radio Config” page.
2) In radio channel field, click on “Read” button to read the current channel value, or select a radio channel from the list and click on “Switch” button to change the radio channel.
3) In radio power field, click on “Read” button to read the current radio power, or select high/low from the list and click on “Setup” button to apply power for radio.



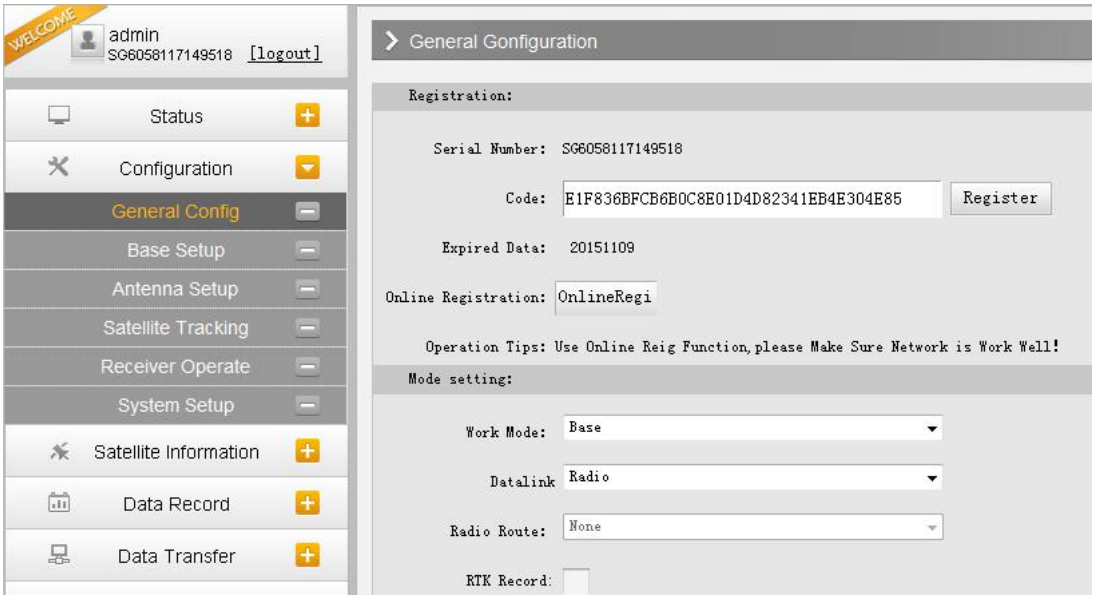


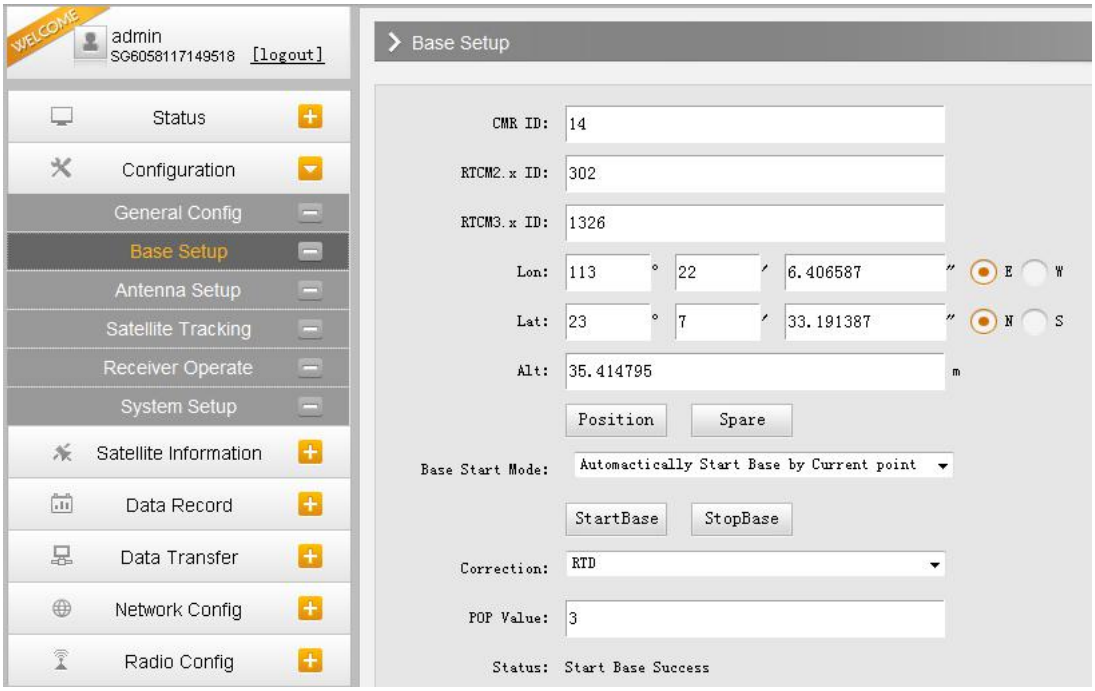
Using internal Web UI

1) Connect New G1 plus with computer via 7-pin to USB cable and set the USB port to output as Ethernet on New G1 plus. (a driver is required to installed on computer to enable this function).

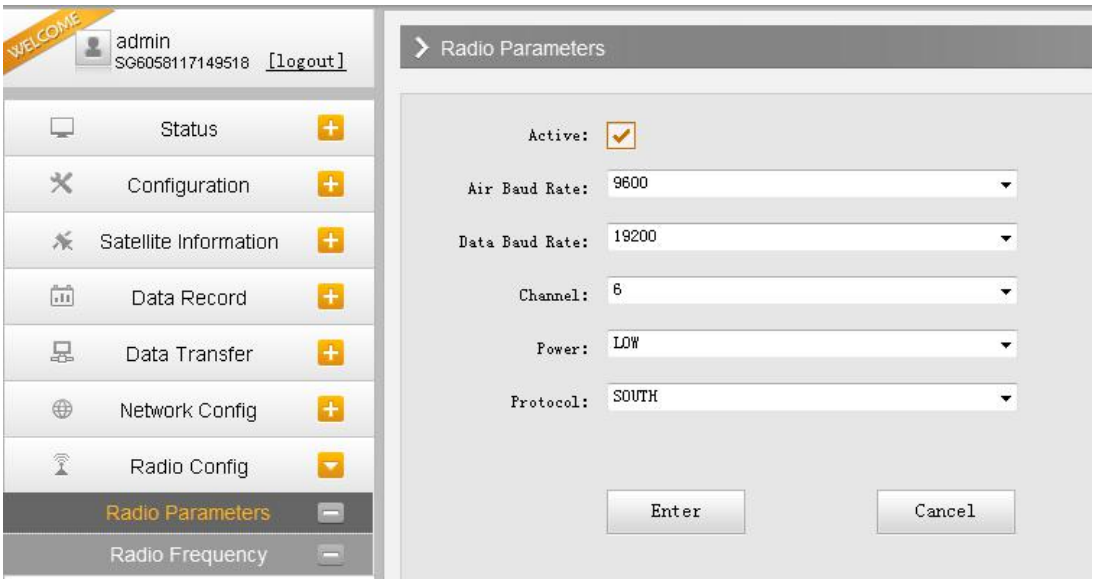


2) Login the internal Web UI of New G1 plus with the default username and password (admin/admin).
3) Get into “General Config” interface under “Configuration”;
4) Choose “Base” in “Work Mode” and “Radio” for “Datalink”, then click “Enter” button to save configurations;
5) Get into “Base Setup” interface, and input known coordinates or click “Position” button to obtain a single coordinates for base station;
6) Choose the correction format in “Corrections”, then click “StartBase” button to start the base station.





7) Get into "Radio Parameters" interface under "Radio Config", configure the radio parameters for base station such air baud rate, channel value, power and protocol.

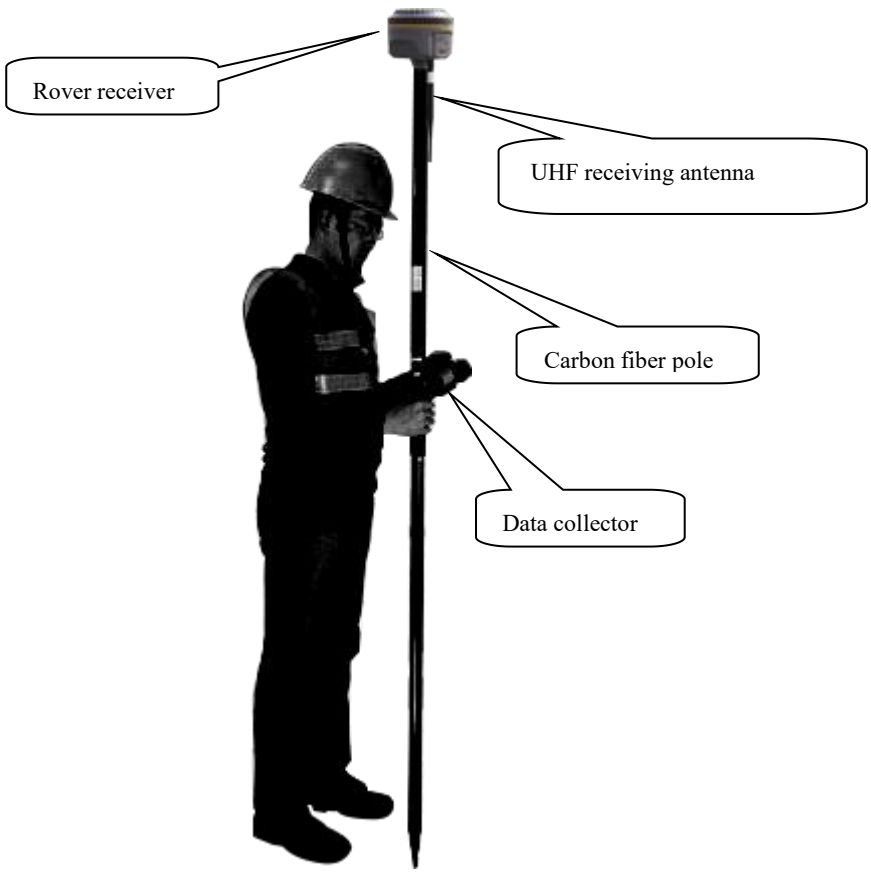


§8.2.1.3 Rover station set up

After verifying the successful transmitting of the Base station, the rover station shall be set up at this moment.

1) Install the bracket holder onto the carbon fiber pole, and fix the controller into the bracket, then power on the controller.

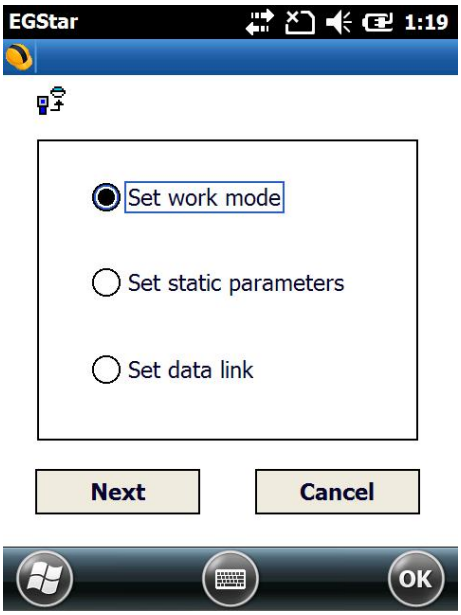
2) Install the receiving antenna onto the rover receiver, and screw the receiver into the carbon fiber pole, then power on the receiver.
3) Set the receiver as rover with internal radio mode. (set on the control panel, or on internal Web UI or on the software installed on data collector).

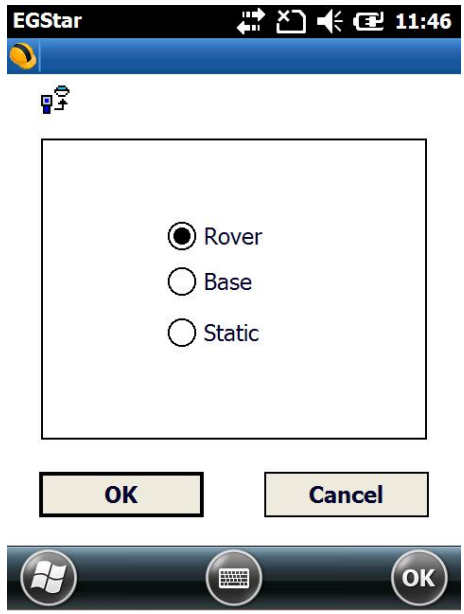


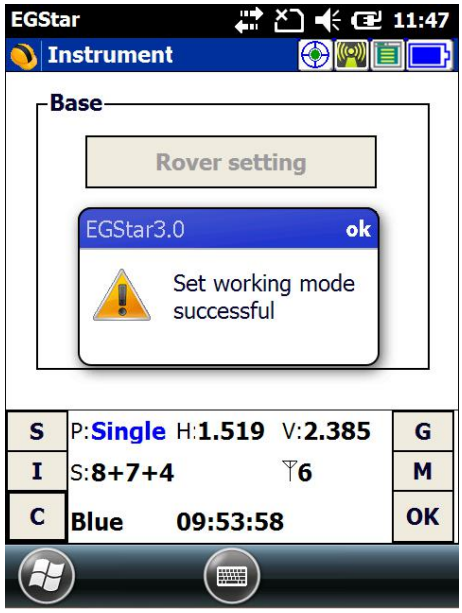
§8.2.1.4 Rover settings

Using EGStar3.0

1) Run EGStar3.0 program on data collector;
2) Go to “Config—Device Config—Instrument Config” page to configure the working mode and datalink for rover receiver.
3) Tap on “Work mode setting” and then check the box of “Set work mode”, then click on “Next” to continue;
4) Check the box of “Rover” option and click “OK” and return to Instrument setting page. At this moment, New G1 plus prompts the correct working mode with voice guide.

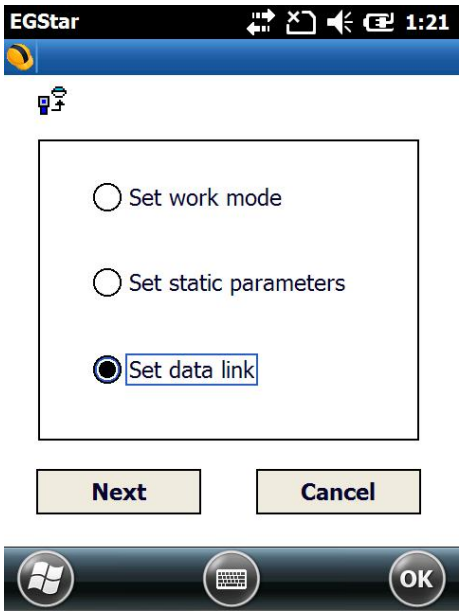


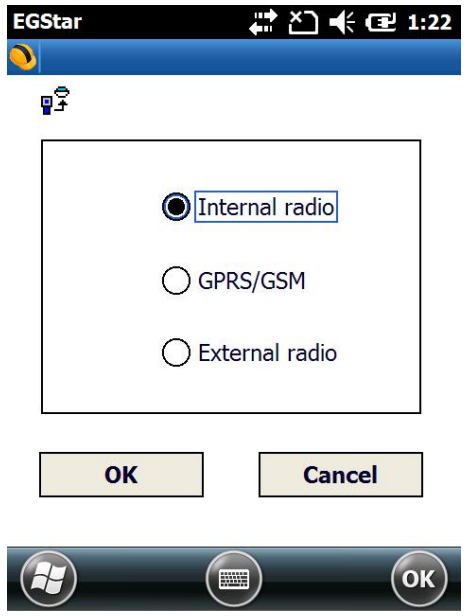




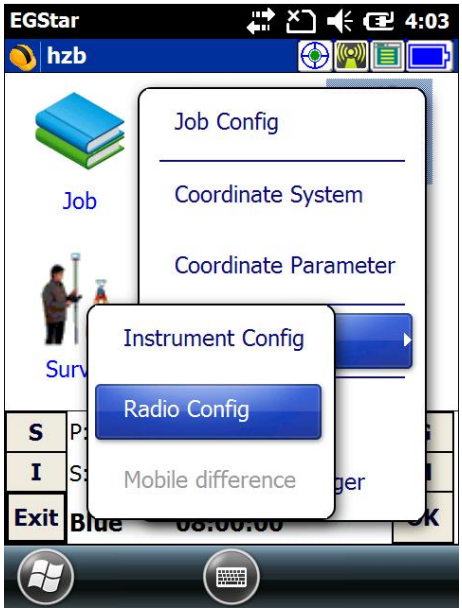
5) Then tap on “Work mode setting” and then check the box of “Set data link”, then click on “Next” to continue;

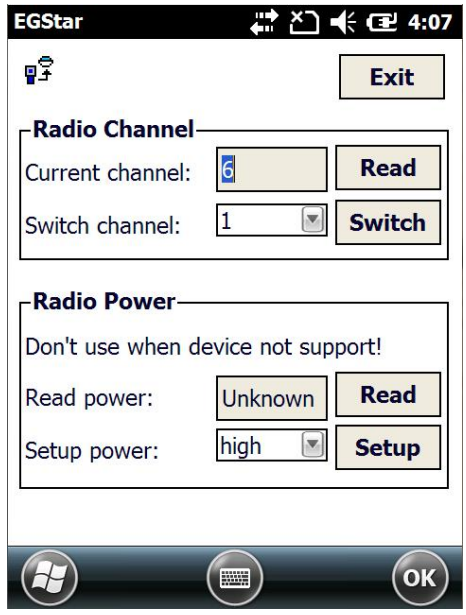
6) Check the box of “Internal radio” option and click “OK” to complete the settings.





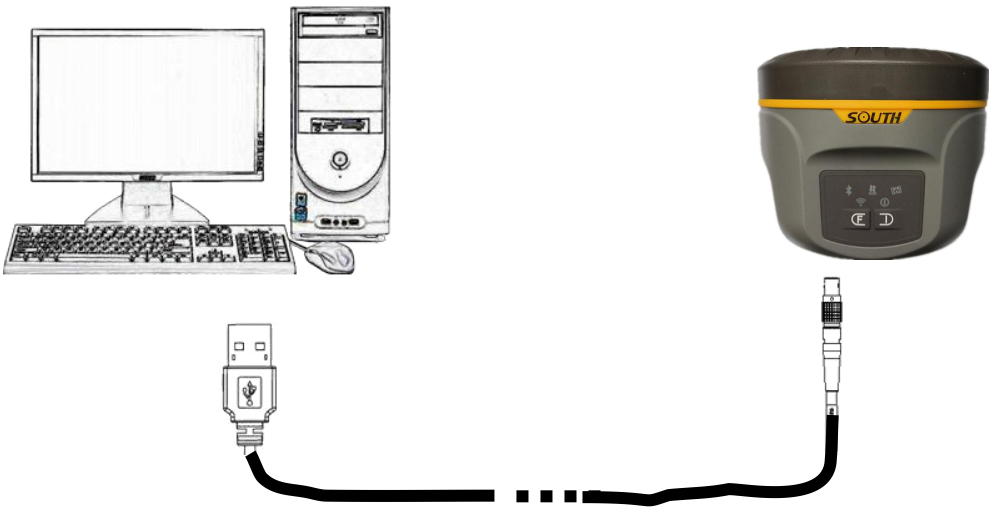
7) Radio channels setting
8) Go to “Config—Device Config—Radio Config” page.
9) In radio channel field, click on “Read” button to read the current channel value;
10) Select the same radio channel value as set on base station from the list and click on “Switch” button to apply this channel value.



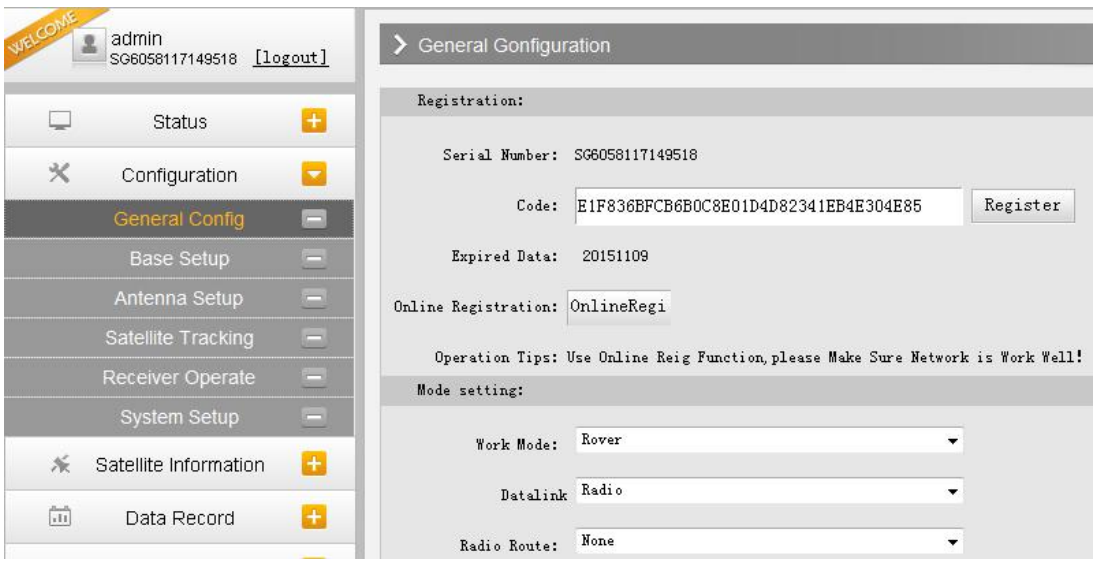


Using Web UI

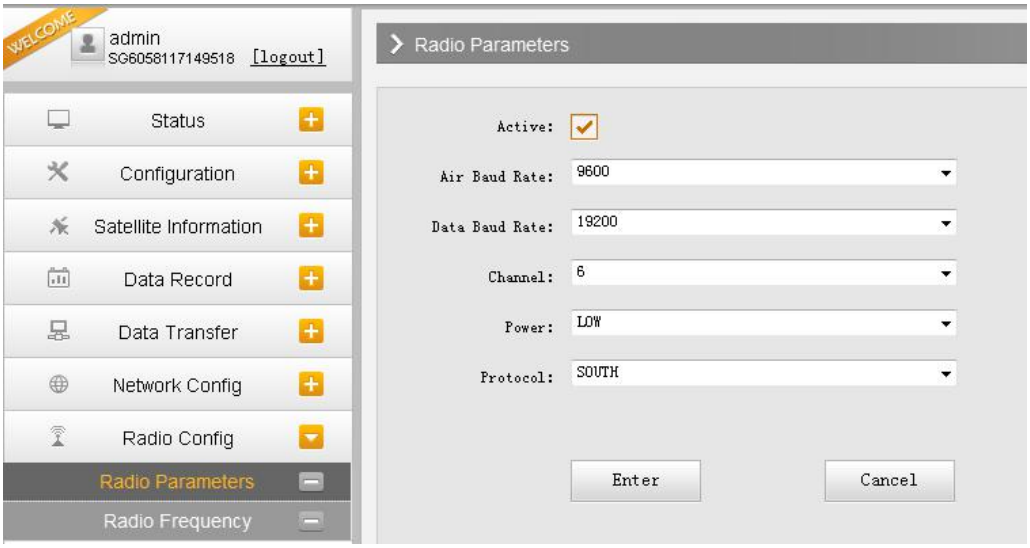
1) Connect New G1 plus with computer via 7-pin to USB cable and set the USB port to output as Ethernet on New G1 plus. (a driver is required to installed on computer to enable this function).

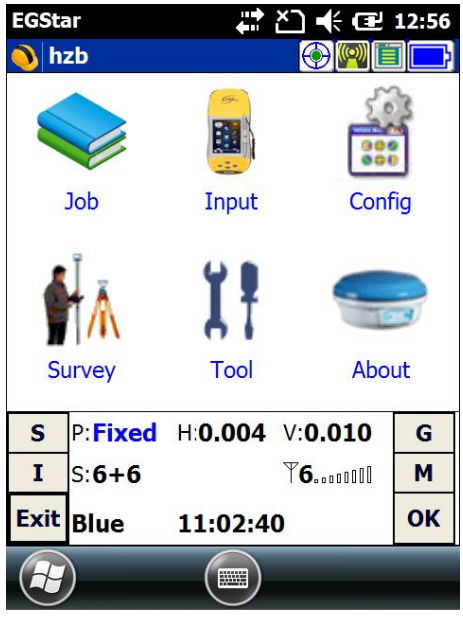


2) Login the internal Web UI of New G1 plus with the default username and password (admin/admin).
3) Get into “General Config” interface under “Configuration”;
4) Choose “Rover” in “Work Mode” and “Radio” for “Datalink”, then click “Enter” button to save configurations;



5) Get into “Radio Parameters” interface under “Radio Config”, configure the same radio parameters as set on base station for rover station such air baud rate, channel value, power and protocol

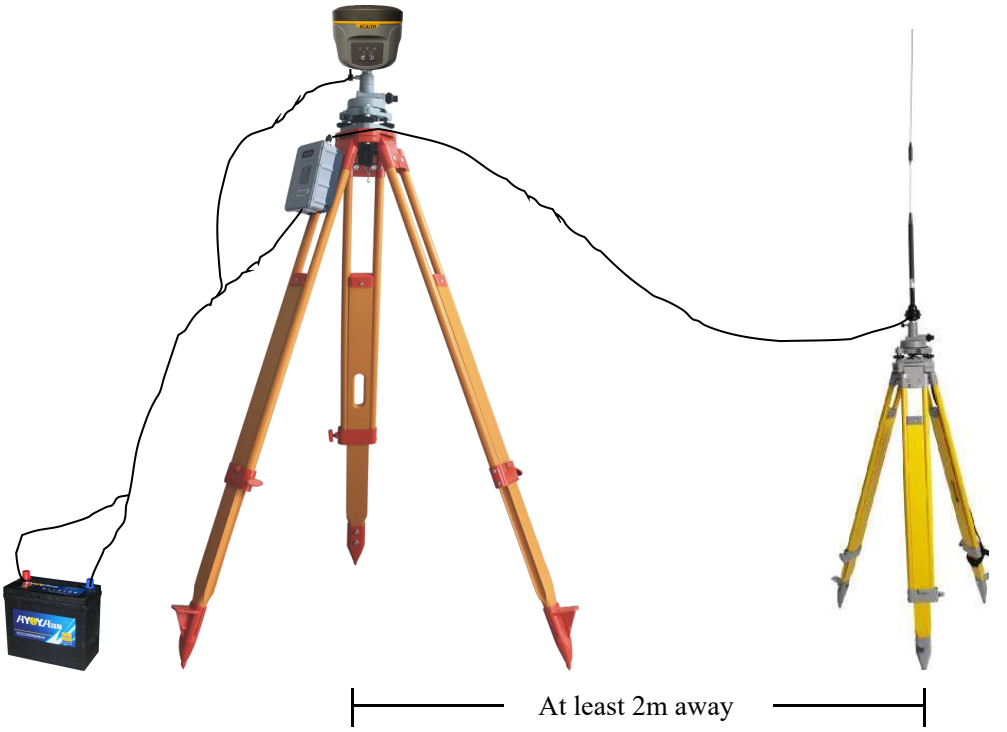




§8.2.2 By using radio (external radio)

§8.2.2.1 Base station setup

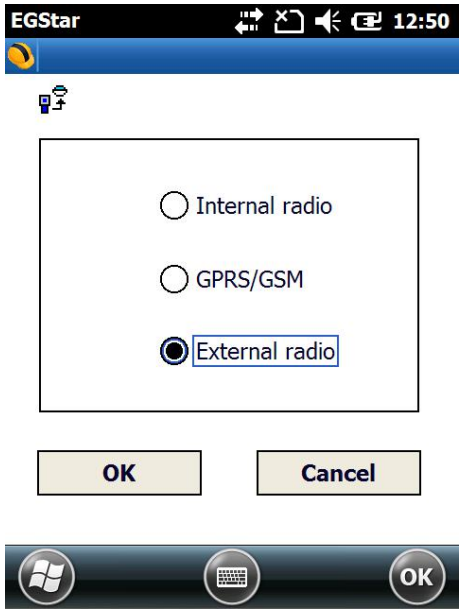
1) Set a tripod to the location with known coordinates (or unknown), attach base receiver to the tribrach adapter set (the measuring plate is recommended to install under base receiver).
2) Mount the UHF antenna set onto a tripod, and connect it to the external radio which is linked with the external power supply via the multi-function cable.
3) Power on the base receiver and set the receiver as base with external radio mode. (set on the control panel, or on internal Web UI or on the software installed on data collector).



NOTE: place the 2 tripods at least 2m away from each other against signal interference.

Using EGStar3.0

Set the base receiver as base working mode from "Config—Device Config—Instrument Config—Work mode setting—Set work mode--Base", choose the External option in "Set data link".



§8.2.2.2 Radio settings

1) Make sure all connections are alright, then power on the radio by pressing power button, and then press “C” button to define the channel for data transmission.
2) Please keep in mind the channel is selected to match the settings in controller later on.
3) Radio starts to transmit when TX LED is flashing.

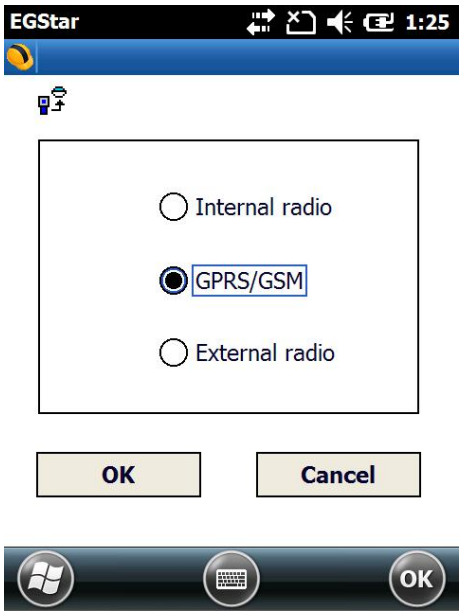
§8.2.2.3 Start Base Station (Please refer to 8.2.1.2)

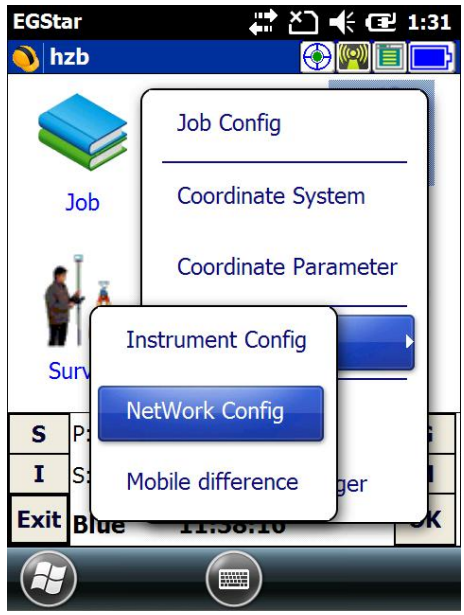
§8.2.3 By using internet (GPRS)

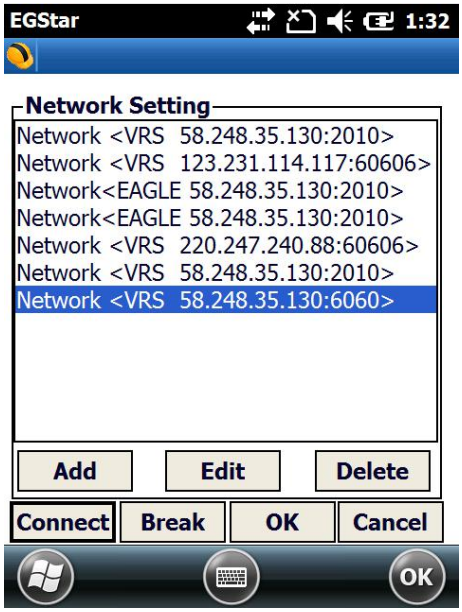
1) In this mode, base station is no longer to set up as CORS is permanently installed.
2) Insert a SIM card into the SIM card slot in battery component.
3) Power on the rover receiver and connect with controller via Bluetooth.

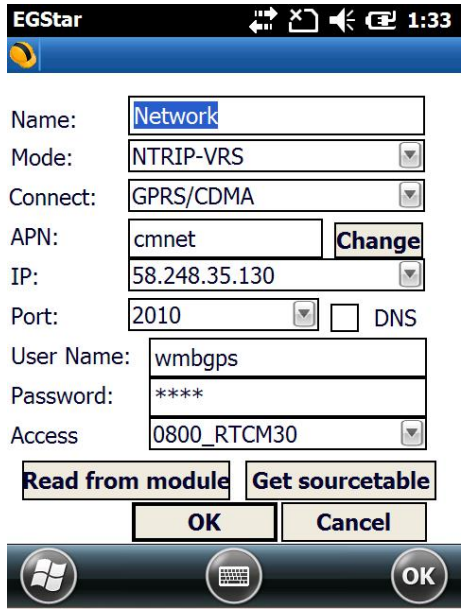
EGStar3.0 settings

1) Go to “Config—Device Config—Instrument Config—Work mode setting—Set data link” interface to choose “GPRS/GSM” option for rover station.
2) Then return to main interface and go to “Config—Device Config—Network Config” page.
3) Add a new NTRIP connection in this page or select the existed one to re-edit/use directly.



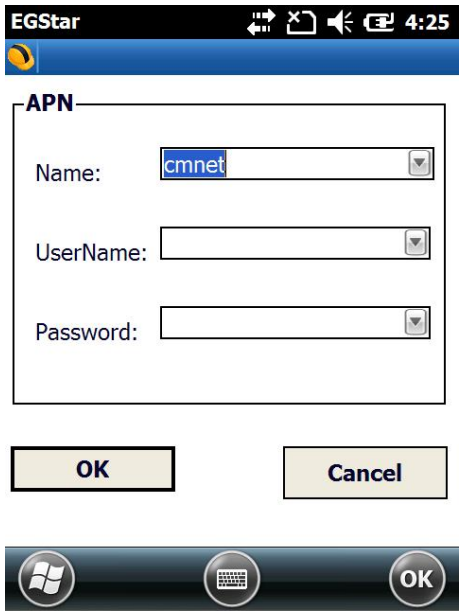






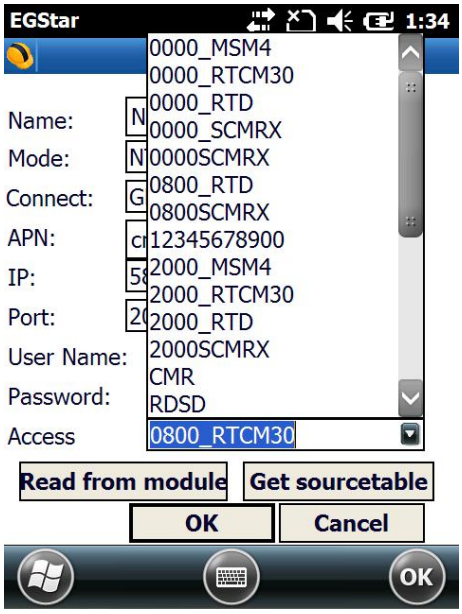
4) Input a name for NTRIP connection and choose “NTRIP-VRS” for “Mode” and choose “GPRS/CDMA” for Connect.

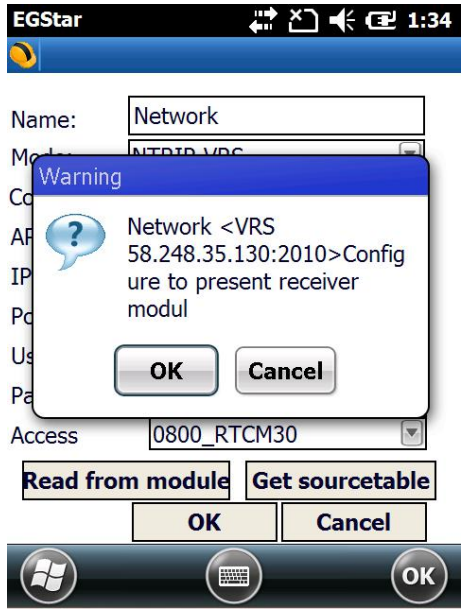
5) Then click on “Change” button to define the ANP for your local SIM card.



6) Input the IP address and port, then input the assigned username and password for your NTRIP connection.

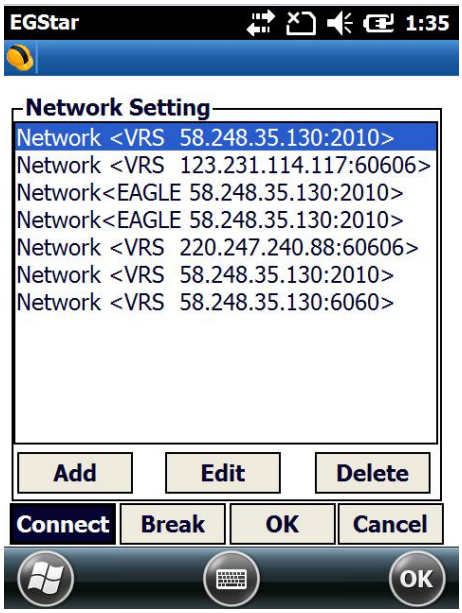
7) Press “Get Sourcetable” button to obtain mountpoint list, then select the appropriate one from the list in Access option, press “OK” button to confirm and return to Network Setting interface.

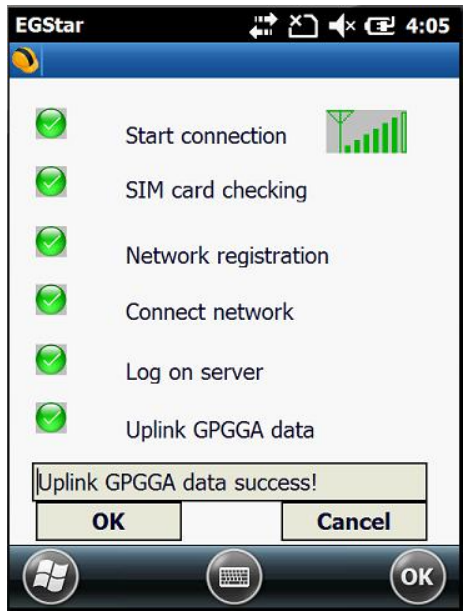




8) Press “Connect” button to access CORS network and obtain corrections from selected mountpoint.

9) After the message “Uplink GPGGA data success” appears in the status bar, click “OK” button to return to main interface, and check the general info at the bottom.

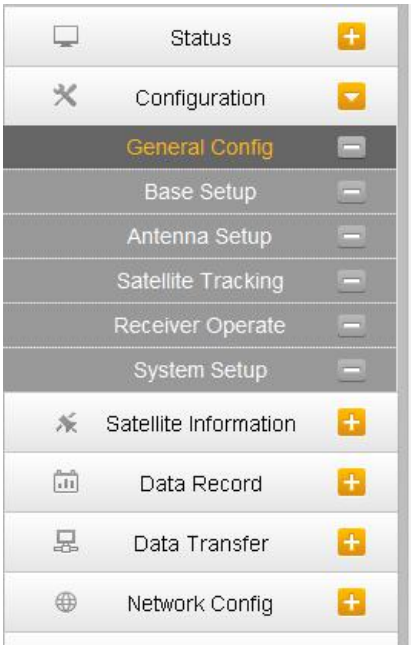


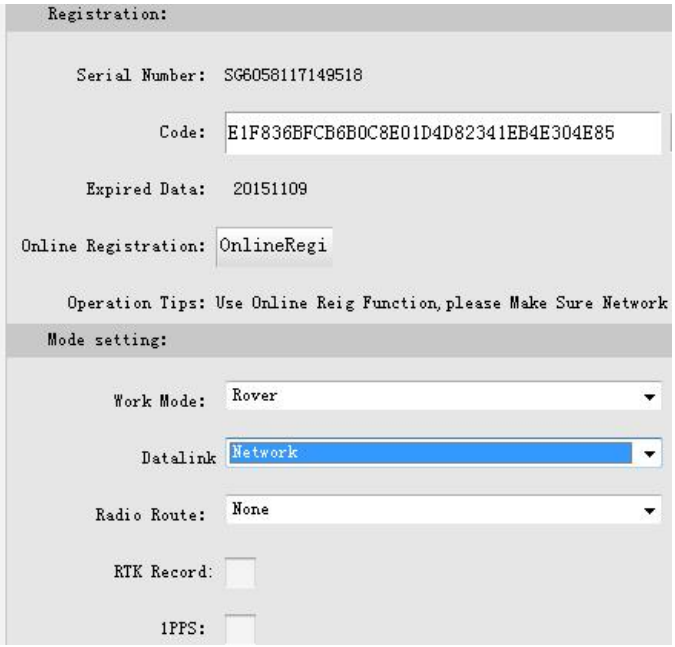


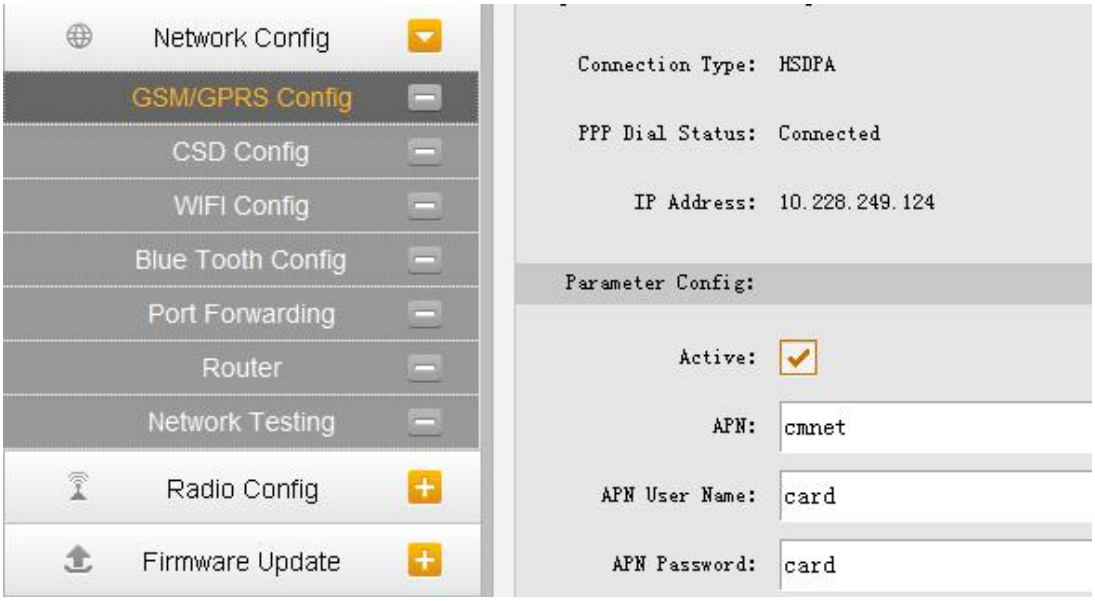
NOTE; the parameters would be automatically saved up once input, the receiver would track the CORS info most recently input and connect when it gets started next time.

Web UI settings

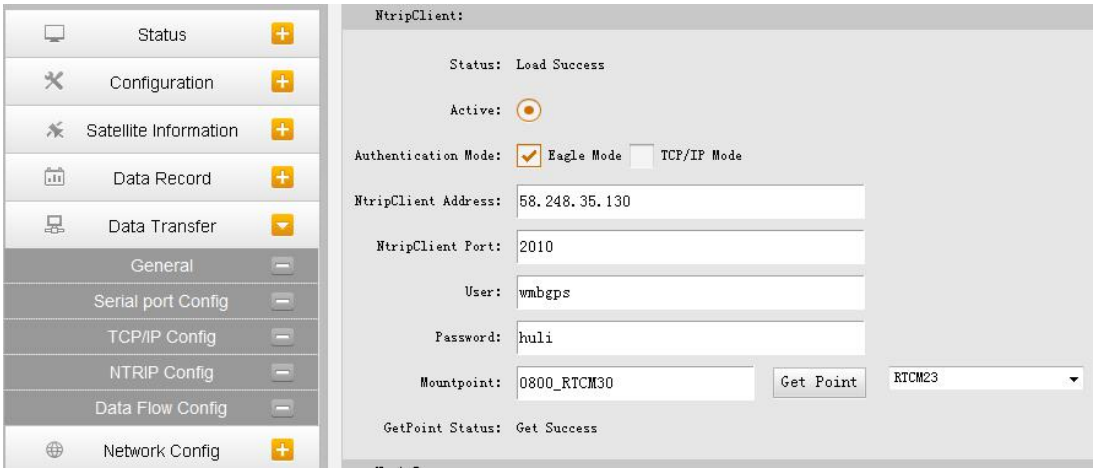
1) Login the web UI of New G1 plus and go to "General Config" interface, then choose "Network" in "Datalink" option, click on "Enter" button to confirm and save the settings.
2) Then go to "GSM/GPRS Config" interface under "Network Config" to check if the SIM card is detected, and input the APN information at the bottom.







3) Go to "NTRIP Config" interface under "Data Transfer", and input the CORS server information including IP, Port, User and password, then click "Get Point" button to download mountpoint list from server. Then select the appropriate one from the list and click on "Enter" button at the bottom to access.



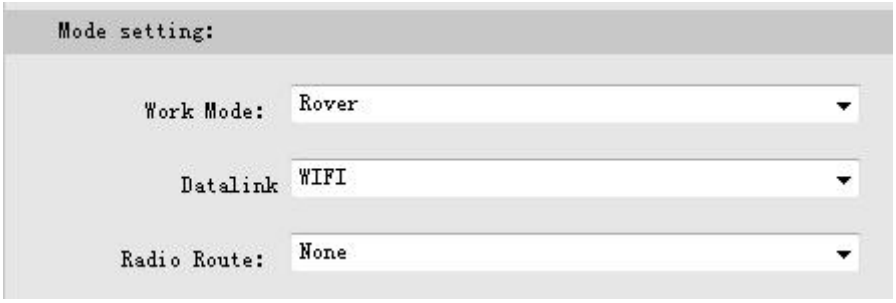
§8.2.4 By using internet (WIFI)

WiFi datalink is a new feature and new technology adopted on New G1 plus, it is more faster and stable in network RTK job.

Set the receiver as rover with WIFI mode on the control panel or on Web UI.

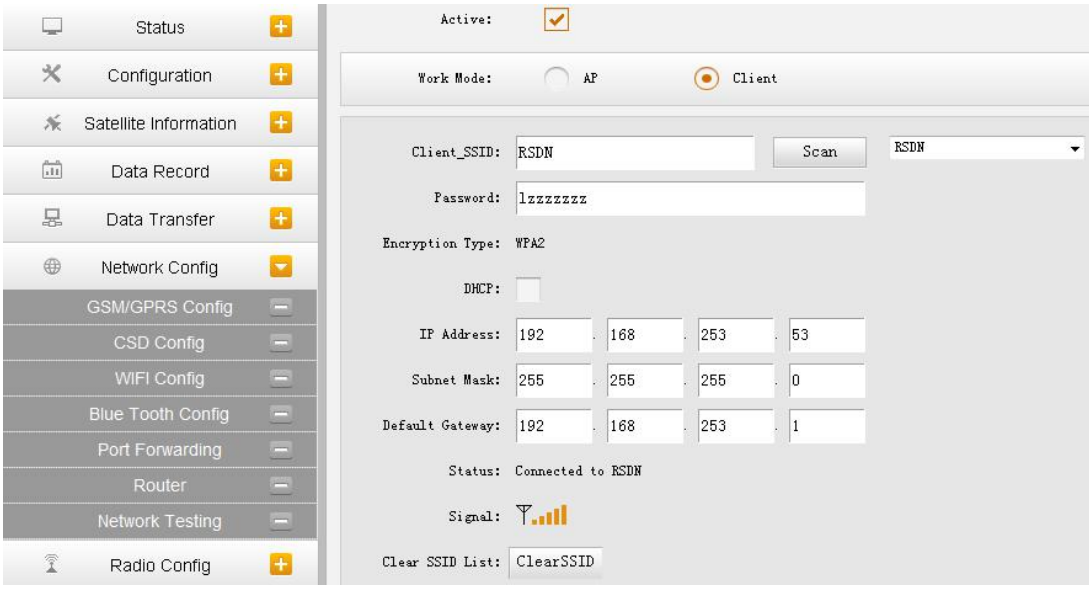
Web UI settings

1) Login the web UI of New G1 plus and go to “General Config” interface, then choose “WIFI” in “Datalink” option, click on “Enter” button to confirm and save the settings.

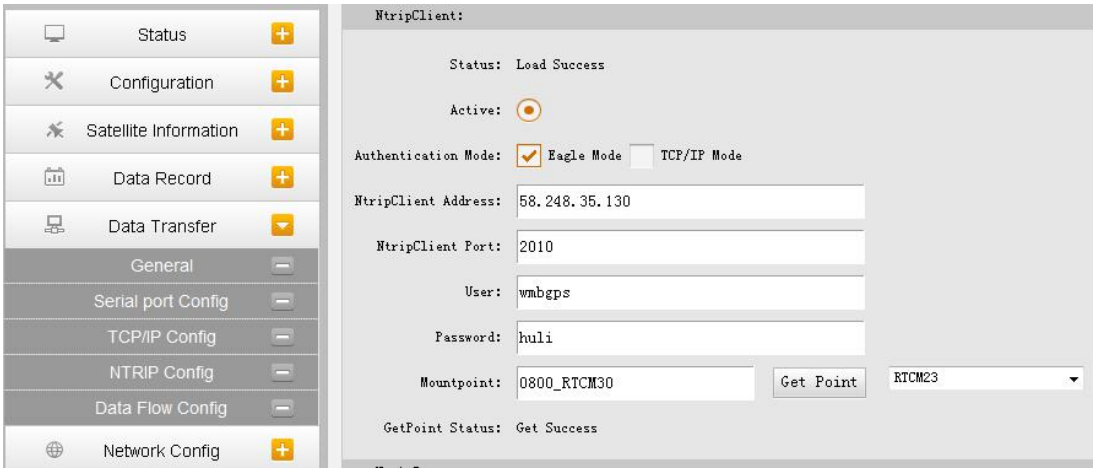


2) Then go to “WIFI Config” interface under “Network Config”, there the option of “Client” is activated if WIFI used as datalink.

3) Click on the “Scan” button to search the surrounding available WIFI hotspot, then select a proper one and input the password, click the “Enter” button at the bottom to confirm and access



4) If the WIFI connection is successfully connected, go to “NTRIP Config” interface under “Data Transfer”, and input the CORS server information including IP, Port, User and password, then click “Get Point” button to download mountpoint list from server. Then select the appropriate one from the list and click on “Enter” button at the bottom to access.



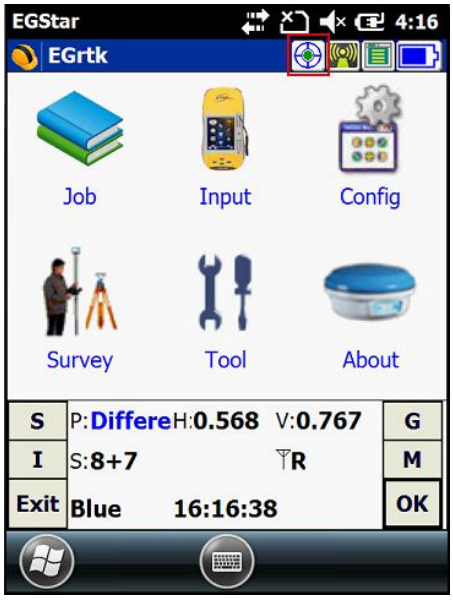
§8.2.5 Tilt Survey

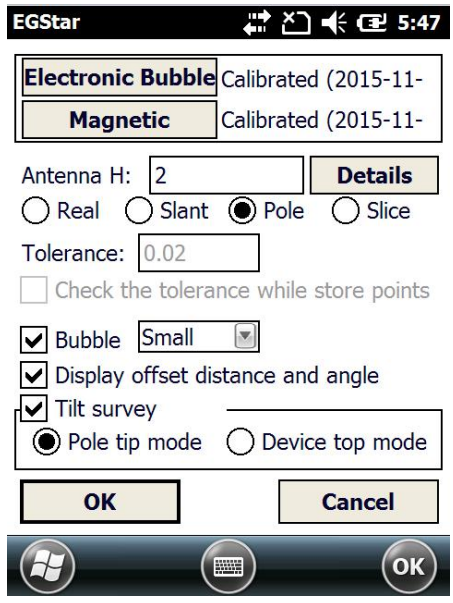
Electronic Bubble

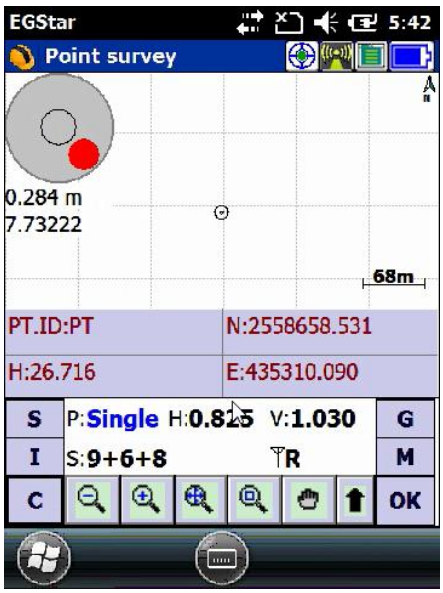
Start electronic bubble

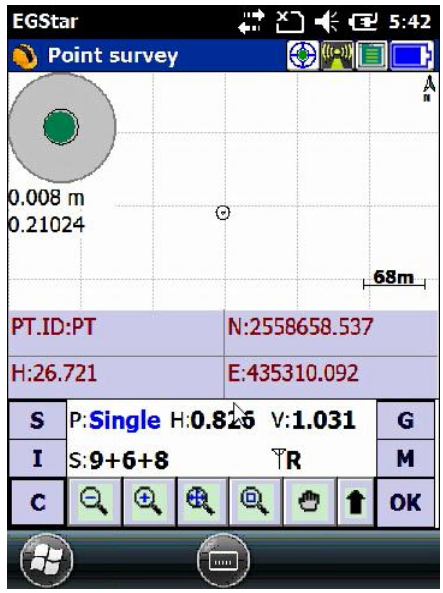
a) In the main interface, click the calibration setting button on the top of the interface, then get into the setting interface.

b) Mark on the checkbox of “Bubble” option in the setting interface, click ‘OK’ return to Point survey interface, there appears the electronic bubble on the upper left of the screen.







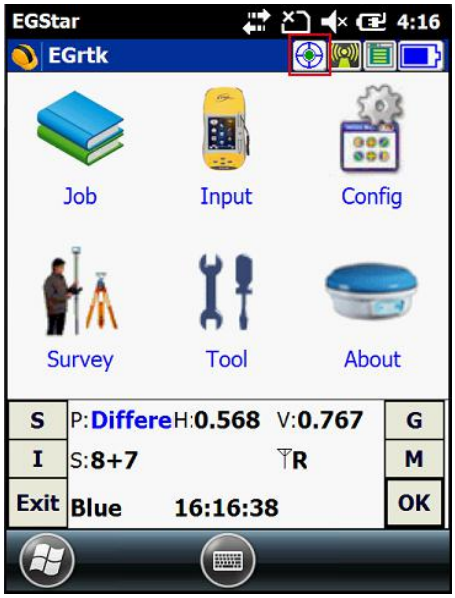


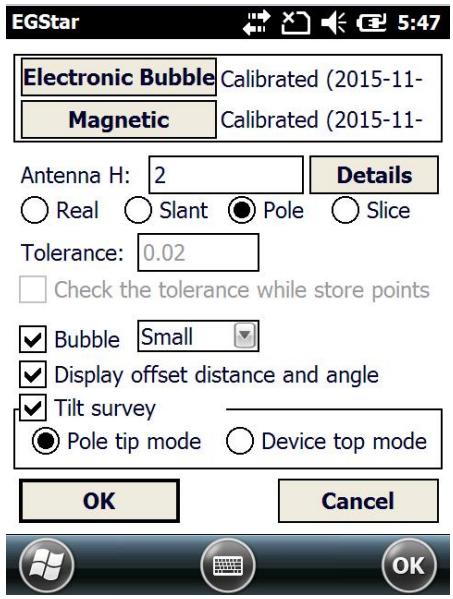
Sensors Calibration

New G1 plus supports tilt survey function, but before doing the tilt surveying on New G1 plus, the sensors calibration shall be done.

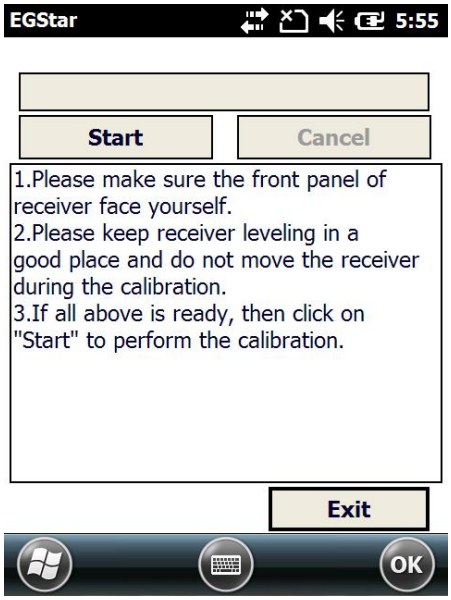
1. Electronic Bubble calibration

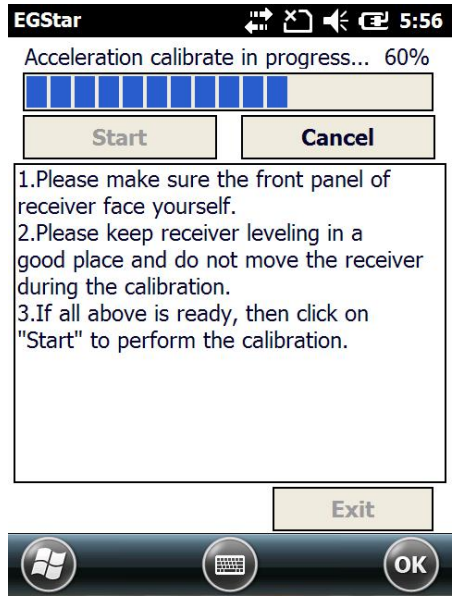
Get into calibration interface by clicking on calibration setting button on the top of the screen. Click “Electronic Bubble” in the calibration setting interface,





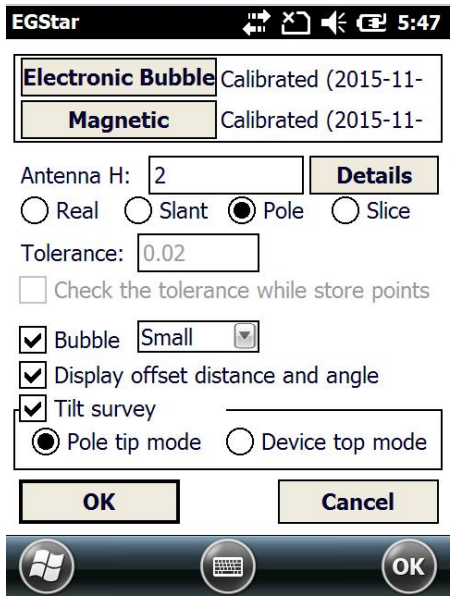
In the acceleration calibration interface, make sure the device is level, hold and click “Start” button to start the calibration, until it’s finished.



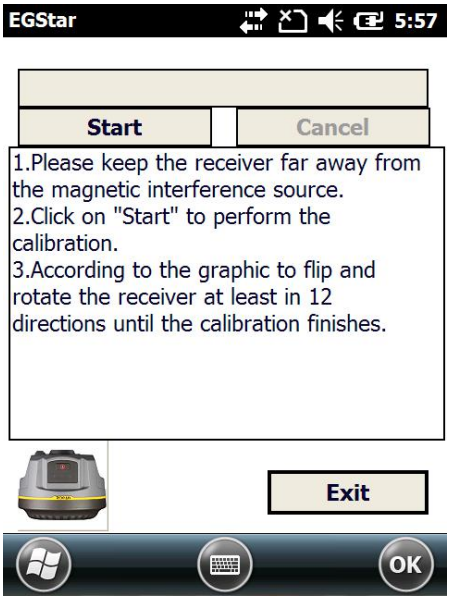


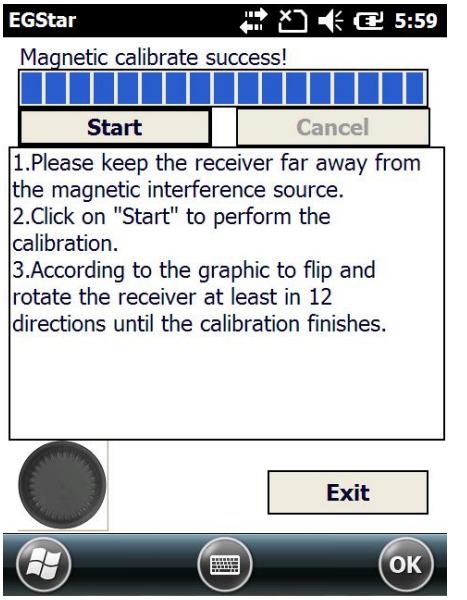
2. Magnetic calibration

In the calibration setting interface, click “Magnetic” to enter the magnetic calibration interface.



In the megnetic calibration interface, click “Start” to start the calibration, then flip and rotate the New G1 plus according to the sketch map on the left bottom of the screen (you can also draw “∞” after New G1 plus is connected to the carbon fiber pole), until the calibration is finished 100%.





Tilt Surveying

After finishing the calibration for sensors, you can start tilt survey with New G1 plus in the tough conditions such as under the eave or around the wall, this function can correct the slant coordinates to the normal coordinates within 30° angle of inclination.

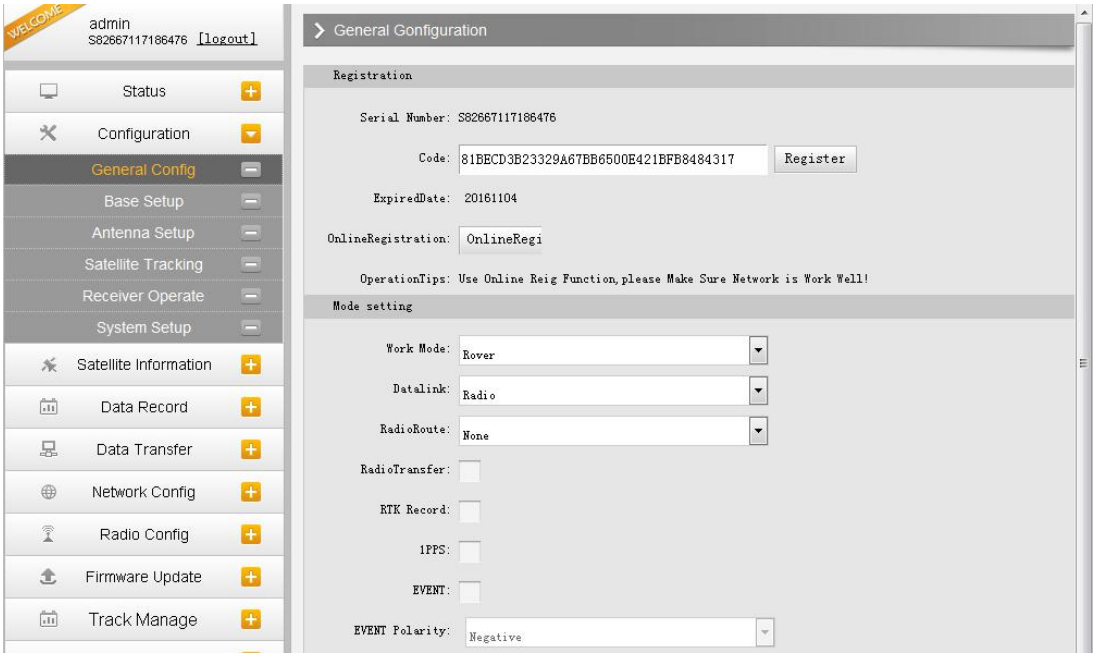
SPECIAL REMIND: We recommend you to do the measurement in usual way with the pole centering in the open air area, the tilt survey function is not the mainly measuring method for the normal fieldwork.

ChapterⅨ Hardware Registration

Users can get the point how to register the instrument in this chapter. Registering on New G1 plus is easier than operating on G1.

Login the web UI management of New G1 plus with WiFi or USB network connection.

Go to “Config—General Config” configuration page, the registration section is located at the top of this interface.



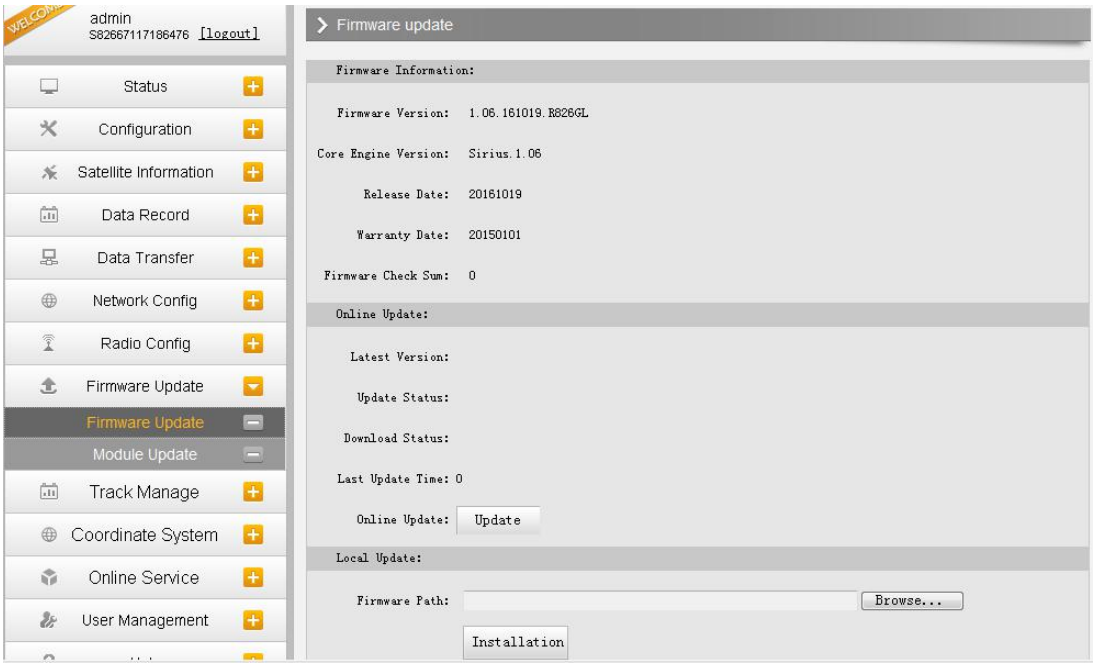
Enter the registration code and click on “Register” button, a prompt message will appear. And the ExpiredDate would be changed.

Chapter Ⅹ Firmware Update

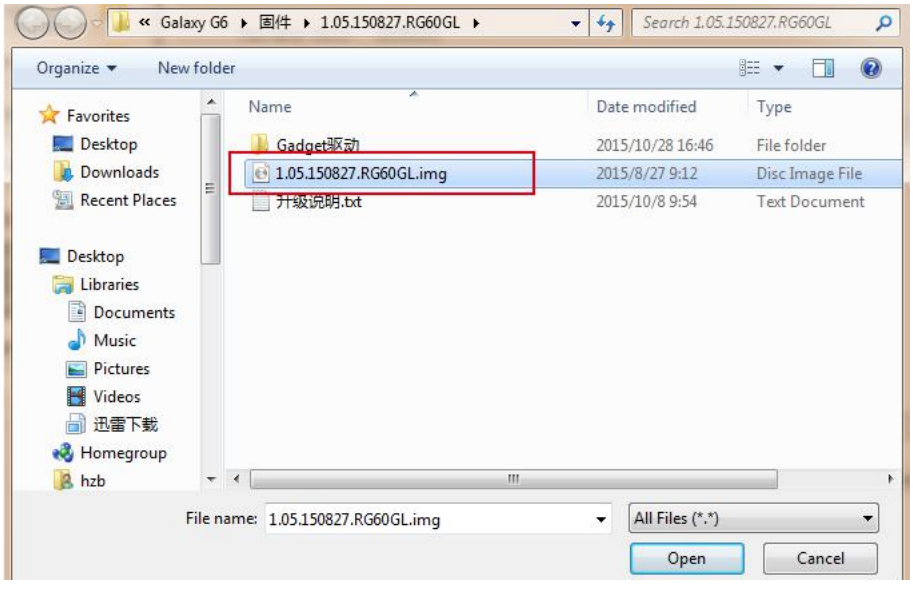
This chapter will explain how to update the firmware for New G1 plus, detail steps are written below.

Login the web UI management of New G1 plus with WiFi or USB network connection.

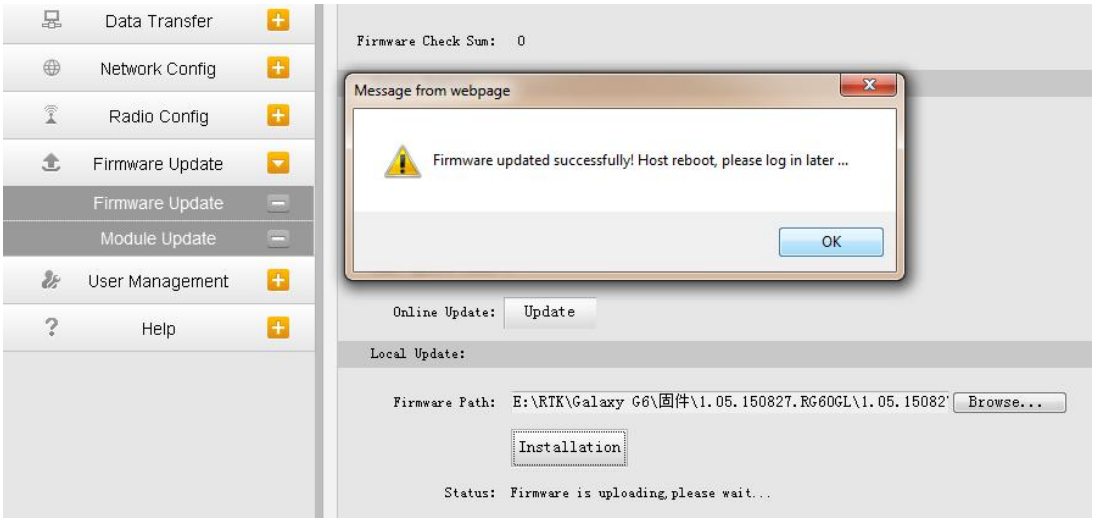
Go to “Firmware Update—Firmware Update” configuration page, all the information of the firmware which current installed on New G1 plus would be displayed here.



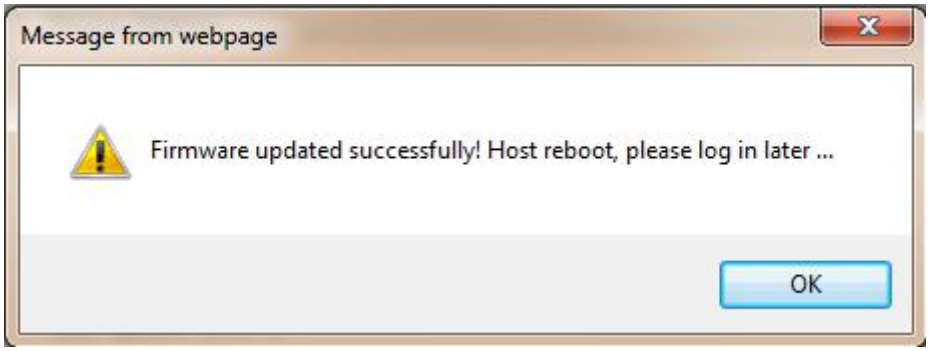
Click on “Browse” button to load firmware file (Please take in mind that the firmware is ended with .img as the extension name).



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: New G1 plus doesn’t support to update the firmware with the help of **INstar** program any more, in the future, update the firmware for New G1 plus shall be done through the Web UI.*

Appendix A New G1 plus technical specifications

Signals Tracked Simultaneously	
Channels	336 Channels(220 channels optional)
BDS	B1, B2, B3
GPS	L1C/A, L1C, L2C, L2E, L5
GLONASS	L1C/A, L1P, L2C/A, L2P, L3
SBAS	L1C/A, L5 (Just for the satellites supporting L5)
GALILEO	GIOVE-A, GIOVE-B, E1, E5A, E5B
	QZSS, WAAS, MSAS, EGNOS, GAGAN, SBAS
GNSS Features	
Positioning output rate	1Hz~50Hz
Initialization time	< 10s
Initialization reliability	>99.99%
Positioning Precision	
Code Differential GNSS Positioning	Horizontal: ± 0.25 m + 1 ppm
	Vertical: ±0.50 m + 1 ppm
SBAS positioning accuracy	typically<5m 3DRMS
Static GNSS Surveying	Horizontal: ±2.5 mm + 0.5 ppm
	Vertical: ±5 mm + 0.5 ppm
Real-Time Kinematic Surveying	Horizontal: ±8 mm + 1 ppm
(Baseline<30km)	Vertical: ±15 mm + 1 ppm
Network RTK	Horizontal: ±8 mm + 0.5 ppm
	Vertical: ±15 mm + 0.5 ppm
RTK initialization time	2~8s
Physical	
Dimension	13.5cm(Diameter)×11.3cm(Height)
Weight	1.39kg (battery included)
Material	Magnesium aluminum alloy shell
Environmental	
Operating	-30℃~+65℃
Storage	-40℃~+80℃
Humidity	95% Non-condensing
Waterproof/Dustproof	IP67 standard, protected from long time immersion to depth of 1m
	IP67 standard, fully protected against blowing dust
Shock and Vibration	Withstand 2 meters pole drop onto the cement ground naturally
Electrical	

Power Consumption	2W
Power Supply	9-25V DC, overvoltage protection
Battery	Rechargeable, removable Lithium-ion battery, allow to check remaining electricity quantity
Battery Life	Single battery: 16h (static mode)
	10h (internal UHF base mode)
	12h (rover mode)
Communications	
I/O Port	5PIN LEMO external power port + RS232
	7PIN LEMO +external USB(OTG)+Ethernet
	1 UHF antenna interface
	SIM card slot
Wireless Modem	Integrated internal radio receiver and transmitter, 1W/2W/3W optional
	External radio transmitter 5W/25W
Frequency Range	410-470MHz
Communication Protocol	TrimTalk450s, TrimMark3, PCC EOT, SOUTH
Cellular Mobile Network	WCDMA3.5G network communication module, downward compatible with GPRS/EDGE
	customized CDMA2000/EVDO 3G and TDD-LTE/FDD-LTE 4G module
Double Module Bluetooth	BLEBluetooth 4.0 standard, support for android, ios cellphone connection
	Bluetooth 2.1 + EDR standard
NFC Communication	Realizing close range (shorter than 10cm) automatic pair between New New G1 plus and controller (controller equipped NFC wireless communication module needed)
External Devices	Optional external GPRS/EDGE dual-mode communication module, switchable; allow to connect external WLAN card
WIFI	
Modem	802.11 b/g standard
WIFI hotspot	The WIFI hotspot allows any mobile terminal to connect and access to the internal webserver for the control and moditor receiver
WIFI Client	To work as the datalink that receiver is able to broadcast and receive differential data through WIFI
Data Storage/Transmission	
Storage	8GB SSD internal storage
	Automatical cycle storage (The earliest data files will be removed while the memory is not enough)
	Support external USB storage

	The customizable sample internal is up to 50Hz
Data Transmission	Plug and play mode of USB data transmission
	Support FTP/HTTP data download
Data Format	Differential data format: CMR+, CMRx, RTCM 2.1, RTCM 2.3, RTCM 3.0, RTCM 3.1, RTCM 3.2
	GPS output data format: NMEA 0183, PJK plane coordinates, Binary code, Trimble GSOF
	Network model support: VRS, FKP, MAC, fully support NTRIP protocol
Inertial Sensing System	
Tilt Survey	Built-in tilt compensator, correcting coordinates automatically according to the tilt direction and angle of the centering rod
Electronic Bubble	Controller software display electronic bubble, checking leveling status of the centering rod real time
User Interaction	
Operating system	Linux
Buttons	One-button operation, visual operation, convenient and efficient
Indicators	Convenient to view and understand mode settings and status
Webserver	Allows to control and moditor the receiver in webserver through WIFI or Bluetooth, freely to configure receiver
Voice guide	Status and operation voice guide, support to customize local language, Chinese/English/Korean/Spanish/Portuguese/Russian/Turkish supported
Open platform	The OpenSIC observation data format and interactive interface support secondary development

Appendix B 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 make 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.