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NET660i
BASE STATION RECEIVER

USER GUIDE

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Contents

Preface

Introduction

Welcome to using the High-Precision GNSS Receiver. This introduction describes how to use this product.

Tips for Safe Use

Notice: The contents here are about special operations and so they need your special attention. Please read them carefully.

Exclusions

Before using the product, please read these operating instructions carefully, they will help you to use it better. This company assumes no responsibility if you fail to operate the product according to the instructions, or operate it wrongly due to misunderstanding the instructions.

This company is committed to constantly perfecting product functions and performance, improving service quality, and reserves the rights to change these operating instructions without notice.

We have checked the contents of the instructions and the software & hardware, without eliminating the possibility of deviation. The pictures in the operating instructions are for reference only. In case of non-conformity with products, the products shall prevail.

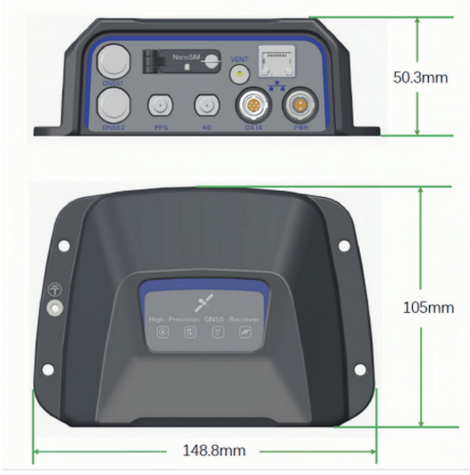
Technology and Service

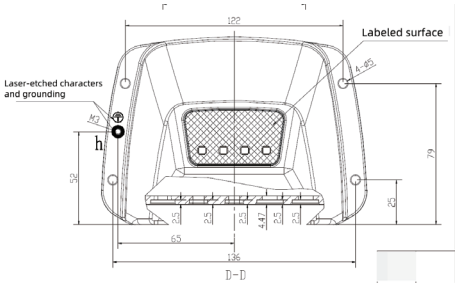
If you have any technical issues, please call this company technology department for help, and we will answer your questions in time.

1. NET660i Introduction

NET660i is a cost-effective miniaturized GNSS receiver designed for the construction of the BeiDou Ground-Based Augmentation System. It features a built-in Linux operating system and is developed with fully independent intellectual property rights. Boasting rich interface types, diverse communication methods, and support for large-capacity data storage, it stands as an optimal choice for the construction of the BeiDou Ground-Based Augmentation System.

The NET660i comes in two models: Positioning version and Heading version.





The NET660i receiver provides multiple communication interfaces for users to use in different application scenarios. The functions of each communication interface are shown in the table 1-2 below:

Communication Interface Description Table

	Name	Funciton
1	RJ45	Adaptive 10/100M ethernet interface
2	PWR	NET660i power supply interface,2-pin interface, 9-24V (Tpy12V)
3	Data	7PIN-RS232 interface, supporting output of multiple data formats
4	Nano SIM	SIM card slot
5	4G	4G antenna interface
6	GNSS 1	Positioning antenna interface (available on both Positioning and Heading versions)
7	GNSS 2	Heading antenna interface (exclusive to Heading versions)
8	PPS	Pulse per second output

2. Basic Receiver Operations

2.1 Power On

The NET660i does not have a built-in battery. Connect an external 9-24V DC (typically 12V) power cord to the receiver, and the device will power on automatically.

2.2 Power Off

Disconnect the power cord, and the NET660i will automatically shut down after power is cut off.

2.3 Web UI Connect

The NET660i receiver features a built-in Web UI configuration management page, enabling real-time monitoring of the receiver's operating status and download management of static storage data. Here's how to access it:

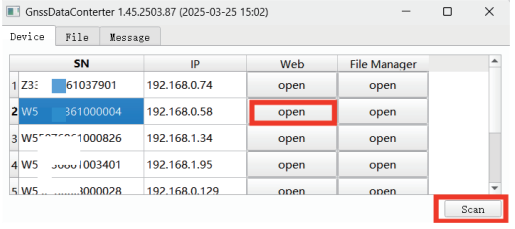
(1) Power on the receiver and connect it to a switch or router via Ethernet cable.

(2) Ensure the PC/laptop accessing the receiver is on the same local network.

(3) Open the GnssDataConterter tool, and click [Scan].

(4) After the target receiver's SN number appears in the scan results, click [Open] to open the Web UI page.

Note: If the IP address cannot be detected, verify that the PC and receiver are on the same local network.



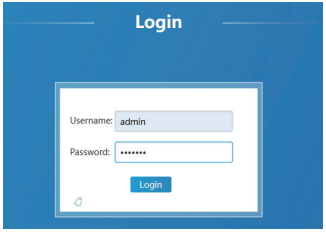
Alternatively, note the IP address of the NET660i within the local network and enter it into the browser's address bar to access the NET660i via Web.

Note: Display may vary slightly across different browsers. (Login interface shown below)Default factory credentials:

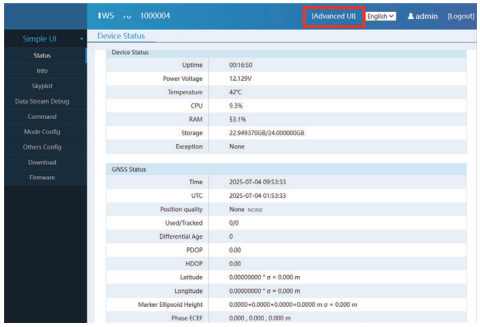
Username: admin

Password: ~abc123456

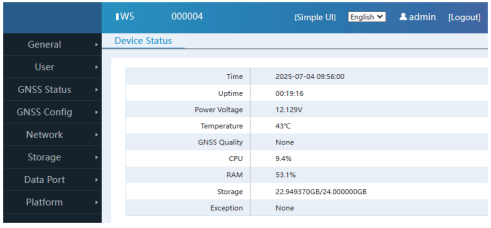
Security Notice: To enhance security, the maximum idle timeout for browser access is set to 10 minutes. The session will automatically expire and return to the login screen after 10 minutes of inactivity.



After successfully logging in with validation information, enter the NET660i Web Simple UI. The home page displays NET660i status information as shown below:



Click on "Advanced UI" in the upper right corner to access the full NET660i configuration page, as shown below:



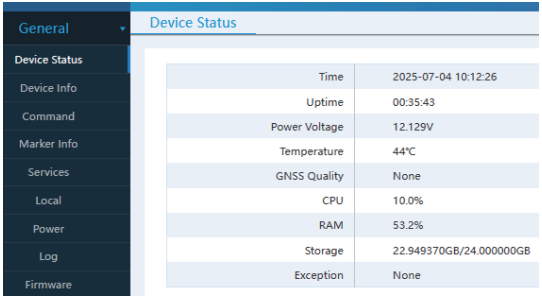
The NET660i Web UI is mainly divided into 8 sections, each containing multiple display information and functional settings options. Detailed content will be introduced in the following chapters.

3. Web UI Introduction

3.1 General

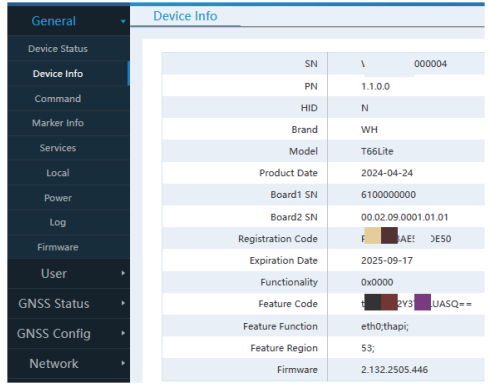
3.1.1 Device Status

Provides the physical status of the receiver, such as time, uptime, temperature, power voltage, GNSS quality, CPU, RAM, storage and exception. As shown below:



3.1.2 Device Info

Displays device information such as SN, PN, HID, product date, register code, firmware version, etc. As shown below:



3.1.3 Command

The command options are displayed, including System Commands, Config and Data, GNSS Operation, Registration Code, Feature Code.

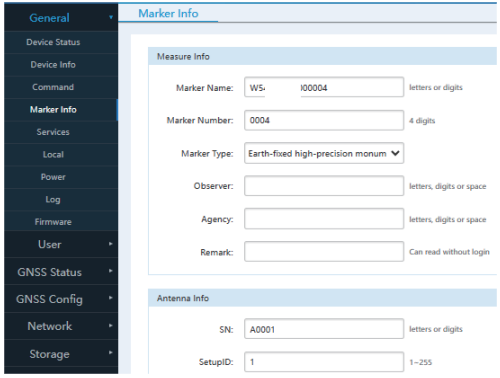
Registration code: The registration code is a valid time code for authorizing the device's positioning function. If the registration code expires and the device's positioning function becomes unavailable, you can provide the device's SN to the supplier to obtain a new registration code, enter it on this page, and click [Register] to complete the registration.

Reset Config: Restore the NET660i to its factory settings.

Feature Code: Enter the custom code and restart the NET660i to add the functions corresponding to the custom code.:

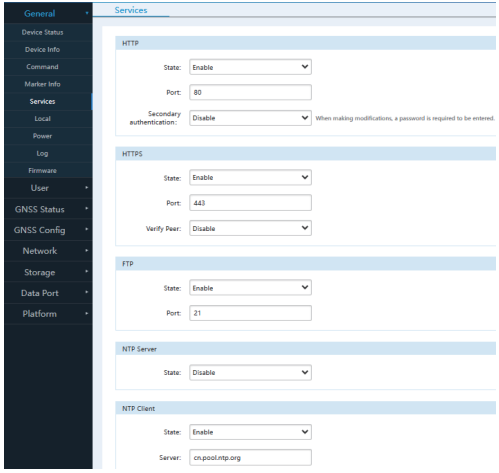
3.1.4 Marker Info

The station configuration options are displayed, allowing configuration of relevant information such as measure information and antenna information. The default station name is the device number. When the station name or station number is modified, the name of the stored data file will change accordingly.



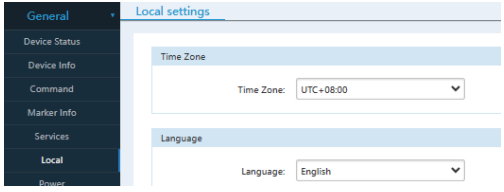
3.1.5 Services

Provides service configuration options, configure HTTP, HTTPS, FTP and other related ports. Configure the status (enable/disable), set the port, and choose whether to enable secondary authentication and client identity verification. As shown below:



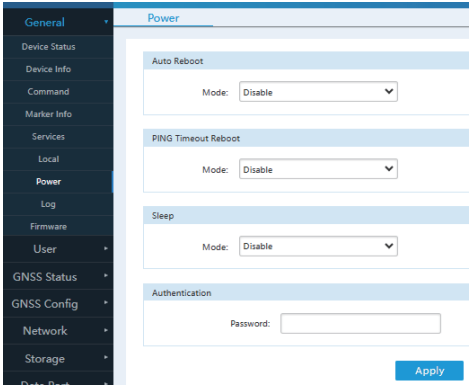
3.1.6 Local

Provides time zone settings and language settings of the receiver. The time zone setting is used to display the time of the customer's current city. For example, in Beijing (East 8th Time Zone), select UTC+08:00.As shown below:



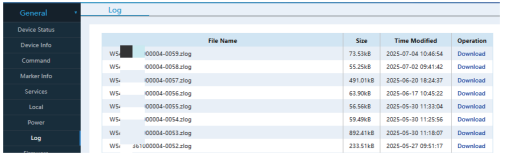
3.1.7 Power

Display power configuration options to configure CPU mode, automatic reboot, PING timeout reboot, external power, and battery management. A PING timeout typically indicates a problem with network communication. The display is as follows:



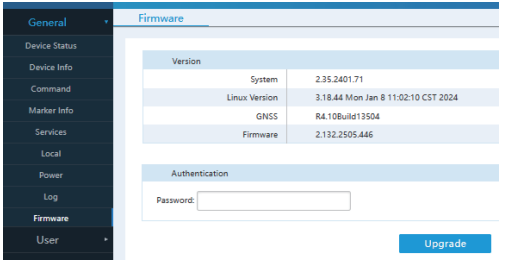
3.1.8 Log

Each time the receiver is powered on, a system log file will be generated to record the various states of the receiver, so that it is convenient to investigate the cause of the receiver exception when an exception occurs. The default log name is the device number. As shown below:



3.1.9 Firmware

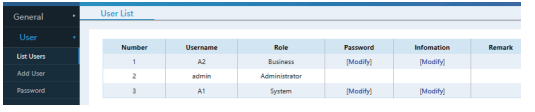
Provides the current receiver's system, linux version, GNSS, and firmware, as well as version upgrade operations. As shown below:



3.2 User

3.2.1 User List

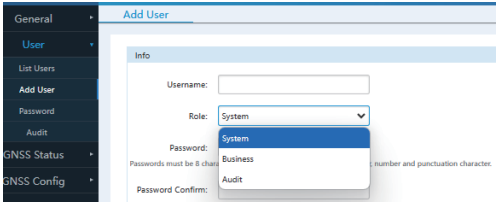
Provides the current receiver user list, admin is the administrator, has the highest authority, and can add or decrease other users, configure password settings and permissions. If a new user is added, by default, the user has no login permission. You need to click [Modify] and check the login permission for the newly - added user. As shown below:



3.2.2 Add User

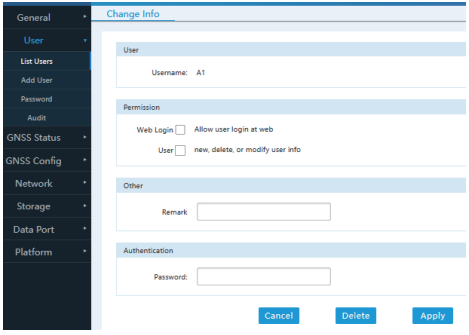
Set new user information, including username, password, and role . The role include system role, business role, and audit role. The display is as follows:

Note: Different role types have different permissions. Role permissions can be selected in the [Modify Information] section of the [User List] page in Section 3.2.1.

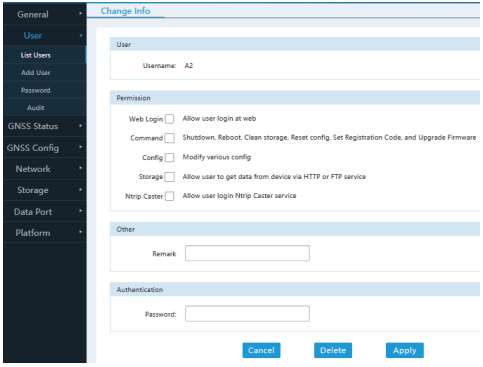


Different role attributes have different permissions, which can be checked as follows:

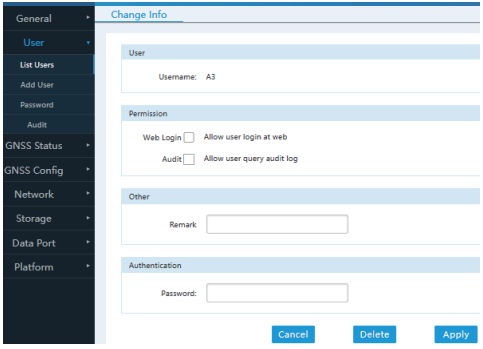
System role:



Business role

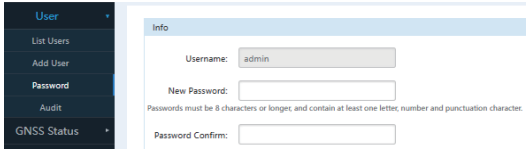


Audit role



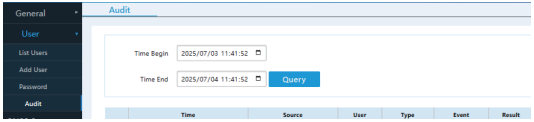
3.2.3 Password

It is used for the currently logged-in user to change the password. The current user's password needs to be filled in the authentication section. The display is as follows:



3.2.4 Audit

Users with audit permissions can query audit records. Display as follows:

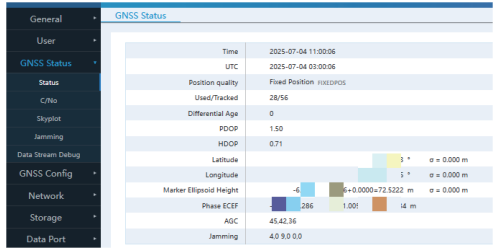


3.3 GNSS Status

3.3.1 GNSS Status

Display the GNSS status, such as time, UTC, position quality, number of satellites, differential age, PDOP, HDOP, point longitude and point latitude, point height and phase ECEF. The display is as follows:

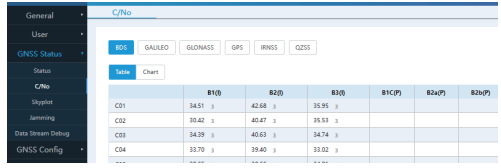
Note: The measuring point elevation refers to the height from the phase center of the antenna to the surface of the WGS84 ellipsoid.

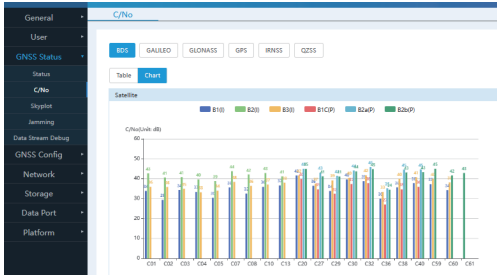


3.3.2 C/No

There are two display modes: table and chart. Click the corresponding satellite system icon to view the satellite signal-to-noise ratio information of the system. As shown below:

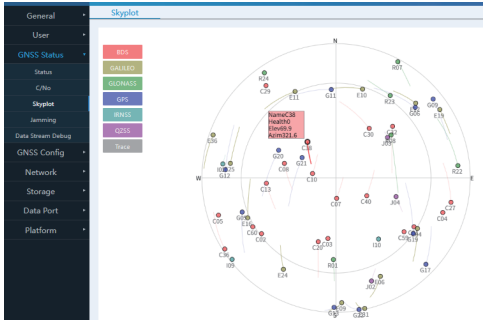
Note: The number of carrier-to-noise ratio frequency points is related to the signal acquisition environment, for example, the number of frequency points displayed indoors and outdoors may differ.





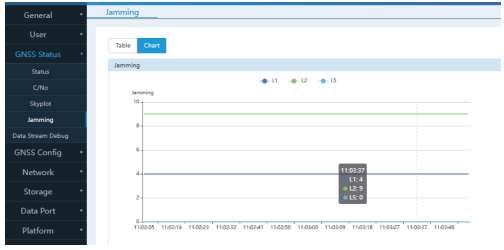
3.3.3 Skyplot

Display the distribution of satellites currently tracked by the NET660i. On the left side, you can select the satellite systems to be displayed and whether to draw trajectories. Clicking a satellite on the right side will show its azimuth information and health value. The display is as follows:



3.3.4 Jamming

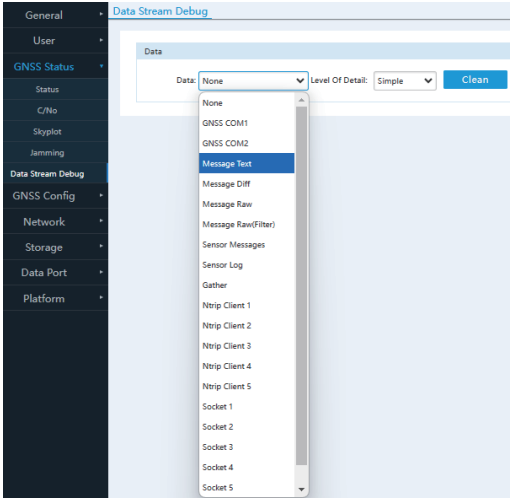
It includes two display modes: table and line chart. The table shows information about the current interference level and interference grade, while the line chart updates and displays the current interference level in real time.

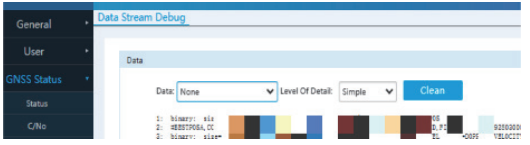


3.3.5 Data Stream Debug

Select the data source from the data drop-down menu. There are multiple types of data sources available. After selection, you can directly view the real-time data of the selected data source in the Web UI, as shown below:

Note: Real-time data is continuously generated and updated. To view a specific segment of data, you can choose "None", which stops the real-time data output, allowing you to scroll and view previously generated data.

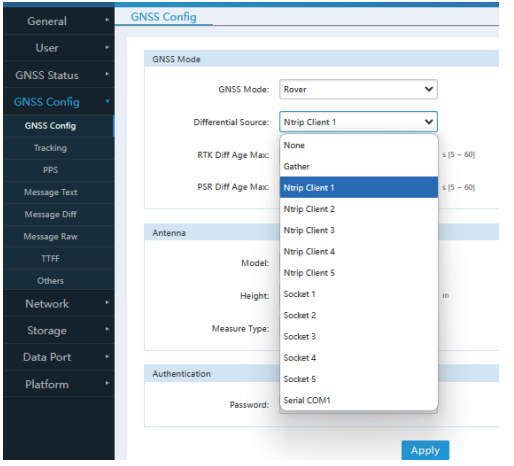




3.4 GNSS Config

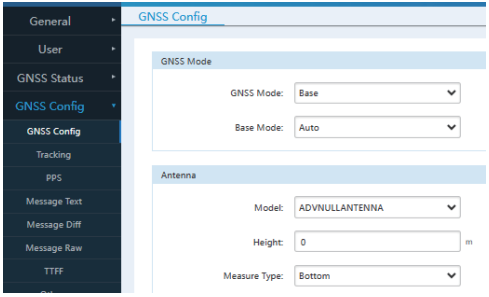
3.4.1 GNSS Config

It is used to configure the working mode of the receiver (Rover, Base, Moving Base), whether to supply power to the antenna and the selection of the level surface. As a rover mode, you can select [Differential Source]. As shown below:

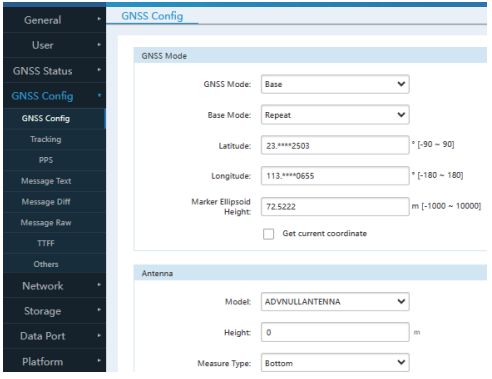


When used as the base station, auto coordinate start and repeat coordinate start can be selected.

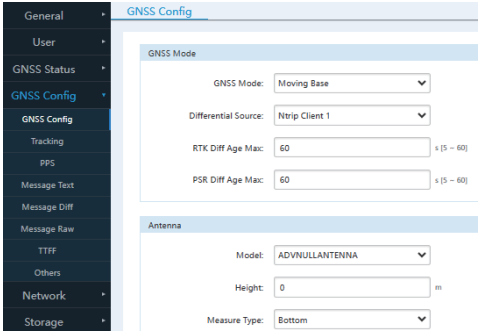
When auto coordinates are started, the receiver automatically matches a base station start coordinate according to the current single-point positioning data to start the base station. As shown below:



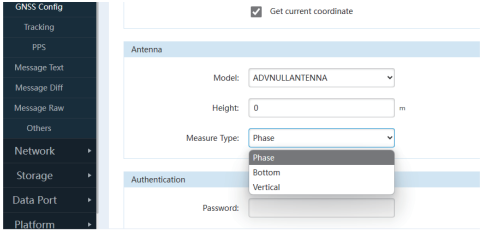
In Repeat Coordinate mode, you can manually input the antenna's location coordinates to start the base station, or check "Get Current Coordinate" to obtain the NET660i's current single-point coordinates for base station startup. Display as follows:



You can also select the base station (motion direction finding) mode, as shown below.



Antenna model and height information can be determined based on the specification manual or by consulting technical personnel. The current antenna configuration model is generally default; "Measurement Method" is available for selection, but "Phase" is generally default.Display as follows:



The "ah" (antenna height, which is actually the bottom height) in the RTCM1006 message output is the result calculated through the antenna information parameters filled in the [Positioning Configuration] page. Its value range is 0.0000-6.5535. If the converted value is not within this range, the page will prompt "Invalid parameter" during application. The conversion methods for the three antenna height measurement modes are as follows:

When the phase center height is selected, the conversion formula is:

Bottom height = Phase center height - H - HL1

When the vertical height is selected, the conversion formula is:

Bottom height = Vertical height - H

When the bottom height is selected, the conversion formula is:

Bottom height = Bottom height

3.4.2 Tracking

Select the desired satellite systems to enable, set the elevation mask angle, choose the corresponding satellite system frequencies, SBAS mode, and PPP mode.

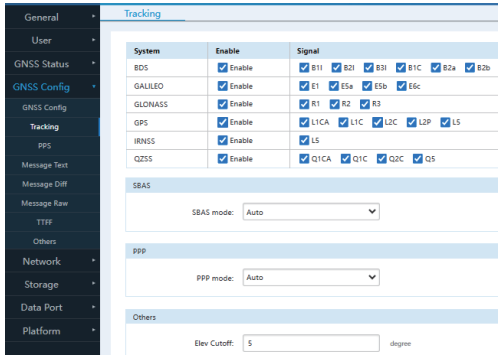
If it is found that the device receives fewer satellites in a normal environment, you can enter this page to check whether all satellite systems are turned on.

The elevation mask angle refers to the masking elevation angle set in GPS measurements to shield the influence of obstacles (such as buildings, trees, etc.) and multipath effects. Satellites in the airspace below this angle will not

be tracked.

When these low - angle satellites interfere with the customer's measurement, a fixed solution cannot be obtained. A common problem is that the RTK has been in a float - solution state. When the customer adjusts the elevation mask angle to shield those interfering low - angle satellites, the probability of obtaining a fixed solution can be increased.

Display as follows:



SBAS (Satellite-Based Augmentation System) improves the accuracy and reliability of satellite navigation systems. It defaults to automatic mode, automatically using the optimal satellite-based augmentation system based on actual conditions, or manually select a single SBAS.

PPP (Precise Point Positioning) enhances the precision of raw satellite signals by obtaining external precise correction data via the internet or satellite broadcasts. It supports three modes: B2b PPP, E6 HAS, and SSR RX.

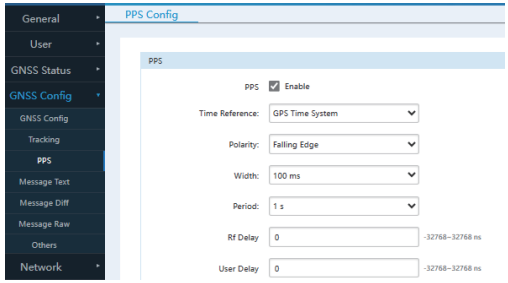
B2b PPP: A satellite-broadcast PPP service provided by China's BeiDou system, broadcasting correction data via the B2b frequency band. Users can achieve real-time centimeter-level positioning without the need for the internet.

E6 HAS: A free high-precision enhancement service provided by the European Galileo satellite navigation system, broadcasting SSR-formatted correction data via the E6 frequency band.

SSR RX: Refers to GNSS receiver devices that support SSR (State Space Representation) correction data. SSR is a general format for correction data.

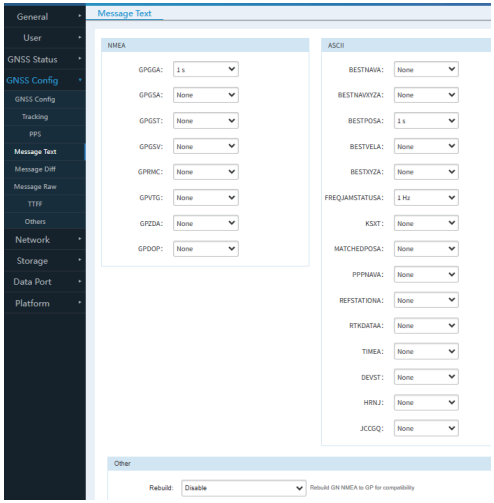
3.4.3 PPS

It is used to configure the parameters of the NET660i's PPS signal. The PPS (Pulse Per Second) signal is a high-precision time synchronization signal.
The time system can be selected as the GPS time system or the BeiDou time system; the polarity can be set to rising edge active or falling edge active; the pulse width, period, radio frequency, and user delay can be configured according to actual requirements. Display as follows:



3.4.4 Message Text

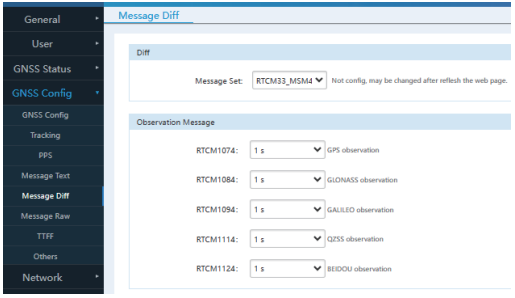
Used to configure the NET660i's text data output type and output rate. Display as follows:

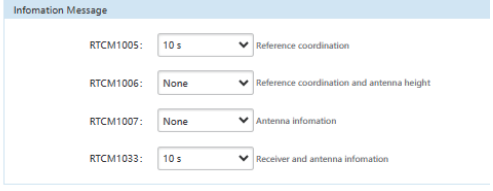


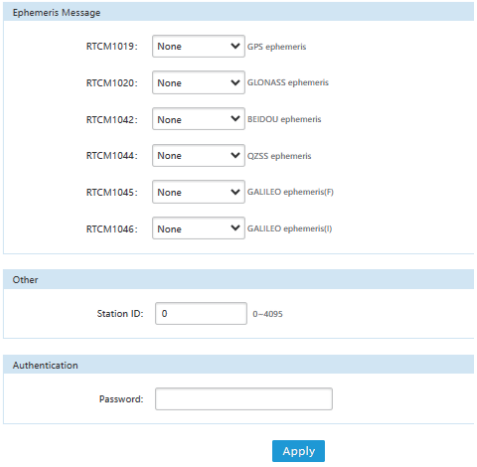
3.4.5 Message Diff

Used to configure the format of the NET660i's differential messages, the output frequency of observation messages, information messages, ephemeris messages, and the base station's ID. Display as follows:

(Note: Only valid in base station working mode -- base station outputs differential messages)

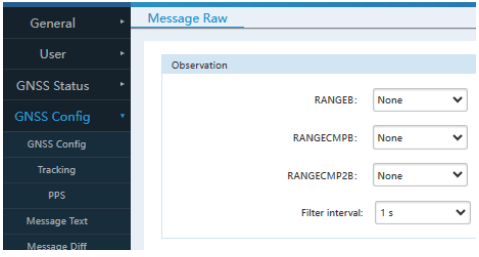


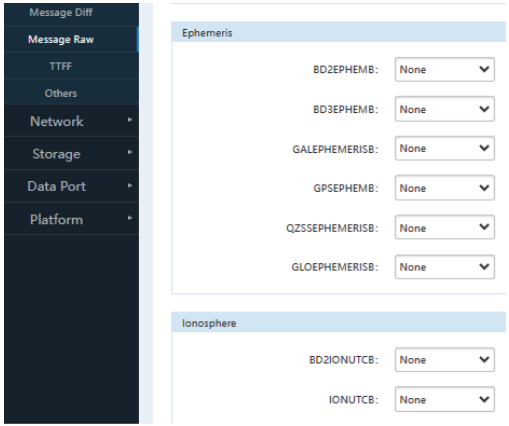


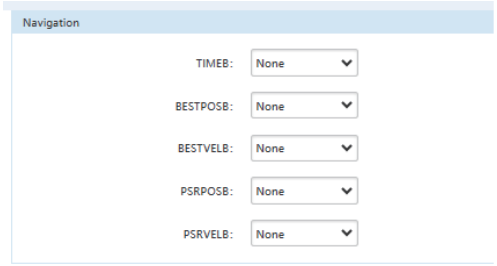


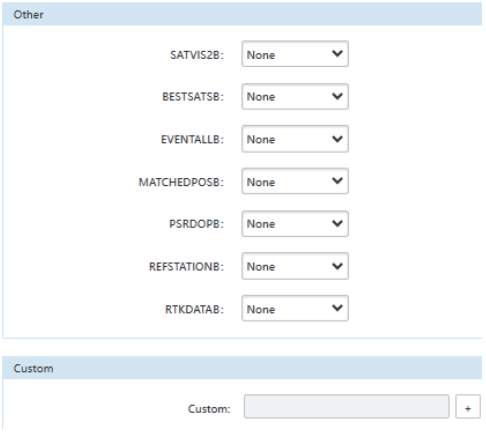
3.4.6 Message Raw

Used to configure whether the NET660i's raw data is output and the output rate, including observation data, ephemeris, ionospheric parameters, navigation messages, other messages, etc., and provides an observation data filter. Display as follows:







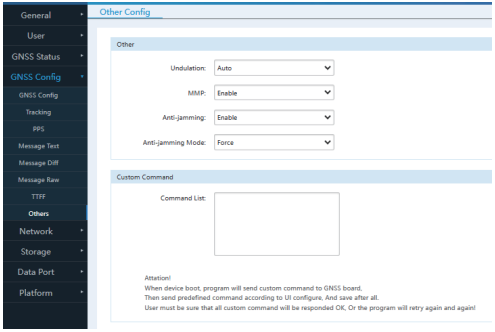


3.4.7 Others

It is used for selecting the geoid, enabling or disabling multipath suppression, enabling or disabling anti-interference, selecting the anti-interference mode, and sending user-defined commands to the positioning board. When customers want to send commands directly to the GNSS board to request corresponding messages, they can enter them in the box.

Note: After the NET660i starts, it will first send these commands to the positioning board, then send predefined commands according to the interface configuration, and finally save the configuration. Users must ensure that all custom commands can return

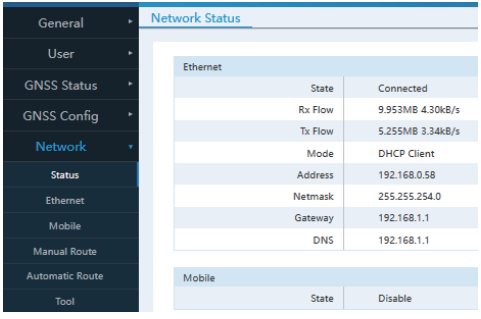
"OK"; otherwise, the NET660i will loop and retry repeatedly! The anti-interference mode can be set to adaptive or forced on.



3.5 Network

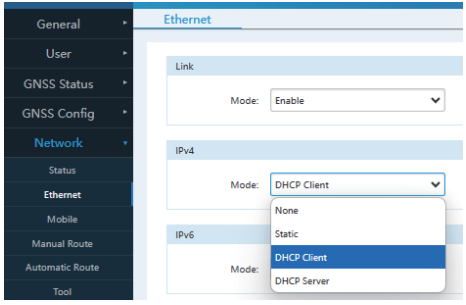
3.5.1 Status

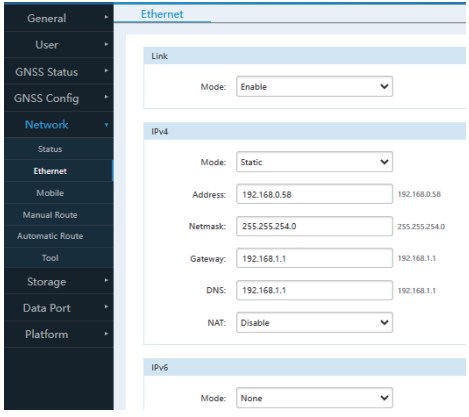
Displays the current activation status of the ethernet, WiFi, and mobile networks (only supported by devices with mobile network support). Display as follows:



3.5.2 Ethernet

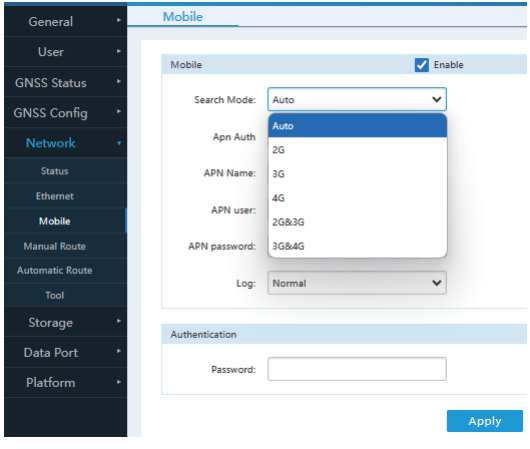
It is used to configure the relevant information of the NET660i's wired network. The NET660i is in DHCP client mode by default. In static address mode, the IP, subnet mask, gateway, and DNS need to be entered manually. Display as follows:





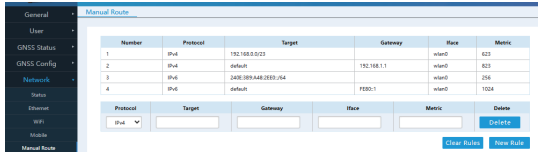
3.5.3 Mobile

It is used to configure the relevant information of the NET660i's mobile network. To enable the NET660i to use the mobile network, you first need to insert a data card into the NET660i and connect the 4G antenna, then click "Enable" on this interface. If the NET660i uses a private network IoT card that requires APN information configuration, you need to fill in the APN details. After filling in, restart the NET660i so that it can use the private network IoT card normally. The display is as follows:



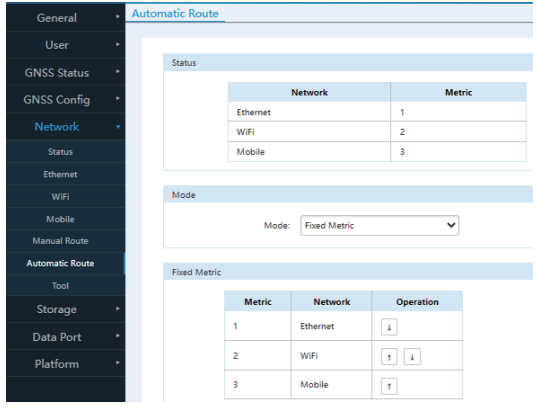
3.5.4 Manual Route

Configures protocol, target, gateway, iface and metric, as shown below:

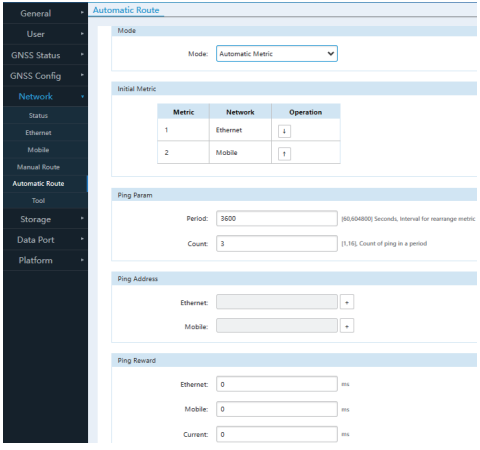


3.5.5 Automatic Route

Allows setting network priority, with modes divided into fixed priority and auto priority.In fixed priority mode, click the arrow to sort priorities. The display is as follows:

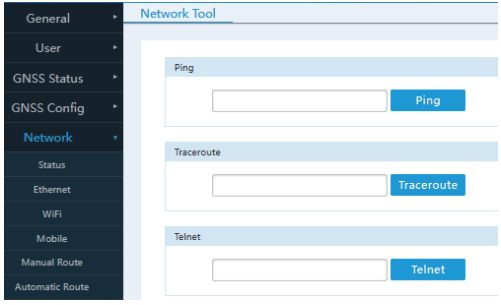


Auto priority allows setting the initial priority order, then automatically selects the optimal network through configured ping parameters, ping address, and ping reward. The display is as follows:



3.5.6 Tool

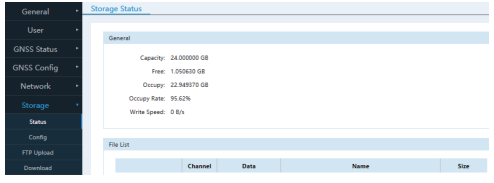
The NET660i provides three network tools: Ping, Traceroute, and Telnet, used for online testing of network connectivity. When customers find that they cannot retrieve data from the server or send data to the server, they can use the ping function. Enter the server IP, click "Ping", and check if the ping is successful. The display is as follows:



3.6 Storage

3.6.1 Status

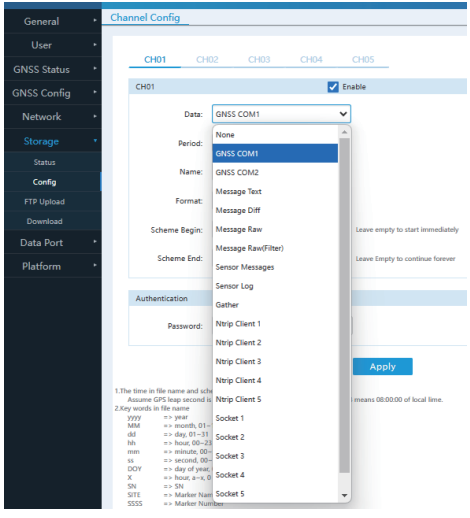
Displays the NET660i's overall storage status, current files being stored, and write speed. The display is as follows:



3.6.2 Channel Configuration

Configures data source type, filename, format, and duration. The NET660i provides 5 storage channels for user settings. Each file runs for a data storage duration of 1 day (natural day unit). It also supports scheduled storage. If the configuration is empty, it defaults to full-time storage.

After configuring data storage, you can check whether the data is being stored in Section 3.6.1. The display is as follows:



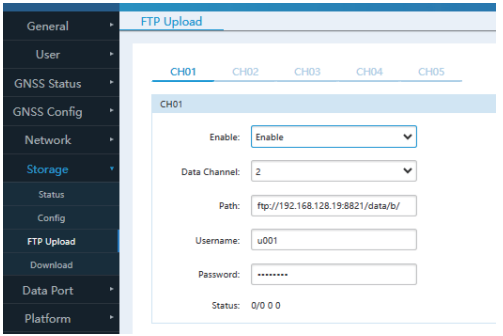
1.The time in file name and scheme is converted from GPS time directly.
Assume GPS leap second is 18, Time Zone offset is +08:00, Then 00:00:18 means 08:00:00 of local lime.
2.Key words in file name

yyyy	=> year
MM	=> month, 01~12
dd	=> day, 01~31
hh	=> hour, 00~23
mm	=> minute, 00~59
ss	=> second, 00~59
DOY	=> day of year, 000~366
X	=> hour, a=x, 0 when one file per day
SN	=> SN
SITE	=> Marker Name
SSSS	=> Marker Number

3.6.3 FTP Upload

The NET660i provides FTP remote storage functionality for the 5 storage channels, allowing users to upload data from the corresponding channels to remote devices via FTP. The display is as follows:

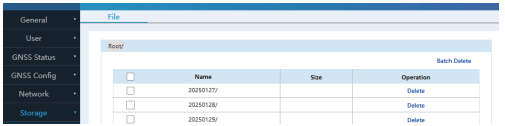
(Note: Non-real-time upload, only after the corresponding channel file recording is completed)



3.6.4 Download

Enter the file download page, the first page displays folders named by date.

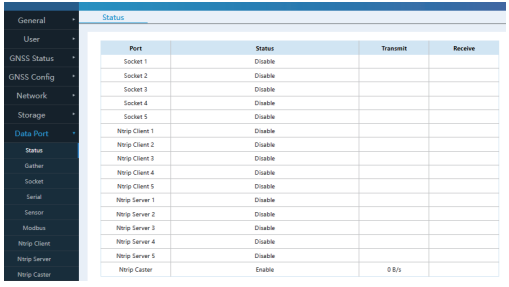
Click the folder to enter folders named by storage channels. Clicking the corresponding channel displays the stored data for that channel. Click the download interface to download the corresponding file. The display is as follows:



3.7 Data Port

3.7.1 Status

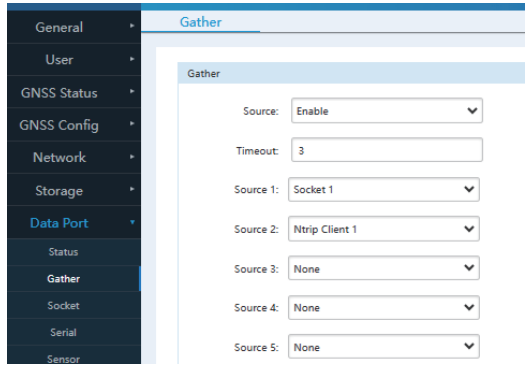
Used to view the status information of each port on the NET660i. The display is as follows:



3.7.2 Gather

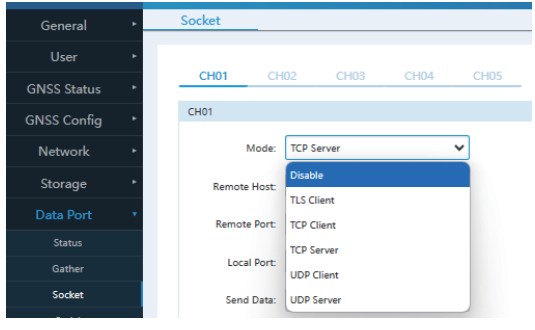
The data convergence function is used to set the priority of 5 differential data receiving links. The priority order is as follows: Data Source 1 > Data Source 2 > Data Source 3 > Data Source 4 > Data Source 5.

The NET660i automatically uses the differential receiving link with higher priority. If the higher-priority link fails to receive data due to an accident, the NET660i will automatically switch to the differential data receiving link with lower priority. You can set the timeout duration for automatic link switching, as shown below: as shown below:



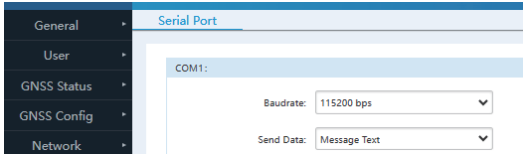
3.7.3 Socket

The NET660i provides 5 network connections and supports TSL client, TCP server/client, and UDP server/client modes, as shown below:



3.7.4 Serial

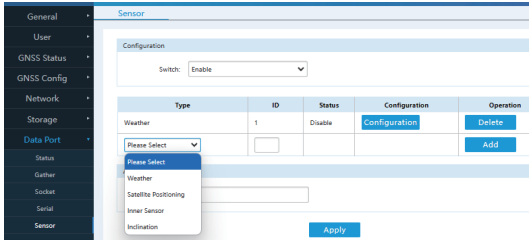
The NET660i provides external serial communication functionality. The serial port baud rate supports a minimum of 1200bps and a maximum of 921600bps, and the type of data to be output can be selected. The following is displayed:



3.7.5 Sensor

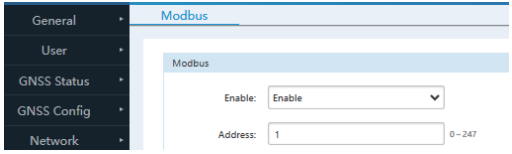
The NET660i can be connected to external sensor devices, with selectable types. However, it is necessary to provide the communication protocol of the sensor to the staff in advance, and the manufacturer will customize the protocol to ensure normal communication between the NET660i and the external sensor.

Click "Add", enter the operation password, and after clicking "Apply", you can configure the sensor accordingly.



3.7.6 Modbus

The NET660i connects to RTU devices or computers that support the Modbus protocol. Then, enable the Modbus transmission function of the NET660i, fill in the local address, and click "Apply". After that, you can use the RTU device or relevant software on the computer to actively obtain positioning data from the NET660i, as shown below:

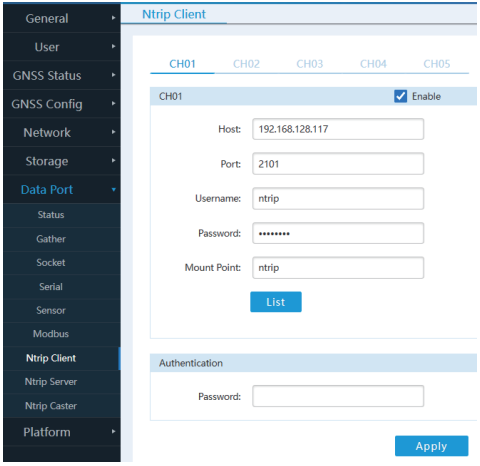


The Modbus transmission protocol has prompts at the bottom of the page, as shown in the figure below:

3.7.7 Ntrip Client

Parameter configuration when the NET660i acts as an Ntrip client: This is used for the NET660i to obtain differential data from the server, and 5 Ntrip Client links can be configured.

Fill in the correct IP address, port, username, and password according to the actual situation. The mount points can be listed and selected, as shown below:

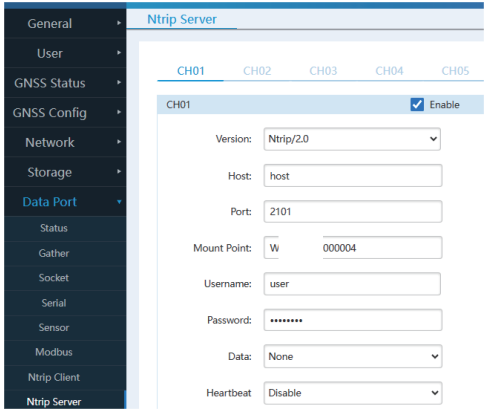


3.7.8 Ntrip Server

Parameter configuration when the NET660i acts as an Ntrip server, which is used for the NET660i to send data to the server. You can select the Ntrip protocol version (version 2.0 is recommended). Fill in the corresponding server address and port correctly according to the

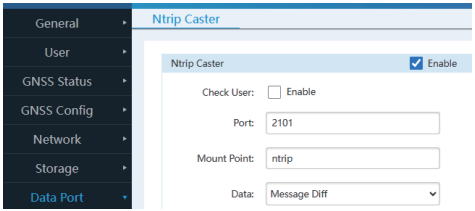
actual situation. The mount point is defaulted to the device's own serial number (SN). The username and password are used for clients to connect to the server, and the data to be sent needs to be selected. The display is as follows:

After filling in the parameters for uploading differential data to the server, go to the port status page to check whether the data is being sent normally.



3.7.9 Ntrip Caster

When the NET660i has an IP address, it can directly act as an Ntrip caster. This configuration item is used for the NET660i to provide data externally as an NtripCaster. Other devices or clients can connect to this NET660i via Ntrip Client to obtain differential data, provided that they can communicate normally with the NET660i over the network, as shown below:

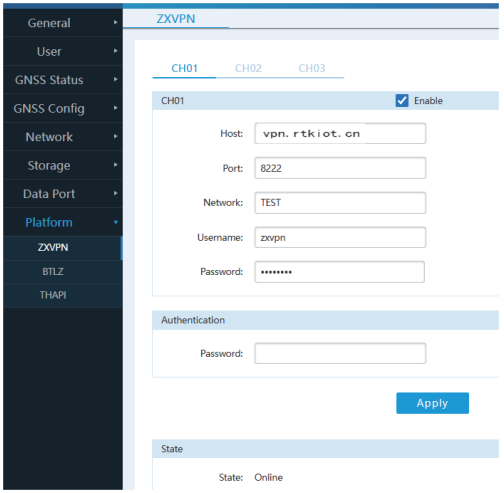


Users must have NtripCaster permissions to use the Caster service.

3.8 Platform

3.8.1 ZXVPN

When the NET660i's network is normally available and can access the public network, the NET660i can configure connection parameters for the platform's server address, port, network, user, and password. After successfully connecting to the ZXVPN, the NET660i can access the NET660i page through a remote link, enabling remote configuration of the NET660i. The display is as follows:



4 Configuration Examples

To help users better understand the use and configuration of the NET660i receiver, we have specially selected 4 common working modes as examples to illustrate the corresponding configuration methods and processes.

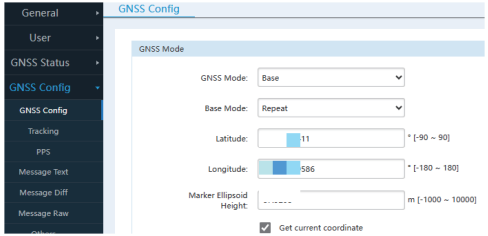
4.1 Example One

The receiver is used as a reference station, started with a fixed coordinate, outputs differential data as RTCM33 MSM4, TCP1 is set as the server, sends RTCM33 MSM4 differential data, raw data is output at 1 Hz (1 second per

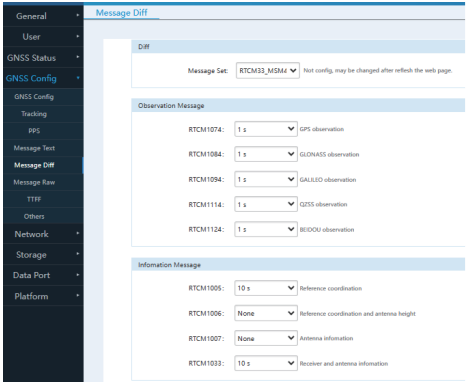
output), and raw data is stored in RINEX 3.02 format. The configuration is as follows:

(1)Set the receiver as a base station and start it with the “Repeat” mode.

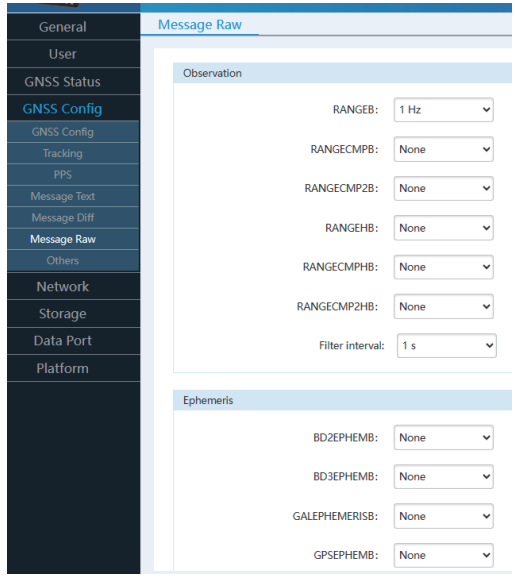
The display is as follows:



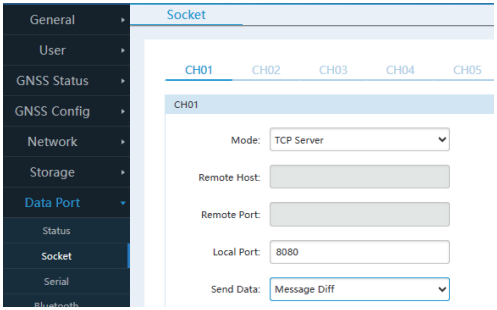
(2)Set the differential output message to RTCM33_MSM4. The display is as follows:



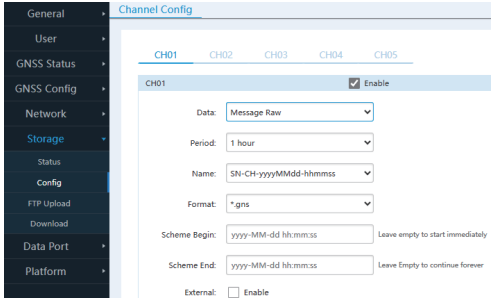
(3)Set raw data output at 1 Hz (1 second per output).The display is as follows:



(4)Set TCP connection 1 as the server, and select positioning differential data as the data source. The display is as follows:



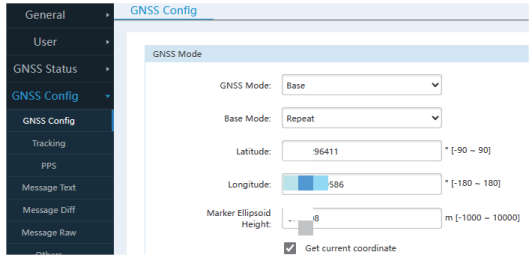
(5)Set to store raw data in RINEX 3.02 format. The display is as follows:



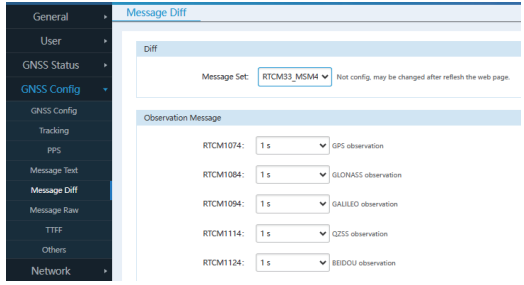
4.2 Example Two

The receiver acts as a base station and starts with a fixed coordinate. It outputs RTCM33 MSM4 differentially. Ntrip Server 1 transmits RTCM33 MSM4 to a certain CORS server using the 1.0 protocol. The original data is output at 1-second intervals and stored in RINEX3.02 format. The configuration is as follows:

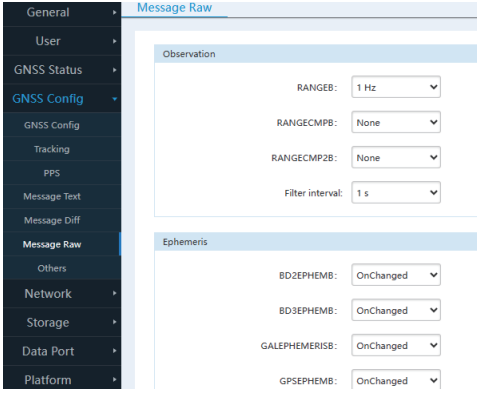
(1)Set the receiver as a base station and start with Repeat Base Mode, as shown below:



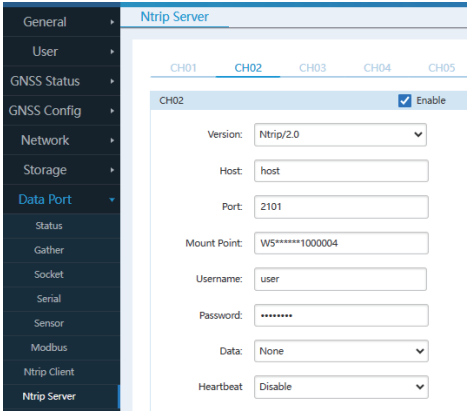
(2)Set differential output to RTCM33 MSM4, as shown below:



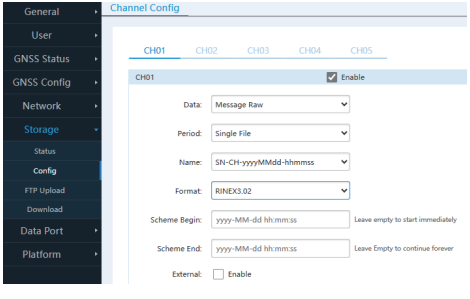
(3)Set raw data output every 1 second, as shown below:



(4)Set Ntrip Server connection 2 to use the Ntrip/2.0 protocol to send RTCM33 to a CORS server. Select positioning differential data as the data source, as shown below:



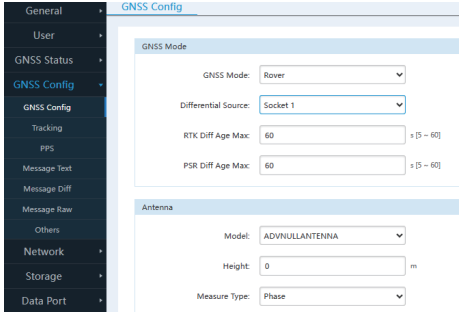
(5)Set storage of raw data in rinex3.02 format, as shown below:



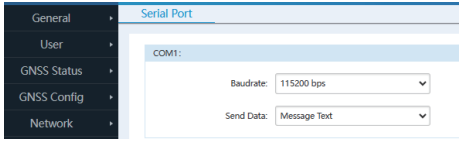
4.3 Example Three

The receiver acts as a mobile station, receives differential data via TCP connection 1 as a client, and outputs GPGGA and BESTPOSA via the COM port. The configuration is as follows:

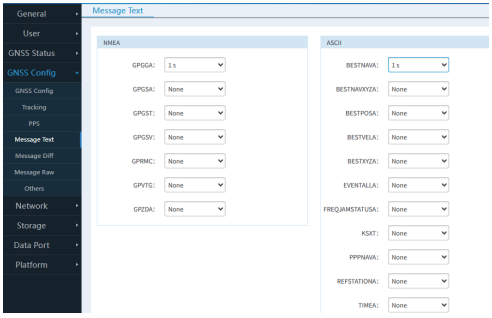
(1)Set the receiver as a rover and select connection 1 as the differential data source for the mobile station, as shown below:



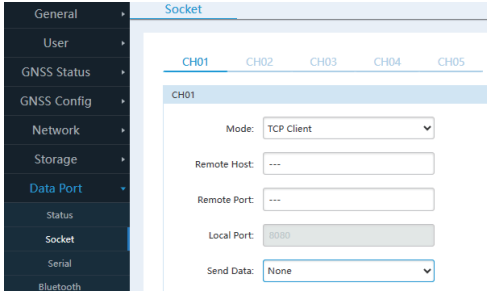
(2)Set COM1 port to output positioning text data, as shown below:



(3)Set the output frequency for text output of GPGGA and BESTPOSA, as shown below:



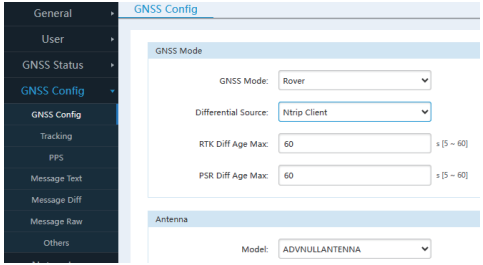
(4)Set network connection CH01 as a TCP client to receive differential data, as shown below:



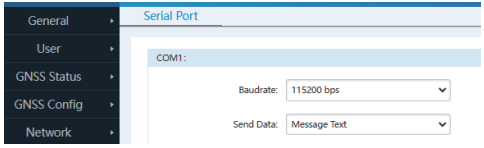
4.4 Example Four

The receiver acts as a rover, uses Ntrip Client as the differential data source, and outputs GPGGA and BESTPOSA via the COM port. The configuration is as follows:

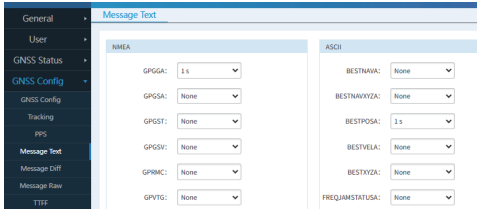
(1)Set the receiver as a rover and select the differential data source as Ntrip client, as shown below:



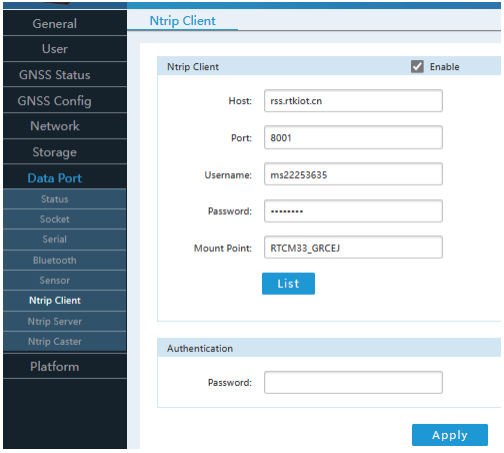
(2)Set COM1 port to send positioning text data, as shown below:



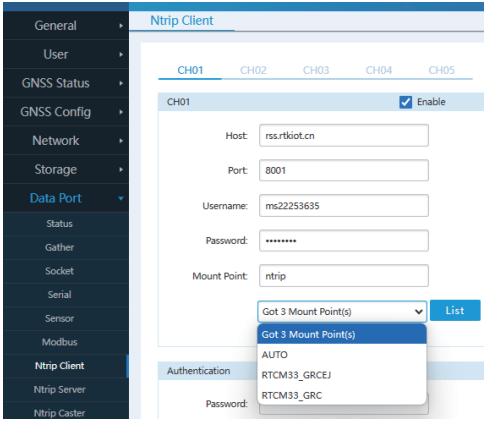
(3)Set the output frequency for text output of GPGGA and BESTPOSA, as shown below:



(4)Set Ntrip Client to obtain differential data from a CORS server. First, list and select the access point for differential data, fill in the corresponding server IP address, port, username, and password, click apply, and after correct configuration, differential data can be obtained from the server.



(5)Obtain the access point, select the mount point to be accessed, and click "List" to retrieve the differential data of this access point from the server. The display is as follows:



Technical Indicators

SYSTEM	
HARDWARE SYSTEM	ARM Cortex-A7 1.8GHz
OS	Linux

GNSS	
GPS	L1 C/A, L1C, L2P(Y), L2C, L5
GLONASS	L1, L2, L3
BDS	B1I, B2I, B3I, B1C, B2a, B2b(PPP)
GALILEO	E1, E5a, E5b, E6(PPP)
QZSS	L1, L2, L5
SBAS	L1(PPP)
NavIC (IRNSS)	L5(IRNSS support in future)
Channel	1408
Differential Observation Accuracy(RMS)	10.0cm
Kinematic Phase Observation Accuracy(RMS)	1.0cm
Data Format	RINEX, Custom

Position Data	NMEA-0183
Differential Data	RTCM 3.X
Data update frequency	1Hz, 2Hz, 5Hz, 10Hz, 20Hz
Receive Data Availability	⩾98% (Data available/Data collected)
Data Integrity	⩾98%(Data collected/ Data should be collected)
Single (RMS)	Horizontal: 1.5m / Vertical: 2.5m
RTK (RMS)	Horizontal: ± (8mm+1ppm) Vertical: ± (15mm+1ppm)
Static Accuracy (RMS)	Horizontal: ± (2.5mm+0.5ppm) Vertical: ± (5mm+0.5ppm)
Timing Precision (RMS)	20ns

SYSTEM	
Serial Port	Standard RS232 interface, Baud rate supports 1200, 2400, 4800, 9600, 19200, 38400, 115200, 230400bps
USB	Integrated on the 7-pin interface, support access to the computer to copy data directly
Network port	Standard RJ45 interface, 10/100Mbps network adaptive
Network Communication (Full Netcom)	LTE FDD: B1/2/3/4/5/7/8/12/13/18/19/20/25/26/28 LTE TDD: B38/39/40/41 WCDMA: B1/2/4/5/6/8/19 GSM: B2/3/5/8
Interface	PWE*1: Power supply port DATA*1 PPS*1 SIM*1: Nano SIM card Ethernet*1 GNSS*1: Main antenna 4G*1: 4G antenna port
Storage	32GB storage, circular storage support multi-channel storage

ELECTRICAL CHARACTERISTIC	
Voltage Input	9-24V DC(12V typical)
Power Dissipation	1.8W(typ)

ENVIRONMENT	
Operating Temperature	-40°C~+85°C
Storage Temperature	-40°C~+85°C
Protection Class	IP68

PHYSICAL	
Material	Magnesium alloy main body
Dimension	148.8mm*105mm*50.3mm
Weight	490g