

NET660i BASE STATION RECEIVER



USER GUIDE

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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.

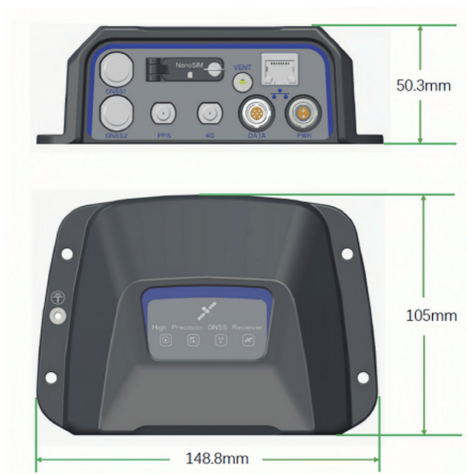
Technology and Service

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	Function
1	RJ45	Adaptive 10/100M ethernet interface
2	PWR	NET660i power supply interface, 2-pin interface, 9-24V (Typ12V)
3	Data	7PIN-RS232 interface, supporting output of multiple data formats
4	Nano SIM	SIM card slot
5	4G	4G antenna interface
6	GNSS1	Positioning antenna interface (available on both Positioning and Heading versions)
7	GNSS2	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:

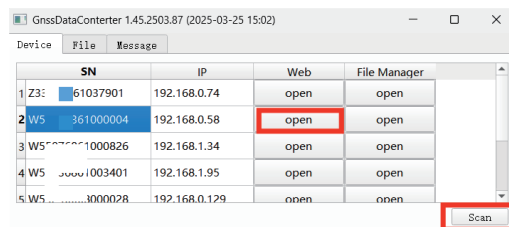
(1) Power on the receiver and connect it to a switch or router via Ethernet cable.

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

(3) Open the GnsDataCenter 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.



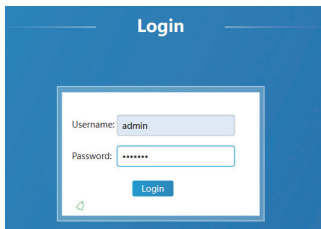
Alternatively, note the IP address of the NET660i within the local network and enter it into the browser's address bar to access the NET660i via Web.

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

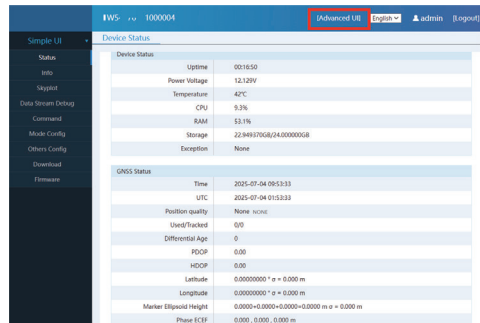
Username: admin

Password: ~abc123456

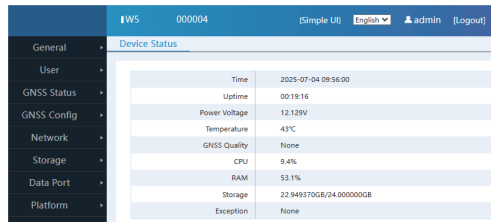
Security Notice: To enhance security, the maximum idle timeout for browser access is set to 10 minutes. The session will automatically expire and return to the login screen after 10 minutes of inactivity.



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:

General	Device Status
Device Status	
Device Info	
Command	
Marker Info	
Services	
Local	
Power	
Log	
Firmware	

Time	2025-07-04 10:12:26
Uptime	00:35:43
Power Voltage	12.129V
Temperature	44°C
GNSS Quality	None
CPU	10.0%
RAM	53.2%
Storage	22.949370GB/24.000000GB
Exception	None

3.1.2 Device Info

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

General	Device Info
Device Status	
Device Info	
Command	
Marker Info	
Services	
Local	
Power	
Log	
Firmware	
User	
GNSS Status	
GNSS Config	
Network	

SN	V	000004
PN	1.1.0.0	
HID	N	
Brand	WH	
Model	T66Lite	
Product Date	2024-04-24	
Board1 SN	6100000000	
Board2 SN	00.02.09.0001.01.01	
Registration Code	f	AE! >E50
Expiration Date	2025-09-17	
Functionality	0x0000	
Feature Code	t	RY3 JASQ==
Feature Function	eth0thapi;	
Feature Region	53;	
Firmware	2.132.2505.446	

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:

The screenshot shows the 'Power' configuration page. On the left is a sidebar menu with options: General, Device Status, Device Info, Command, Marker Info, Services, Local, Power (selected), Log, Firmware, User, GNSS Status, GNSS Config, Network, and Storage. The main content area has a 'Power' tab. It contains four sections: 'Auto Reboot' with a 'Mode' dropdown set to 'Disable'; 'PING Timeout Reboot' with a 'Mode' dropdown set to 'Disable'; 'Sleep' with a 'Mode' dropdown set to 'Disable'; and 'Authentication' with a 'Password' input field. An 'Apply' button is at the bottom right.

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:

The screenshot shows the 'Log' page with a table of log files. The table has columns: File Name, Size, Time Modified, and Operation. The first column is partially obscured by a sidebar menu.

File Name	Size	Time Modified	Operation
00004-0000.log	71.25KB	2025-07-04 10:46:04	Download
00004-0000.log	55.25KB	2025-07-02 09:41:42	Download
00004-0007.log	491.01KB	2025-06-20 18:24:37	Download
00004-0006.log	63.30KB	2025-06-17 10:45:22	Download
00004-0005.log	56.56KB	2025-05-30 11:33:04	Download
00004-0004.log	59.49KB	2025-05-30 11:25:56	Download
00004-0003.log	862.81KB	2025-05-30 11:18:07	Download
as1000004-0002.log	233.51KB	2025-05-27 09:51:17	Download

3.1.9 Firmware

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

The screenshot shows the 'Firmware' page. On the left is a sidebar menu with options: General, Device Status, Device Info, Command, Marker Info, Services, Local, Power, Log, Firmware (selected), User, GNSS Status, GNSS Config, Network, and Storage. The main content area has a 'Firmware' tab. It contains two sections: 'Version' with a table showing System (2.35.2401.71), Linux Version (3.18.44 Mon Jan 8 11:02:19 CST 2024), GNSS (RA10Build13504), and Firmware (2.132.2505.446); and 'Authentication' with a 'Password' input field. An 'Upgrade' button is at the bottom right.

Version	
System	2.35.2401.71
Linux Version	3.18.44 Mon Jan 8 11:02:19 CST 2024
GNSS	RA10Build13504
Firmware	2.132.2505.446

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:

The screenshot shows the 'User List' page. On the left is a sidebar menu with options: General, Device Status, Device Info, Command, Marker Info, Services, Local, Power, Log, Firmware, User (selected), GNSS Status, GNSS Config, Network, and Storage. The main content area has a 'User List' tab. It contains a table with columns: Number, Username, Role, Password, Information, and Remark. The first column is partially obscured by a sidebar menu.

Number	Username	Role	Password	Information	Remark
1	A2	Business	[Modify]	[Modify]	
2	admin	Administrator	[Modify]	[Modify]	
3	A1	System	[Modify]	[Modify]	

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.

General		GNSS Status	
Time	2025-07-04 11:00:06	UTC	2025-07-04 03:00:06
Position quality	Fixed Position	Fixed Position	FIXED POS
Used/Tracked	28/56		
Differential Age	0		
PDOP	1.50		
HDOP	0.71		
Latitude	31° 0' 0.0000 m		
Longitude	121° 0' 0.0000 m		
Marker Ellipsoid Height	-4.0000 m		
Phase ECEF	45.43.36		
AGC	1.001		
Jamming	4.0 9.0 0.0		

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:

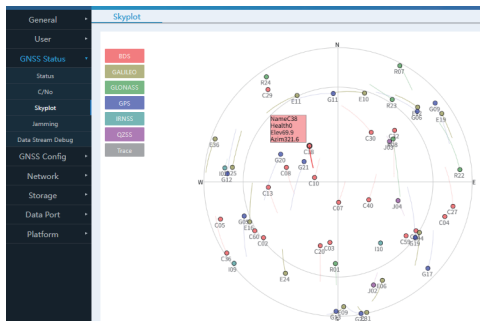
Note: The number of carrier-to-noise ratio frequency points is related to the signal acquisition environment, for example, the number of frequency points displayed indoors and outdoors may differ.

General		C/No	
		BDS GALILEO GLONASS GPS IRNSS QZSS	
		Table Chart	
	B1(f)	B2(f)	B3(f)
C01	34.51	42.88	35.91
C02	36.42	46.87	39.53
C03	34.39	40.83	34.74
C04	33.70	39.40	33.02



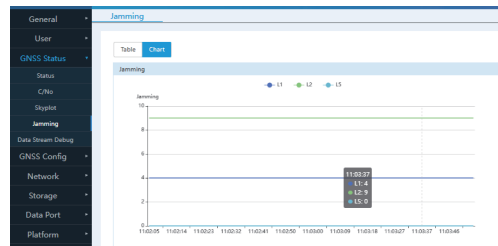
3.3.3 Skyplot

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

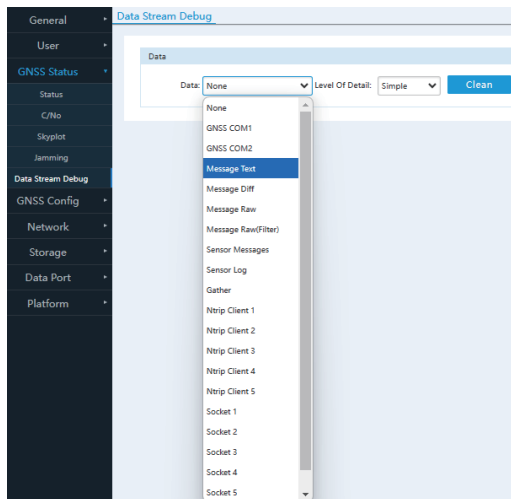
It includes two display modes: table and line chart. The table shows information about the current interference level and interference grade, while the line chart updates and displays the current interference level in real time.



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:

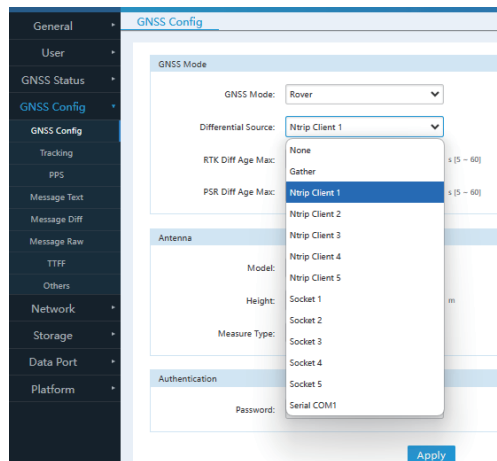
Note: Real-time data is continuously generated and updated. To view a specific segment of data, you can choose "None", which stops the real-time data output, allowing you to scroll and view previously generated data.



3.4 GNSS Config

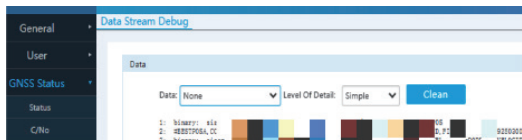
3.4.1 GNSS Config

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:



General ▸ GNSS Config

User ▸

GNSS Status ▸

GNSS Config ▸

Tracking

PPS

Message Test

Message Diff

Message Raw

TTFF

Others

Network ▸

Storage ▸

Data Port ▸

Platform ▸

GNSS Mode

GNSS Mode: Base ▾

Base Mode: Auto ▾

Antenna

Model: ADVNULLANTENNA ▾

Height: 0 m

Measure Type: Bottom ▾

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:

General ▸ GNSS Config

User ▸

GNSS Status ▸

GNSS Config ▸

Tracking

PPS

Message Test

Message Diff

Message Raw

TTFF

Others

Network ▸

Storage ▸

Data Port ▸

Platform ▸

GNSS Mode

GNSS Mode: Base ▾

Base Mode: Repeat ▾

Latitude: 23.****2503 ° [90 ~ 90]

Longitude: 113.****0655 ° [180 ~ 180]

Marker Ellipsoid Height: 72.5222 m [-1000 ~ 10000]

☐ Get current coordinate

Antenna

Model: ADVNULLANTENNA ▾

Height: 0 m

Measure Type: Bottom ▾

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

General ▸ GNSS Config

User ▸

GNSS Status ▸

GNSS Config ▸

Tracking

PPS

Message Test

Message Diff

Message Raw

TTFF

Others

Network ▸

Storage ▸

GNSS Mode

GNSS Mode: Moving Base ▾

Differential Source: Ntrip Client 1 ▾

RTK Diff Age Max: 60 s [5 ~ 60]

PSR Diff Age Max: 60 s [5 ~ 60]

Antenna

Model: ADVNULLANTENNA ▾

Height: 0 m

Measure Type: Bottom ▾

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:

General ▸ GNSS Config

User ▸

GNSS Status ▸

GNSS Config ▸

Tracking

PPS

Message Test

Message Diff

Message Raw

Others

Network ▸

Storage ▸

Data Port ▸

Platform ▸

GNSS Mode

☒ Get current coordinate

Antenna

Model: ADVNULLANTENNA ▾

Height: 0 m

Measure Type: Phase ▾

Phase

Bottom

Vertical

Authentication

Password:

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:

$$\text{Bottom height} = \text{Phase center height} - H - HL1$$

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

$$\text{Bottom height} = \text{Vertical height} - H$$

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

$$\text{Bottom height} = \text{Bottom height}$$

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:

System	Enable	Signal
BDS	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> B1I <input checked="" type="checkbox"/> B2I <input checked="" type="checkbox"/> B3I <input checked="" type="checkbox"/> B1C <input checked="" type="checkbox"/> B2a <input checked="" type="checkbox"/> B2b
GALILEO	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> E1 <input checked="" type="checkbox"/> E5a <input checked="" type="checkbox"/> E5b <input checked="" type="checkbox"/> E6c
GLONASS	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> R1 <input checked="" type="checkbox"/> R2 <input checked="" type="checkbox"/> R3
GPS	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> L1CA <input checked="" type="checkbox"/> L1C <input checked="" type="checkbox"/> L2C <input checked="" type="checkbox"/> L2P <input checked="" type="checkbox"/> L5
IRNSS	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> L5
QZSS	<input checked="" type="checkbox"/> Enable	<input checked="" type="checkbox"/> Q1CA <input checked="" type="checkbox"/> Q1C <input checked="" type="checkbox"/> Q2C <input checked="" type="checkbox"/> Q5

SBAS

SBAS mode:

PPP

PPP mode:

Others

Elev Cutoff: degree

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)

Message	Frequency	Description
RTCM1074	1 s	GPS observation
RTCM1084	1 s	GLONASS observation
RTCM1094	1 s	GALILEO observation
RTCM1114	1 s	QZSS observation
RTCM1124	1 s	BEIDOU observation

Message	Frequency	Description
RTCM1005	10 s	Reference coordination
RTCM1006	None	Reference coordination and antenna height
RTCM1007	None	Antenna information
RTCM1033	10 s	Receiver and antenna information

Message	Frequency	Description
RTCM1019	None	GPS ephemeris
RTCM1020	None	GLONASS ephemeris
RTCM1042	None	BEIDOU ephemeris
RTCM1044	None	QZSS ephemeris
RTCM1045	None	GALILEO ephemeris(F)
RTCM1046	None	GALILEO ephemeris(I)

Station ID: 0 (0-4095)

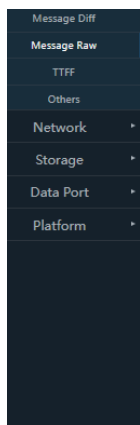
Password:

Apply

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:

Message	Frequency	Description
RANGE	None	
RANGECMPB	None	
RANGECMP2B	None	
Filter interval	1 s	



Ephemeris	
BD2EPHEMB:	<input type="text" value="None"/>
BD3EPHEMB:	<input type="text" value="None"/>
GALEPHEMERISB:	<input type="text" value="None"/>
GPSEPHEMB:	<input type="text" value="None"/>
QZSSEPHEMERISB:	<input type="text" value="None"/>
GLOEPHEMERISB:	<input type="text" value="None"/>

Ionosphere	
BD2IONUTCB:	<input type="text" value="None"/>
IONUTCB:	<input type="text" value="None"/>

Other	
SATVIS2B:	<input type="text" value="None"/>
BESTSATS:	<input type="text" value="None"/>
EVENTALLB:	<input type="text" value="None"/>
MATCHEDPOSB:	<input type="text" value="None"/>
PSRDOPB:	<input type="text" value="None"/>
REFSTATIONB:	<input type="text" value="None"/>
RTKATAB:	<input type="text" value="None"/>

Custom	
Custom:	<input type="text"/> +

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.

Other Config

Other

Undulation: Auto

MMP: Enable

Anti-jamming: Enable

Anti-jamming Mode: Force

Custom Command

Command List

Attention!
When device boot, program will send custom command to GNSS board.
Then send predefined command according to UI configure. And save after all.
User must be sure that all custom command will be responded OK. Or the program will retry again and again!

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:

Network Status

Ethernet		
State	Connected	
Rx Flow	9.953MB 4.30kB/s	
Tx Flow	5.255MB 3.34kB/s	
Mode	DHCP Client	
Address	192.168.0.58	
Netmask	255.255.254.0	
Gateway	192.168.1.1	
DNS	192.168.1.1	

Mobile		
State	Disable	

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:

Ethernet

Link

Mode: Enable

IPv4

Mode: DHCP Client

None
Static
DHCP Client
DHCP Server

IPv6

Mode: DHCP Client

Ethernet

Link

Mode: Enable

IPv4

Status: Static

Address: 192.168.0.58 192.168.0.58

Netmask: 255.255.254.0 255.255.254.0

Gateway: 192.168.1.1 192.168.1.1

DNS: 192.168.1.1 192.168.1.1

NAT: Disable

IPv6

Mode: None

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:

General ▾ Mobile

User ▾

GNSS Status ▾

GNSS Config ▾

Network ▾

Status ▾

Ethernet ▾

Mobile ▾

Manual Route ▾

Automatic Route ▾

Tool ▾

Storage ▾

Data Port ▾

Platform ▾

Mobile ☒ Enable

Search Mode:

Apn Auth:

APN Name:

APN user:

APN user:

APN password:

Log:

Authentication

Password:

Apply

3.5.4 Manual Route

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

General ▾ Manual Route

User ▾

GNSS Status ▾

GNSS Config ▾

Network ▾

Status ▾

Ethernet ▾

Mobile ▾

Manual Route ▾

Number	Protocol	Target	Gateway	Iface	Metric
1	IPv4	192.168.0.0/24		eth0	623
2	IPv4	default	192.168.1.1	eth0	623
3	IPv4	2000:100:100:100::/64		eth0	256
4	IPv4	default	FE80::1	eth0	1024

Protocol: Target: Gateway: Iface: Metric:

Delete

Clear Route New Route

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:

General ▾ Automatic Route

User ▾

GNSS Status ▾

GNSS Config ▾

Network ▾

Status ▾

Ethernet ▾

WiFi ▾

Mobile ▾

Manual Route ▾

Automatic Route ▾

Tool ▾

Storage ▾

Data Port ▾

Platform ▾

Status

Network	Metric
Ethernet	1
WiFi	2
Mobile	3

Mode

Mode:

Fixed Metric

Metric	Network	Operation
1	Ethernet	<input type="text" value="↓"/>
2	WiFi	<input type="text" value="↑"/>
3	Mobile	<input type="text" value="↑"/>

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:

General

User

GNSS Status

GNSS Config

Network

Status

Ethernet

Mobile

Manual Route

Automatic Route

Tool

Storage

Data Port

Platform

Automatic Route

Mode

Mode: Automatic Metric

Initial Metric

Metric	Network	Operation
1	Ethernet	↓
2	Mobile	↑

Ping Param

Period: 3600 (9000000) Seconds, Interval for measuring metric

Count: 3 (1,96) Count of ping in a period

Ping Address

Ethernet:

Mobile:

Ping Reward

Ethernet: ms

Mobile: ms

Current: ms

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:

General

User

GNSS Status

GNSS Config

Network

Status

Ethernet

WiFi

Mobile

Manual Route

Automatic Route

Network Tool

Ping

Ping

Traceroute

Traceroute

Telnet

Telnet

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:

General

User

GNSS Status

GNSS Config

Network

Storage

Status

Config

FTP Upload

Download

Storage Status

General

Capacity: 24.000000 GB

Free: 1.050630 GB

Occupied: 22.949370 GB

Occupancy Rate: 95.62%

Write Speed: 0.8/s

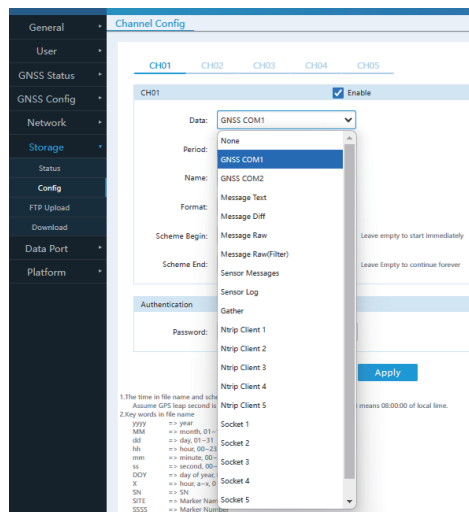
File List

Channel	Data	Name	Size
---------	------	------	------

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 time.

2.Key words in file name

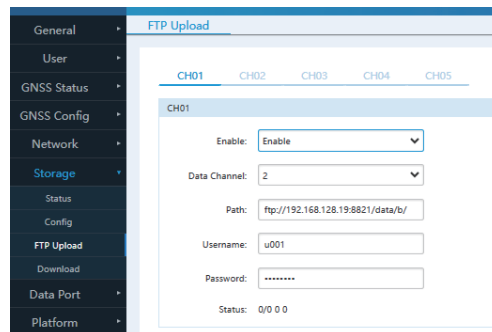
YYYY	=> year
MM	=> month, 01~12
dd	=> day, 01~31
hh	=> hour, 00~23
mm	=> minute, 00~59
ss	=> second, 00~59
DOY	=> day of year, 000~366
X	=> hour, a~z, 0 when one file per day
SN	=> SN
SITE	=> Marker Name
SSSS	=> Marker Number

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:

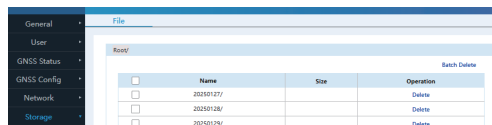
(Note: Non-real-time upload, only after the corresponding channel file recording is completed)



3.6.4 Download

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

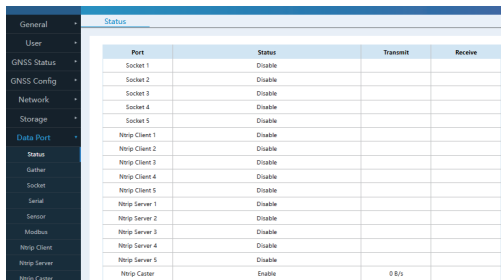
Click the folder to enter folders named by storage channels. Clicking the corresponding channel displays the stored data for that channel. Click the download interface to download the corresponding file. The display is as follows:



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:



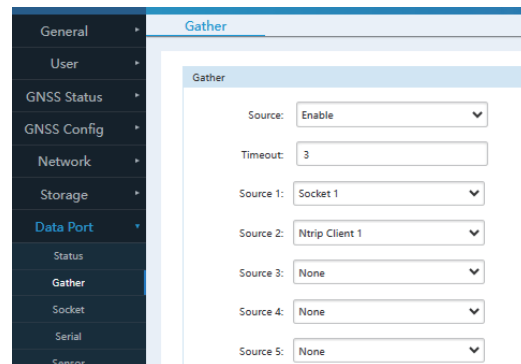
The screenshot shows the 'Status' tab in the NET660i interface. A table lists the status of various ports. The 'Port' column lists different connection types and their IDs. The 'Status' column shows whether each port is 'Enable' or 'Disable'. The 'Transmit' and 'Receive' columns show data transfer rates.

Port	Status	Transmit	Receive
Socket 1	Disable		
Socket 2	Disable		
Socket 3	Disable		
Socket 4	Disable		
Socket 5	Disable		
Ntrip Client 1	Disable		
Ntrip Client 2	Disable		
Ntrip Client 3	Disable		
Ntrip Client 4	Disable		
Ntrip Client 5	Disable		
Ntrip Server 1	Disable		
Ntrip Server 2	Disable		
Ntrip Server 3	Disable		
Ntrip Server 4	Disable		
Ntrip Server 5	Disable		
Ntrip Center	Enable	0 B/s	

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:

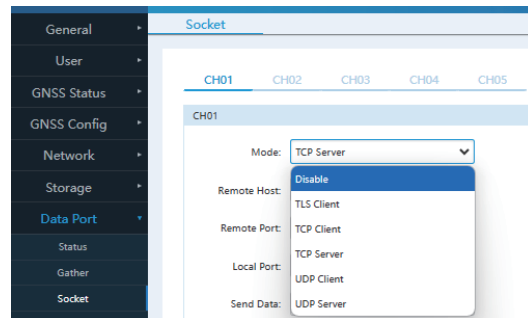


The screenshot shows the 'Gather' configuration page. It allows setting the source and timeout for data gathering. The 'Source' dropdown is set to 'Enable'. The 'Timeout' is set to 3. The 'Source 1' through 'Source 5' dropdowns are set to 'Socket 1', 'Ntrip Client 1', 'None', 'None', and 'None' respectively.

Source	Timeout	Source 1	Source 2	Source 3	Source 4	Source 5
Enable	3	Socket 1	Ntrip Client 1	None	None	None

3.7.3 Socket

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

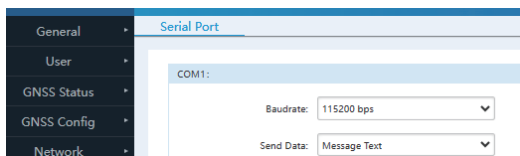


The screenshot shows the 'Socket' configuration page. It allows setting the mode and parameters for 5 network connections (CH01 to CH05). The 'Mode' dropdown for CH01 is set to 'TCP Server'. The 'Remote Host' dropdown is set to 'Disable'. The 'Remote Port' dropdown is set to 'TLS Client'. The 'Local Port' dropdown is set to 'TCP Server'. The 'Send Data' dropdown is set to 'UDP Server'.

CH01	CH02	CH03	CH04	CH05
Mode: TCP Server Remote Host: Disable Remote Port: TLS Client Local Port: TCP Server Send Data: UDP Server				

3.7.4 Serial

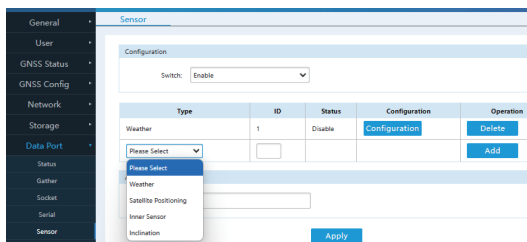
The NET660i provides external serial communication functionality. The serial port baud rate supports a minimum of 1200bps and a maximum of 921600bps, and the type of data to be output can be selected. The following is displayed:



3.7.5 Sensor

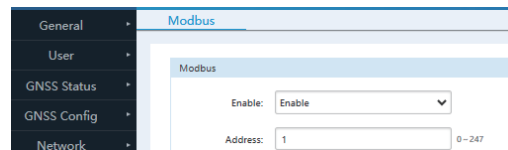
The NET660i can be connected to external sensor devices, with selectable types. However, it is necessary to provide the communication protocol of the sensor to the staff in advance, and the manufacturer will customize the protocol to ensure normal communication between the NET660i and the external sensor.

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:

1. Only support operator 03.
2. Registers is ranged to 3 blocks, each 64 bytes, 0x00~0x3F for positioning, 0x40~0x7F for fsp, 0x80~0xBF for heading.
3. Bytes of positioning: reg 0 high byte, reg 0 low byte, reg 1 high byte, reg 1 low byte...
4. Structure of positioning: (little-endian)
uint8_t quality
uint8_t satellites amount
uint16_t GPS week
uint32_t GPS second, ms
int64_t latitude, 1e-8 degree
int64_t longitude, 1e-8 degree
uint64_t height, 1e-4 meter
uint32_t latitude rmse, 1e-4 meter
uint32_t longitude rmse, 1e-4 meter
uint32_t height rmse, 1e-4 meter
5. Bytes of FSP: reg 0x20 high byte, reg 0x20 low byte, reg 0x21 high byte, reg 0x21 low byte...
6. Structure of FSP: (little-endian)
uint8_t quality
uint8_t satellites amount
uint16_t rmse, 1e-4 meter
uint16_t GPS week of start
uint16_t GPS week of end
uint32_t GPS second of start, ms
uint32_t GPS second of end, ms
int32_t E offset, 1e-4 meter
int32_t N offset, 1e-4 meter
int32_t U offset, 1e-4 meter
int32_t E baseline, 1e-4 meter
int32_t N baseline, 1e-4 meter
int32_t U baseline, 1e-4 meter
7. Bytes of heading: reg 0x40 high byte, reg 0x40 low byte, reg 0x41 high byte, reg 0x41 low byte...
8. Structure of heading: (little-endian)
uint8_t quality
uint8_t satellites amount
uint16_t GPS week
uint32_t GPS second, ms
uint16_t heading, 1e-2 degree
int16_t pitch, 1e-2 degree
uint16_t heading rmse, 1e-2 degree
uint16_t pitch rmse, 1e-2 degree

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:

General ▾ Ntrip Client

User ▾

GNSS Status ▾

GNSS Config ▾

Network ▾

Storage ▾

Data Port ▾

Status

Gather

Socket

Serial

Sensor

Modbus

Ntrip Client

Ntrip Server

Ntrip Caster

Platform ▾

CH01 CH02 CH03 CH04 CH05

CH01 ☒ Enable

Host:

Port:

Username:

Password:

Mount Point:

List

Authentication

Password:

Apply

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.

General ▾ Ntrip Server

User ▾

GNSS Status ▾

GNSS Config ▾

Network ▾

Storage ▾

Data Port ▾

Status

Gather

Socket

Serial

Sensor

Modbus

Ntrip Client

Ntrip Server

CH01 CH02 CH03 CH04 CH05

CH01 ☒ Enable

Version:

Host:

Port:

Mount Point:

Username:

Password:

Data:

Heartbeat:

Apply

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:

General ▸ Ntrip Caster

User ▸

GNSS Status ▸

GNSS Config ▸

Network ▸

Storage ▸

Data Port ▾

Ntrip Caster ☒ Enable

Check User: ☐ Enable

Port:

Mount Point:

Data:

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:

General ▸ ZXVPN

User ▸

GNSS Status ▸

GNSS Config ▸

Network ▸

Storage ▸

Data Port ▸

Platform ▸

ZXVPN

BT/LZ

TH/API

CH01 CH02 CH03

CH01 ☒ Enable

Host:

Port:

Network:

Username:

Password:

Authentication

Password:

Apply

State

State: Online

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:

The screenshot shows the 'GNSS Config' menu. Under 'GNSS Mode', 'Rover' is selected. Under 'Differential Source', 'Socket 1' is selected. The 'RTK Diff Age Max' and 'PSR Diff Age Max' are both set to 60. Under 'Antenna', 'Model' is 'ADRVUULLANTENNA', 'Height' is 0, and 'Measure Type' is 'Phase'.

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

The screenshot shows the 'Serial Port' menu. Under 'COM1', 'Baudrate' is set to 115200 bps and 'Send Data' is set to 'Message Text'.

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

The screenshot shows the 'Message Text' menu. Under 'NMEA', 'GPGGA' is set to 1 s. Under 'ASCII', 'BESTPOSA' is set to 1 s. Other options like 'BESTNAVYZA', 'BESTPOSZA', 'BESTVELA', 'BESTVEZA', 'EVENTALLA', 'FREQUANTSTATUSA', 'KSTZ', 'PPPMANUA', 'REPSTATONAL', and 'TIMEA' are all set to 'None'.

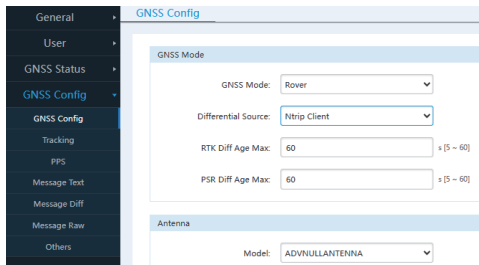
(4) Set network connection CH01 as a TCP client to receive differential data, as shown below:

The screenshot shows the 'Socket' menu. Under 'CH01', 'Mode' is set to 'TCP Client'. 'Remote Host' and 'Remote Port' are both set to '---'. 'Local Port' is set to 8080. 'Send Data' is set to 'None'.

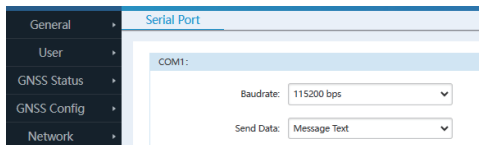
4.4 Example Four

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:

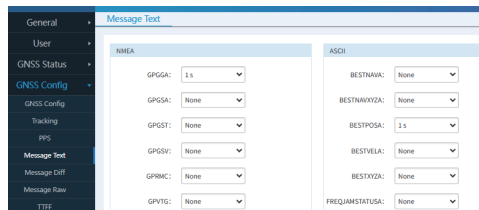
(1) Set the receiver as a rover and select the differential data source as Ntrip client, as shown below:



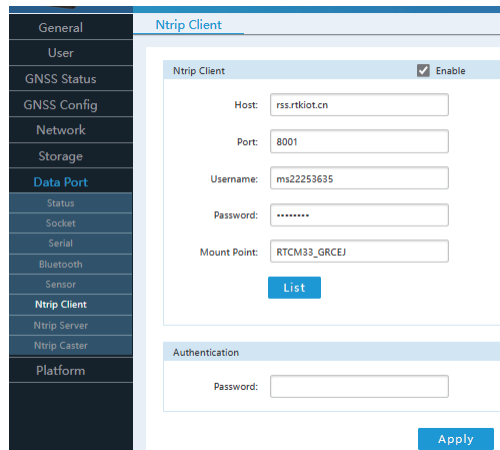
(2) Set COM1 port to send positioning text data, as shown below:



(3) Set the output frequency for text output of GPGLA 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:

General

User

GNSS Status

GNSS Config

Network

Storage

Data Port

Status

Gather

Socket

Serial

Sensor

Modbus

Ntrip Client

Ntrip Server

Ntrip Caster

Ntrip Client

CH01 CH02 CH03 CH04 CH05

CH01 ☒ Enable

Host:

Port:

Username:

Password:

Mount Point:

Got 3 Mount Point(s)

Got 3 Mount Point(s)

AUTO

RTCM333_GRC(E)

RTCM333_GRC

Authentication

Got 3 Mount Point(s)

Got 3 Mount Point(s)

AUTO

RTCM333_GRC(E)

RTCM333_GRC

Got 3 Mount Point(s)

Got 3 Mount Point(s)

AUTO

RTCM333_GRC(E)

RTCM333_GRC

Got 3 Mount Point(s)

Got 3 Mount Point(s)

AUTO

RTCM333_GRC(E)

RTCM333_GRC

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)
OZSS	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

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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	18W(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

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