

# NETWORK TIME SERVER

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## GF-NTP-PRO

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# USER GUIDE





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# 1 Introduction

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The GF-NTP-PRO is a stratum 1 NTP server with an integrated GNSS receiver. It provides NTP, 1PPS and TOD timing outputs. The NTP server uses GNSS (Global Navigation Satellite Systems) signals from GPS, GLONASS, Beidou, and QZSS as the primary time source for synchronization.

The time server can use its built-in, TCXO (temperature compensated crystal oscillator) as autonomous time base for providing several hours of accurate holdover in case that GNSS signals are not available.

The time server has 6 ethernet ports isolated physically, the ports have no communication with each other to ensure network security.

The NTP server is in a 19-inch 1U chassis with rack mount ears for installation.

## 2 Key Features

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- 6000 transaction/second for every port
- NTP accuracy 0.5-2ms
- 6 ethernet ports with full physical isolation to ensure network security
- TCXO (temperature compensated crystal oscillator)
- Web UI monitoring and management
- Multi-GNSS receiver (GPS, GLONASS, Beidou and QZSS)
- NTP v2 (RFC 1119), NTP v3 (RFC 1305), NTP v4 (RFC5905)
- SNTP v3 (RFC 1769), SNTP v4 (RFC 2030)
- NTP md5 authentication
- NTP Unicast and Broadcast mode
- 1PPS output
- 1 RS-232 serial port with ToD output (NMEA ZDA or RMC)
- GPSd is supported via ethernet port 1 (TCP protocol, port 4001)
- RTC
- OLED display
- Power consumption <10W

# 3 Mechanical Size

With rack mount ears: 482 W × 44.5 H × 250 D (mm)



# 4 Physical Specifications


## 4.1 Front panel



Item	Label	Comment
1	Power	Power indication
2	GNSS	GNSS position valid indication ON - Valid, OFF - Invalid
3	NTP	NTP service state ON - Active, OFF - Stop
4	Alarm	NTP service stop alarm
5	OLED display	The default time zone is UTC + 8 GPS: GPS number BeiDou: BeiDou number GLONASS: GLONASS number Antenna: OK - Antenna is ok SHORT - Antenna is short OPEN - Antenna is open

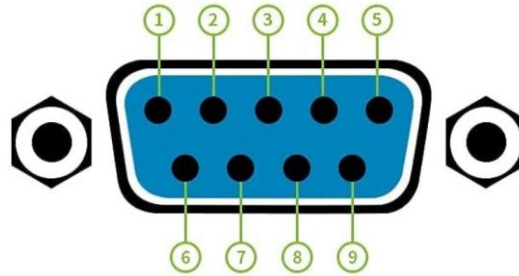
## 4.2 Back panel



Item	Label	Comment
1	ANTENNA	GNSS input, TNC connector
2	COM1	1PPS and TOD output 1PPS with LVTTTL 3.3V, TOD with RS232 level
3	COM2	1PPS and TOD output 1PPS with LVTTTL 3.3V, TOD with RS232 level
4	ETH1	RJ45 connector, 10BASE-T/100BASE-TX Default IP: 192.168.0.101
5	ETH 2	RJ45 connector, 10BASE-T/100BASE-TX Default IP: 192.168.0.102
6	ETH 3	RJ45 connector, 10BASE-T/100BASE-TX Default IP: 192.168.0.103
7	ETH 4	RJ45 connector, 10BASE-T/100BASE-TX Default IP: 192.168.0.104
8	ETH 5	RJ45 connector, 10BASE-T/100BASE-TX Default IP: 192.168.0.105
9	ETH 6	RJ45 connector, 10BASE-T/100BASE-TX Default IP: 192.168.0.106
10	ON/OFF	On-off switch
11	100-240V AC	AC power input
12		Ground

## 4.3 1PPS+TOD

1PPS and TOD output via the male DB9 connector, below table is the pin assignment.



Pin	Name	Comment	Type	Levels
1	1PPS	1PPS output	Output	3.0-3.6V
2	RXD	Data Receive	Input	RS-232
3	TXD	Data Transmit	Output	RS-232
4	-	-	-	-
5	GND	Ground	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	-	-	-

# 5 GNSS Antenna Placement

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The antenna receives the GNSS satellite signals and passes them to the receiver. The GNSS signals are spread spectrum signals in the 1575 MHz to 1610 MHz range and do not penetrate conductive or opaque surfaces. Therefore, **the antenna must be located outdoors with a clear view of the sky.**

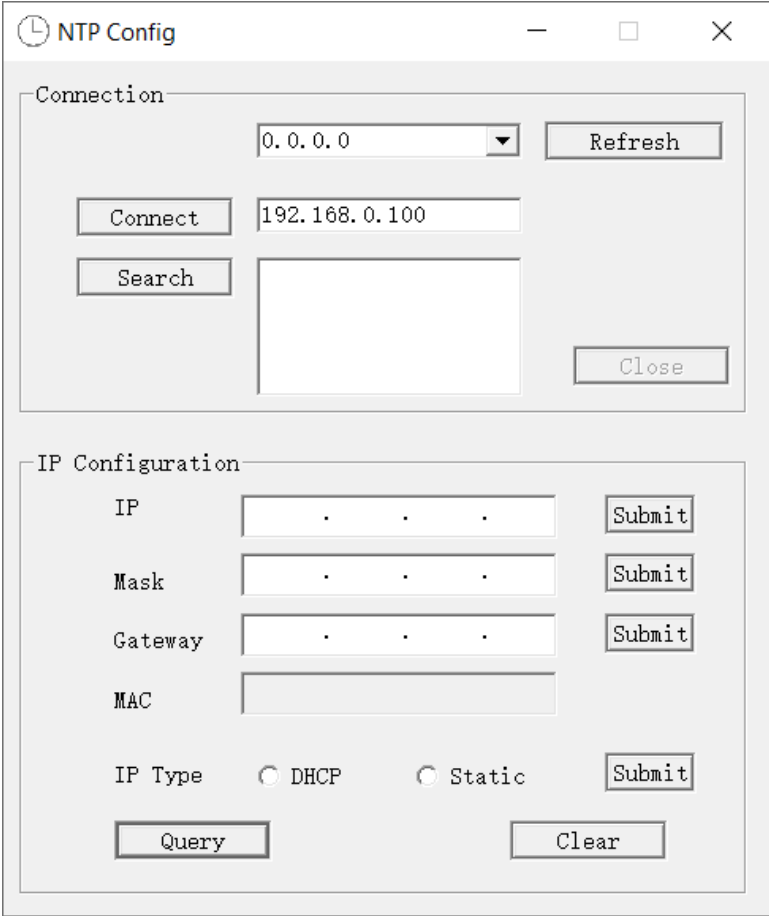
GNSS signals can only be received on a direct line of sight between antenna and satellite. The antenna should see as much as possible of the total sky. Seen from the northern hemisphere of the earth, more satellites will be visible in the southern direction rather than in northern direction. The antenna should therefore have open view to the southern sky. If there are obstacles at the installation site, the antenna should be placed south of the obstacles, preferably, in order not to block sky-view to the south.

If the installation site is in the southern hemisphere of the earth, then the statements above are reversed – more satellites will be visible in the northern direction. Near to the equator, it doesn't matter.

# 6 IP Configuration with Software

Prepare a PC and plug the ethernet cable between PC and the corresponding ethernet port which to be configured. For example, if you want to configure the IP address of ethernet port 2, then should connect the cable to it. The IP configuration software looks like below picture.

**The default subnet is 192.168.0.X for this NTP server, so the IP address of the PC must be set to the same subnet before the configuration.**



The screenshot shows the 'NTP Config' software window. It is divided into two main sections: 'Connection' and 'IP Configuration'.

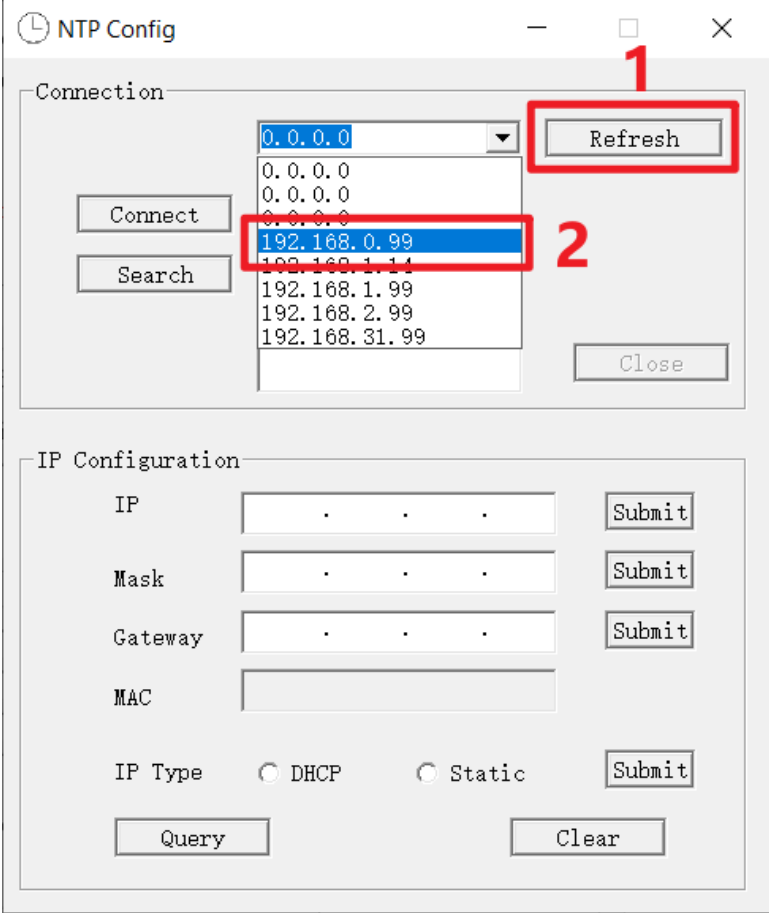
**Connection Section:**

- A dropdown menu showing '0.0.0.0' with a 'Refresh' button to its right.
- A 'Connect' button next to a text input field containing '192.168.0.100'.
- A 'Search' button next to an empty text input field.
- A 'Close' button at the bottom right of the section.

**IP Configuration Section:**

- 'IP' field with three dots and a 'Submit' button.
- 'Mask' field with three dots and a 'Submit' button.
- 'Gateway' field with three dots and a 'Submit' button.
- 'MAC' field with an empty input box.
- 'IP Type' section with radio buttons for 'DHCP' and 'Static', and a 'Submit' button.
- 'Query' and 'Clear' buttons at the bottom.

1. Click the Refresh button
2. Select the IP which connected to NTP server port from the list box



The screenshot shows the 'NTP Config' window. The 'Connection' section contains a list box with the following IP addresses: 0.0.0.0, 0.0.0.0, 0.0.0.0, 0.0.0.0, 192.168.0.99, 192.168.1.11, 192.168.1.99, 192.168.2.99, and 192.168.31.99. The IP address 192.168.0.99 is selected and highlighted in blue. A red box labeled '1' highlights the 'Refresh' button, and another red box labeled '2' highlights the selected IP address. Below the list box are buttons for 'Connect', 'Search', and 'Close'. The 'IP Configuration' section below contains fields for IP, Mask, Gateway, and MAC, each with a 'Submit' button. It also has radio buttons for 'IP Type' (DHCP and Static) and a 'Submit' button. At the bottom are 'Query' and 'Clear' buttons.

3. Click the search button
4. The IP address will be scanned on the edit box
5. Input the scanned the IP address on the edit box right of connect button
6. Click the connect button

The screenshot shows the 'NTP Config' window with two main sections: 'Connection' and 'IP Configuration'.

**Connection Section:**

- A dropdown menu at the top shows '192.168.0.99' with a red box and the number '6' next to it.
- A 'Refresh' button is to the right of the dropdown.
- A 'Search' button is highlighted with a red box and the number '3' below it.
- An input field containing '192.168.0.100' is highlighted with a red box and the number '4' to its right.
- A 'Connect' button is highlighted with a red box and the number '5' to its right.
- A 'Close' button is at the bottom right.

**IP Configuration Section:**

- Fields for 'IP', 'Mask', and 'Gateway' each have a 'Submit' button to its right.
- The 'MAC' field is empty.
- 'IP Type' has radio buttons for 'DHCP' and 'Static', with a 'Submit' button to the right.
- 'Query' and 'Clear' buttons are at the bottom.

7. Click the Query button
8. Edit the value on the IP edit box, and then click the set button to modify the IP. The suggested modification order is Gateway -> Mask -> IP address

The screenshot shows the 'NTP Config' window with two main sections: 'Connection' and 'IP Configuration'.  
In the 'Connection' section, there is a dropdown menu showing '192.168.0.99', a 'Refresh' button, a 'Connect' button, an input field with '192.168.0.100', a 'Search' button, a list box containing '192.168.0.100', and a 'Close' button.  
In the 'IP Configuration' section, there are four rows of input fields with 'Submit' buttons:  
- IP: '192 . 168 . 0 . 100' with a 'Submit' button labeled '10'.  
- Mask: '255 . 255 . 255 . 0' with a 'Submit' button labeled '9'.  
- Gateway: '192 . 168 . 0 . 1' with a 'Submit' button labeled '8'.  
- MAC: '00 01 02 03 04 05'.  
Below these are radio buttons for 'IP Type' with 'DHCP' and 'Static' (selected) options, and a 'Submit' button.  
At the bottom, there is a 'Query' button highlighted with a red box and labeled '7', and a 'Clear' button.

Note: If you want to check the configuration then click the Close button and reconnect the port from step 1 and query the IP parameters.

# 7 Web Interface

## 7.1 Main Page

Web access is permitted only through Ethernet port 1. Launch a web browser and open a connection to the NTP Server by entering the URL that specifies the IP address, <http://192.168.0.101> with username admin, password admin by default.

**Internet Explorer is not supported, Edge and Chrome are recommended.**

Entering the IP address will launch the main page.

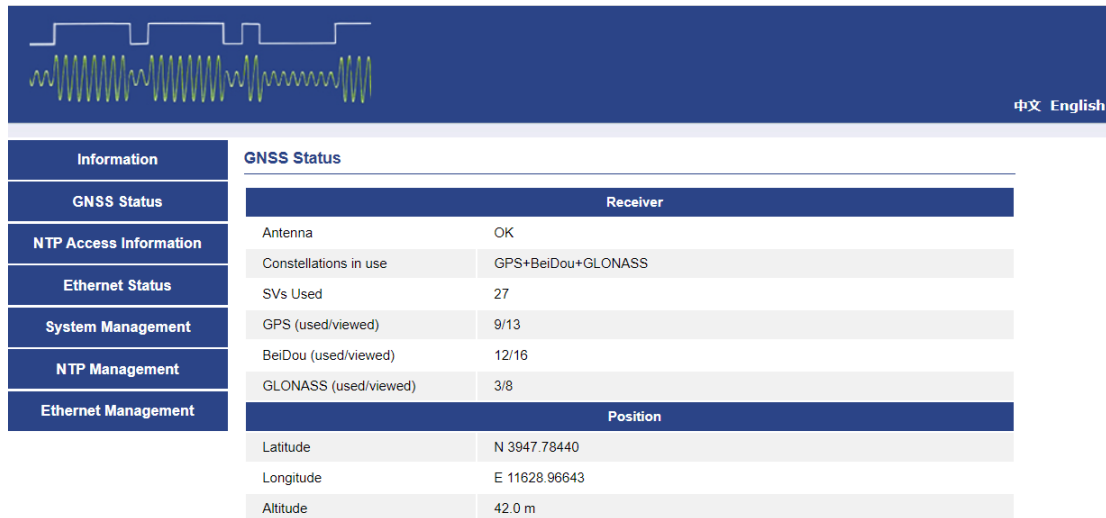


Information	Information														
GNSS Status															
NTP Access Information															
Ethernet Status															
System Management															
NTP Management															
Ethernet Management															
	<table border="1"> <thead> <tr> <th colspan="2">System</th> </tr> </thead> <tbody> <tr> <td>Product Name</td> <td>TF-NTP-PRO</td> </tr> <tr> <td>Firmware Version</td> <td>1.0.1</td> </tr> <tr> <td>Runtime</td> <td>0 Day 00:54:04</td> </tr> <tr> <td>Current Time (UTC)</td> <td>2022/07/02 06:34:47</td> </tr> <tr> <td>Current Time (Local)</td> <td>2022/07/02 14:34:47</td> </tr> <tr> <td>Holdover Time</td> <td>0 Day 00:00:00</td> </tr> </tbody> </table>	System		Product Name	TF-NTP-PRO	Firmware Version	1.0.1	Runtime	0 Day 00:54:04	Current Time (UTC)	2022/07/02 06:34:47	Current Time (Local)	2022/07/02 14:34:47	Holdover Time	0 Day 00:00:00
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NTP Port	123														
Stratum	1														
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Timing & Frequency

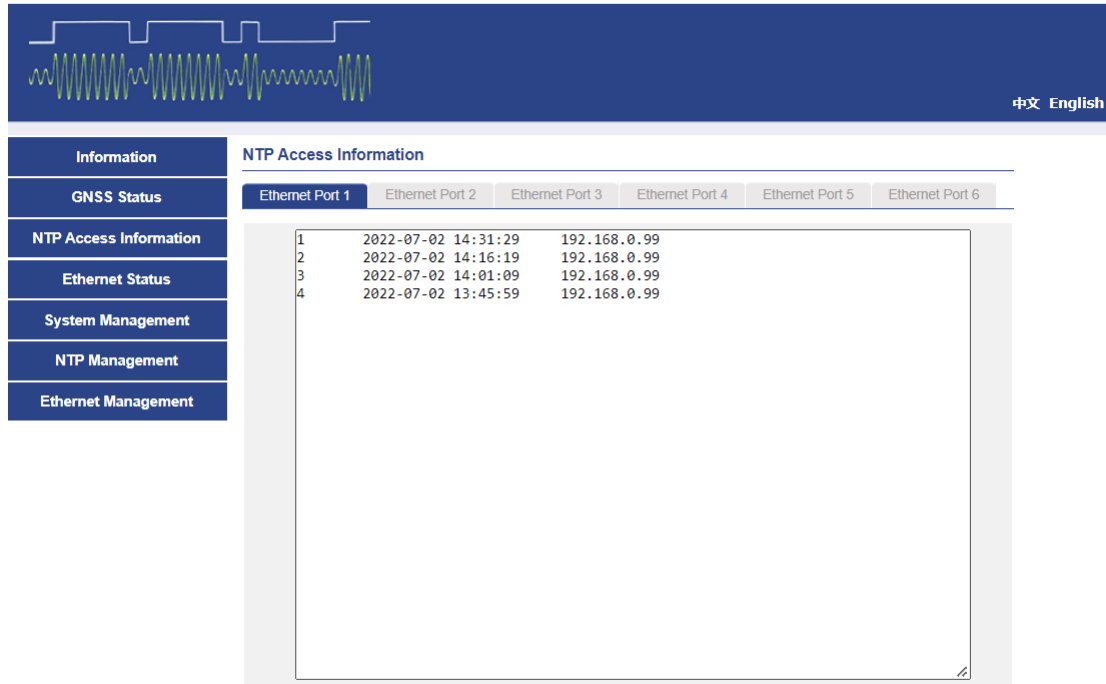
## 7.2 GNSS Status

The antenna connection, constellation, satellites tracking, and position information can be viewed on the GNSS status page.



## 7.3 NTP Access Information

The NTP clients access information can be viewed on this page.

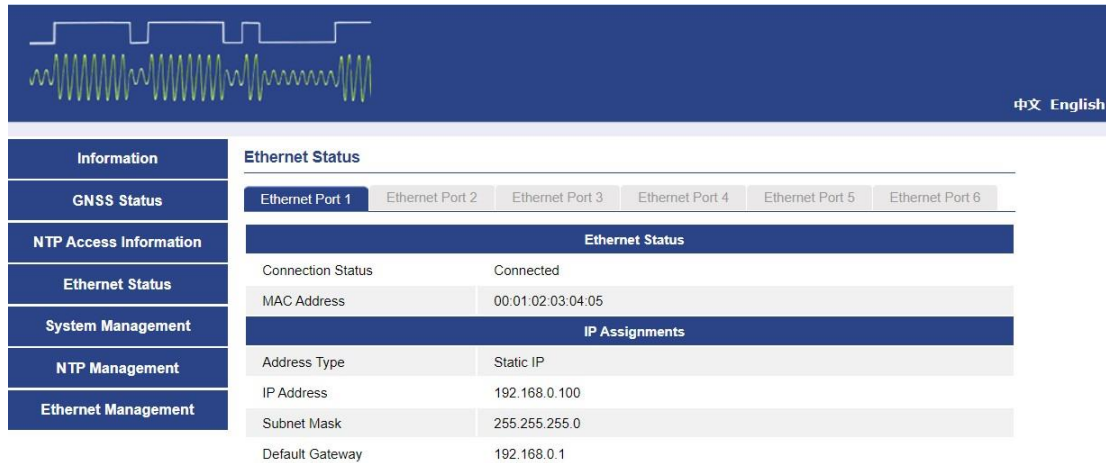


The screenshot displays the NTP Access Information page. On the left is a navigation menu with the following items: Information, GNSS Status, NTP Access Information (selected), Ethernet Status, System Management, NTP Management, and Ethernet Management. The main content area is titled "NTP Access Information" and has tabs for Ethernet Port 1 through Ethernet Port 6. The "Ethernet Port 1" tab is active, showing a table with the following data:

ID	Date/Time	IP Address
1	2022-07-02 14:31:29	192.168.0.99
2	2022-07-02 14:16:19	192.168.0.99
3	2022-07-02 14:01:09	192.168.0.99
4	2022-07-02 13:45:59	192.168.0.99

## 7.4 Ethernet Status

The connection status and IP address configuration can be viewed on this page.



Ethernet Status	
Connection Status	Connected
MAC Address	00:01:02:03:04:05
IP Assignments	
Address Type	Static IP
IP Address	192.168.0.100
Subnet Mask	255.255.255.0
Default Gateway	192.168.0.1

Timing & Frequency

## 7.5 System Management

### 7.5.1 System

#### Timing Service:

By default, this NTP server will allow the timing service for a period of 24 hours from loss of the GNSS. The NTP service can be enabled when GNSS available only.

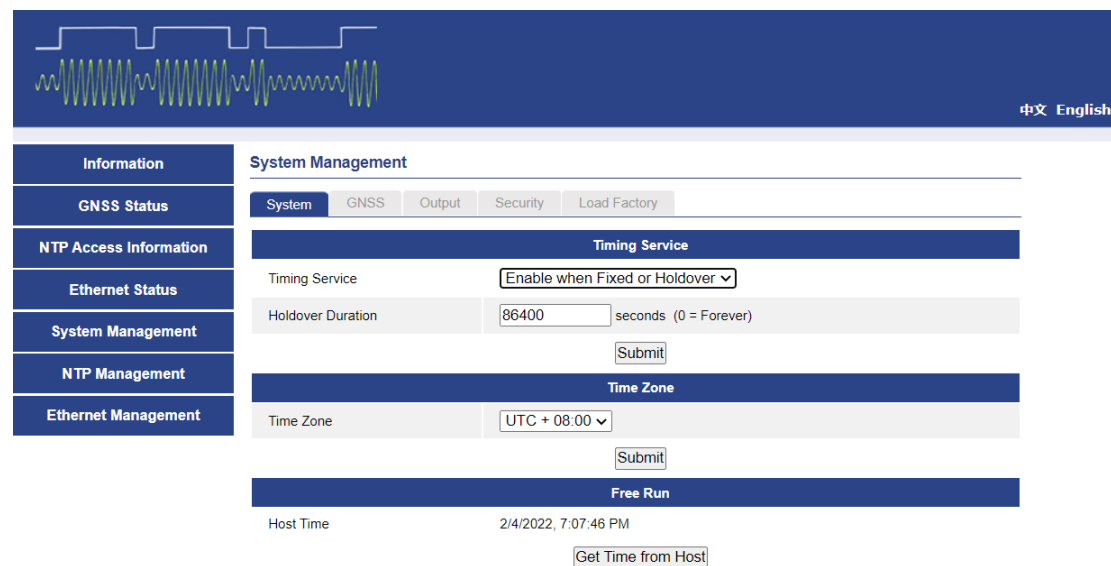
The holdover duration is adjustable in 'seconds' increments. To always allow time dissemination and always consider the internal clock source "valid", set the duration to a value of zero "0"

#### Time Zone:

The time zone is UTC+8 by default.

#### Free Run:

When the time cannot be received from GNSS, the time can be configured manually from local PC and provide NTP service.



The screenshot displays the 'System Management' section of the Network Time Server web interface. The interface is in English, as indicated by the 'English' link in the top right corner. The 'Timing Service' section is active, showing the following settings:

- Timing Service:** Enable when Fixed or Holdover (dropdown menu)
- Holdover Duration:** 86400 seconds (0 = Forever)
- Submit:** A button to save the changes.

The 'Time Zone' section shows:

- Time Zone:** UTC + 08:00 (dropdown menu)
- Submit:** A button to save the changes.

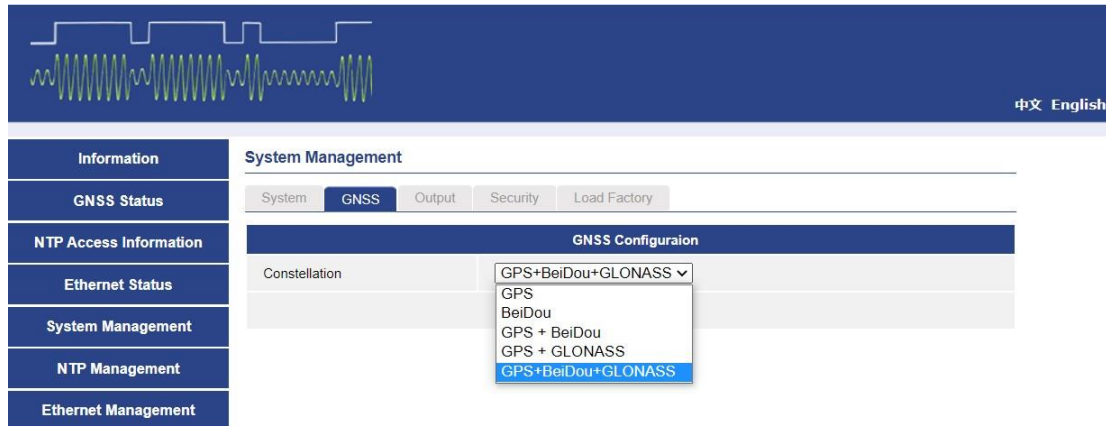
The 'Free Run' section shows:

- Host Time:** 2/4/2022, 7:07:46 PM
- Get Time from Host:** A button to manually update the time from the host.

The interface also includes a sidebar with navigation options: Information, GNSS Status, NTP Access Information, Ethernet Status, System Management (selected), NTP Management, and Ethernet Management. The main content area has tabs for System, GNSS, Output, Security, and Load Factory.

## 7.5.2 GNSS

The constellation can be configured as GPS only, BeiDou only, GPS + BeiDou, GPS + GLONASS, GPS + GLONASS + BeiDou.



Timing & Frequency

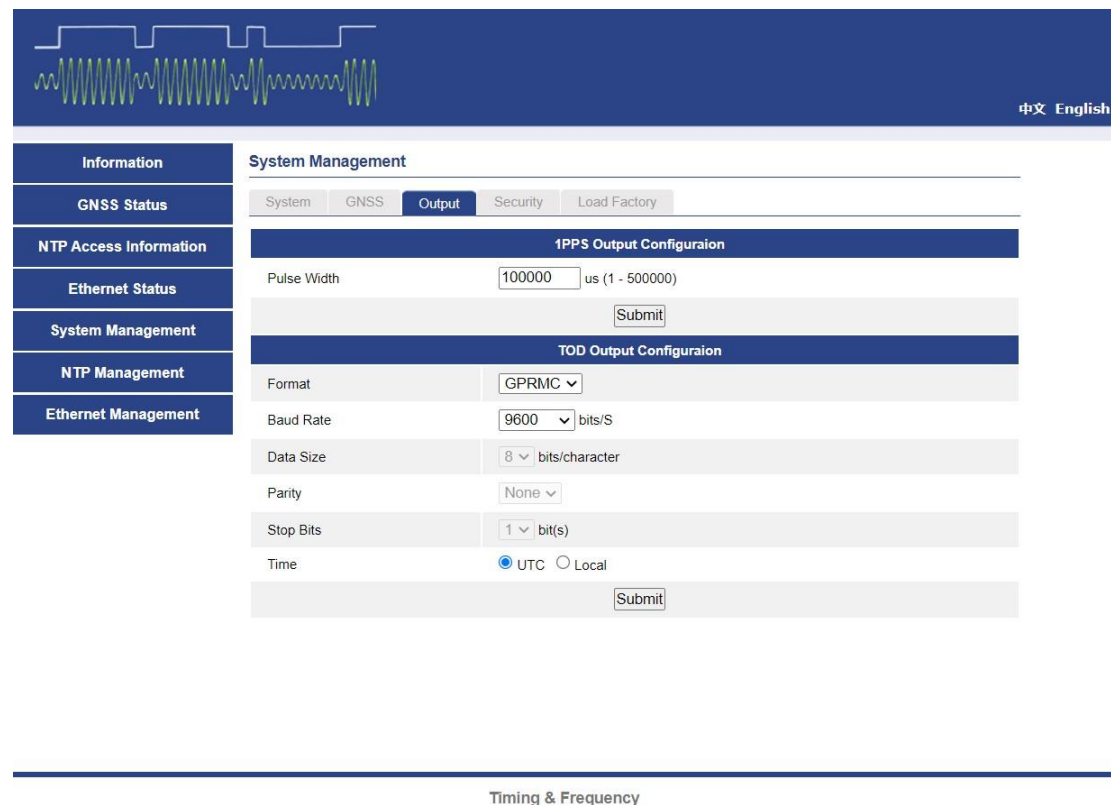
## 7.5.3 Output

### 1PPS Output:

The pulse width is 100 000 us by default, the value range is 1-500000 us.

### TOD Output:

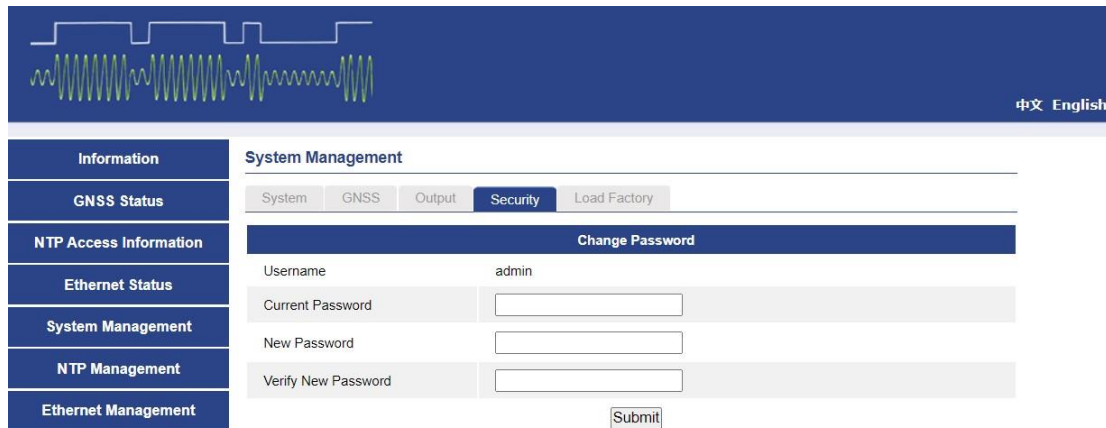
The TOD format is GPRMC or GPZDA, baud rate is 9600 by default, the date size, parity and stop bits are not configurable. The time can be configured as UTC or local.



Timing & Frequency

## 7.5.4 Security


The password can be changed on this page, please note that the default login name is admin, and can't be modified.



The screenshot displays the web interface for a Network Time Server. At the top, there is a blue header with a white waveform icon on the left and the text '中文 English' on the right. Below the header is a navigation menu with the following items: Information, GNSS Status, NTP Access Information, Ethernet Status, System Management (highlighted), NTP Management, and Ethernet Management. The main content area is titled 'System Management' and contains several tabs: System, GNSS, Output, Security (highlighted), and Load Factory. Under the 'Security' tab, there is a 'Change Password' section. This section includes a form with the following fields: 'Username' (pre-filled with 'admin'), 'Current Password', 'New Password', and 'Verify New Password'. Each password field is accompanied by a strength indicator bar. A 'Submit' button is located at the bottom right of the form.

## 7.5.5 Load Factory

The configuration can be restored to factory default on this page.



The screenshot displays the web interface for a Network Time Server. At the top, there is a blue header with a white waveform icon and the text '中文 English'. Below the header is a navigation menu with the following items: Information, GNSS Status, NTP Access Information, Ethernet Status, System Management, NTP Management, and Ethernet Management. The 'System Management' section is expanded, showing sub-menus: System, GNSS, Output, Security, and Load Factory. The 'Load Factory' sub-menu is selected, displaying a 'Restore Factory Defaults' button. Below this button, the text reads 'Restore all options to their factory default states' followed by a 'Submit' button.

Timing & Frequency

## 7.6 NTP Management

NTP broadcast and authentication of all ethernet ports can be configured on this page.

Information  
GNSS Status  
NTP Access Information  
Ethernet Status  
System Management  
**NTP Management**  
Ethernet Management

**NTP Management**

Ethernet Port 1 | Ethernet Port 2 | Ethernet Port 3 | Ethernet Port 4 | Ethernet Port 5 | Ethernet Port 6

**NTP Broadcast**

Broadcast  Enable  Disable

Broadcast Intervals  (seconds)

**NTP Authentication**

MD5 Authentication  Enable  Disable

Unauthenticated NTP Request  Ignore  Accept

MD5 Key Value

Timing & Frequency

## 7.7 Ethernet Management

The IP address of all ethernet ports can be configured on this page.

Ethernet Management	
IP Assignments	
Address Type	Static IP
IP Address	192 . 168 . 0 . 100
Subnet Mask	255 . 255 . 255 . 0
Default Gateway	192 . 168 . 0 . 1
<input type="button" value="Submit"/>	

Timing & Frequency

# 8 Specification

## NTP

Parameter	Description
<b>Interface</b>	10BASE-T/100BASE-TX Conforms to the IEEE 802.3
<b>Connector</b>	RJ-45
<b>Accuracy</b>	0.5-2ms
<b>Standard</b>	NTP v2 (RFC 1119) NTP v3 (RFC 1305) NTP v4 (RFC5905) SNTP v3 (RFC 1769) SNTP v4 (RFC 2030)
<b>MD5 Authentication</b>	Yes
<b>NTP Broadcast</b>	Yes

**1PPS**

Parameter	Description
<b>Connector</b>	DB9 male
<b>Level</b>	3.3V LVTTTL
<b>High Level Width</b>	100ms (default)
<b>Rising Edge</b>	$\leq 5\text{ns}$
<b>Timing Accuracy</b>	$\leq 20\text{ns}$ ( $1\sigma$ )
<b>Holdover</b>	$\leq 1\text{s}$ (7 days)

**TOD**

Parameter	Description
<b>Connector</b>	DB9 male
<b>Level</b>	RS232
<b>Format</b>	GPRMC or GPZDA
<b>Baud Rate</b>	9600 (default)

## GNSS Receiver

Parameter	Description
<b>Constellation</b>	GPS L1 Beidou B1 GLONASS L1 QZSS L1
<b>Antenna Power Feed</b>	3.3V
<b>Horizontal Position Accuracy</b>	<2.5 m CEP50 (autonomous) <2 m CEP50 (SBAS)
<b>Vertical Position Accuracy</b>	<5 m CEP50 (autonomous) <3 m CEP50 (SBAS)
<b>Time to First Fix</b>	<46s (50%), <50s (90%) cold start
<b>Sensitivity</b>	Tracking: -160 dBm Acq: -148 dBm
<b>Dynamic</b>	Velocity 515m/s

## Power

Parameter	Description
<b>AC Input Voltage</b>	AC 100V - 240V
<b>Power Consumption</b>	< 10W

## Environmental

Parameter	Description
<b>Operating Temperature</b>	-20 ~ 45°C
<b>Storage Temperature</b>	-45 ~ 85°C
<b>Operating Humidity</b>	5% ~ 95% RH (non-condensing)
<b>Storage Humidity</b>	5% ~ 95% RH (non-condensing)