

# NETWORK TIME SERVER

---

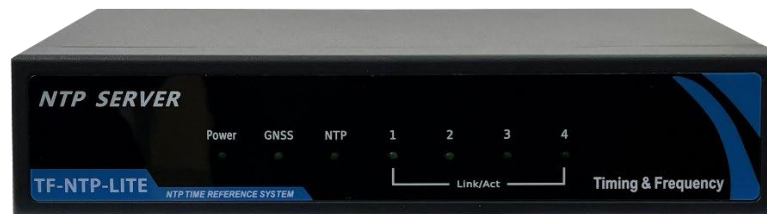
---

## GF-NTP-LITE

---

---

# USER GUIDE





# Contents

---

<b>1 Introduction.....</b>	<b>1</b>
<b>2 Key Features .....</b>	<b>2</b>
<b>3 Mechanical Size .....</b>	<b>3</b>
<b>4 Physical Specifications .....</b>	<b>4</b>
<b>5 GNSS Antenna Placement.....</b>	<b>7</b>
<b>6 IP Configuration with Software .....</b>	<b>8</b>
<b>7 Web Interface .....</b>	<b>12</b>
<b>8 Specification.....</b>	<b>23</b>

# 1 Introduction

---

The GF-NTP-LITE 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 4 ethernet ports isolated physically, the ports have no communication with each other to ensure network security.

The time server has small size in a rack-mountable enclosure, convenient installation, ultra-low power consumption.

## 2 Key Features

---

- 6000 transaction/second for every port
- NTP accuracy 0.5-2ms
- 4 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)
- 9 ~ 60 VDC
- Power consumption <5W

# 3 Mechanical Size

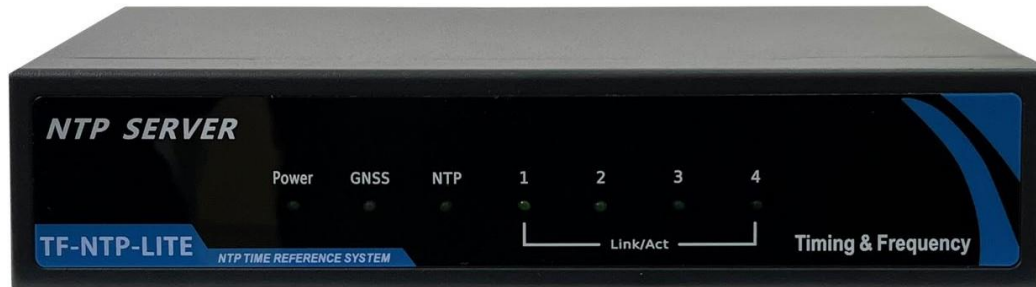
Without extension plate: 200 W × 44.5 H × 100 D (mm)

With extension plate: 482 W × 44.5 H × 100 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	1	Ethernet port 1 state ON – Link ok, Blink – TX/RX activity, OFF – Link down
5	2	Ethernet port 2 state ON – Link ok, Blink – TX/RX activity, OFF – Link down
6	3	Ethernet port 3 state ON – Link ok, Blink – TX/RX activity, OFF – Link down
7	4	Ethernet port 4 state ON – Link ok, Blink – TX/RX activity, OFF – Link down

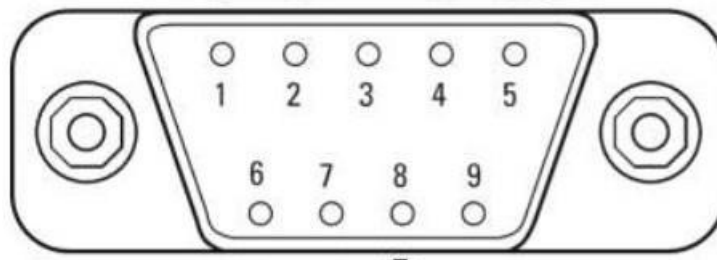
## 4.2 Back panel



Item	Label	Comment
1	ANTENNA	GNSS input, SMA connector
2	1PPS+TOD	1PPS and TOD output 1PPS with LVTTTL 3.3V, TOD with RS232 level
3	1 (Ethernet port)	RJ45 connector, 10BASE-T/100BASE-TX Default IP: 192.168.0.101
4	2 (Ethernet port)	RJ45 connector, 10BASE-T/100BASE-TX Default IP: 192.168.0.102
5	3 (Ethernet port)	RJ45 connector, 10BASE-T/100BASE-TX Default IP: 192.168.0.103
6	4 (Ethernet port)	RJ45 connector, 10BASE-T/100BASE-TX Default IP: 192.168.0.104
7		Ground
8	POWER	9V ~ 60V DC input

## 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

---

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.**

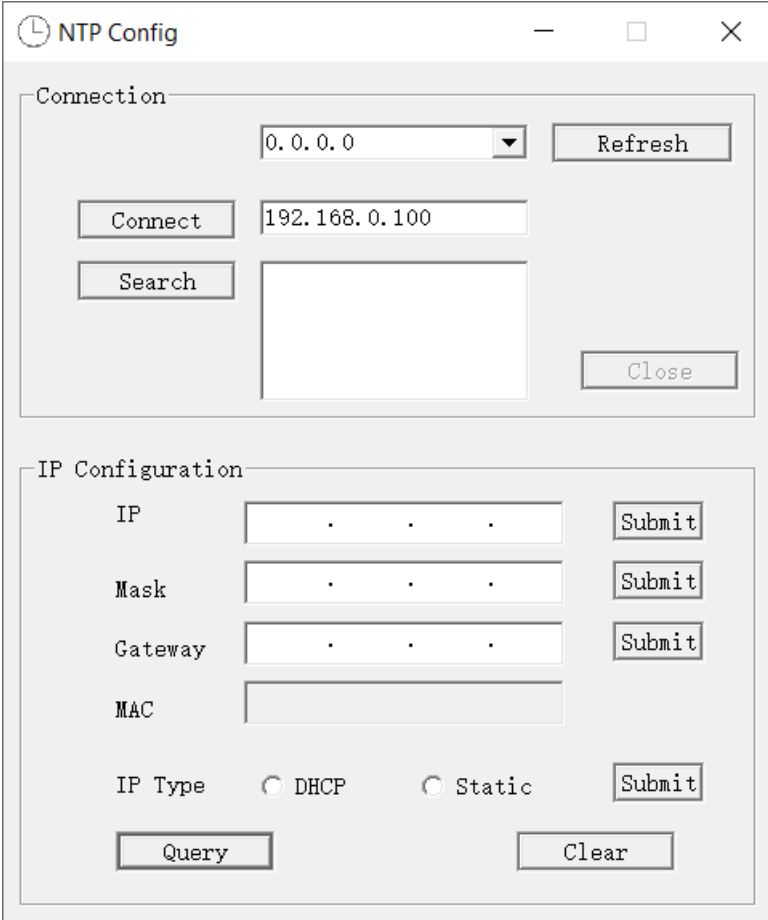
GNSS signals can only be received on a direct line of sight between antenna and satellite. The antenna should see as much as possible of the total sky. Seen from the northern hemisphere of the earth, more satellites will be visible in the southern direction rather than in northern direction. The antenna 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' window with two main sections:

- Connection:** A dropdown menu showing '0.0.0.0' with a 'Refresh' button to its right. Below this is a 'Connect' button and a text input field containing '192.168.0.100'. There is also a 'Search' button and a large empty text area. A 'Close' button is located at the bottom right of this section.
- IP Configuration:** This section contains four rows of input fields, each with a 'Submit' button to its right:
  - IP: A field with three dots (.) and a 'Submit' button.
  - Mask: A field with three dots (.) and a 'Submit' button.
  - Gateway: A field with three dots (.) and a 'Submit' button.
  - MAC: An empty text input field.Below these fields are two radio buttons for 'IP Type': 'DHCP' and 'Static', with a 'Submit' button to their right. At the bottom of this section are 'Query' and 'Clear' buttons.

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 with two main sections: 'Connection' and 'IP Configuration'.

**Connection Section:**

- A dropdown menu is open, showing a list of 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 192.168.0.99 is selected and highlighted in blue.
- A 'Refresh' button is located to the right of the dropdown menu, highlighted with a red box and a red '1'.
- A 'Close' button is located at the bottom right of the Connection section.
- Buttons for 'Connect' and 'Search' are located to the left of the dropdown menu.

**IP Configuration Section:**

- Fields for 'IP', 'Mask', and 'Gateway' are present, each with a 'Submit' button to its right.
- A 'MAC' field is present.
- 'IP Type' is set to 'DHCP' (radio button selected).
- A 'Static' radio button is also present.
- 'Submit' buttons are located to the right of the 'Static' radio button and below the 'MAC' field.
- 'Query' and 'Clear' buttons are located at the bottom of the IP Configuration section.

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 below the search button contains '192.168.0.100' and 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.
- A 'MAC' field is present without a button.
- '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'.

**Connection Section:**

- A dropdown menu shows '192.168.0.99' with a 'Refresh' button to its right.
- A 'Connect' button is next to an input field containing '192.168.0.100'.
- A 'Search' button is next to a list box containing '192.168.0.100'.
- A 'Close' button is at the bottom right.

**IP Configuration Section:**

- IP:** Input field '192 . 168 . 0 . 100' with a 'Submit' button (numbered 10).
- Mask:** Input field '255 . 255 . 255 . 0' with a 'Submit' button (numbered 9).
- Gateway:** Input field '192 . 168 . 0 . 1' with a 'Submit' button (numbered 8).
- MAC:** Input field '00 01 02 03 04 05'.
- IP Type:** Radio buttons for 'DHCP' and 'Static' (selected), with a 'Submit' button.
- Query:** A button highlighted with a red box and numbered 7.
- Clear:** A button at the bottom right.

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.

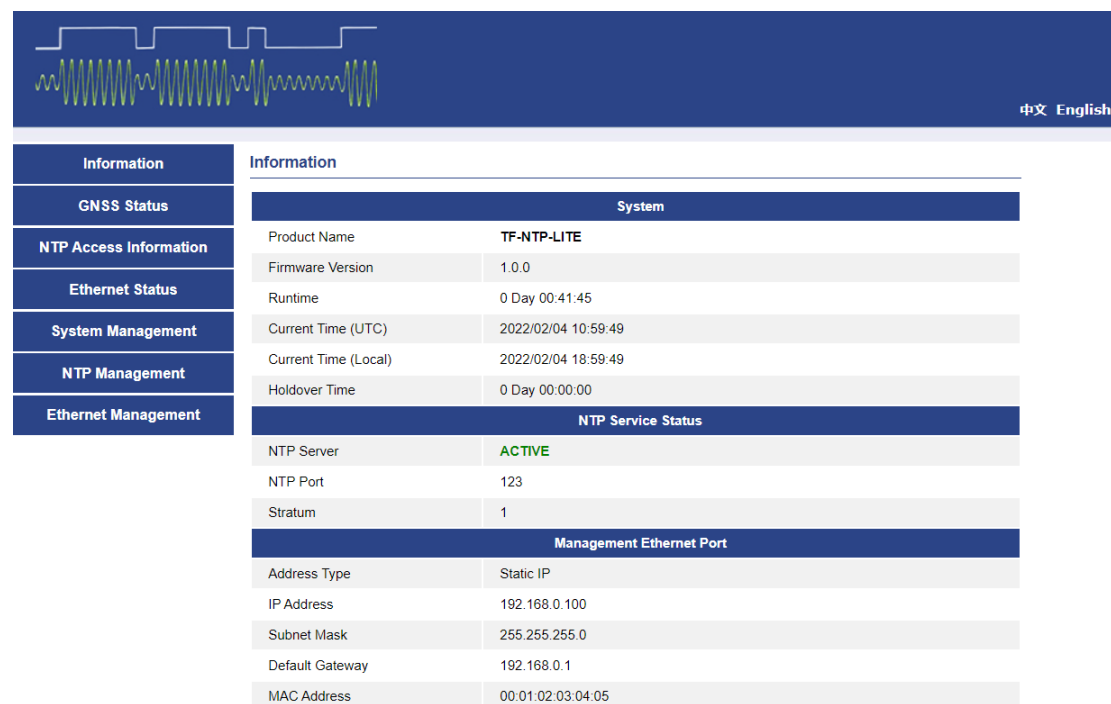
# 7 Web Interface

## 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, Firefox, and Chrome are recommended.**

Entering the IP address will launch the main page.

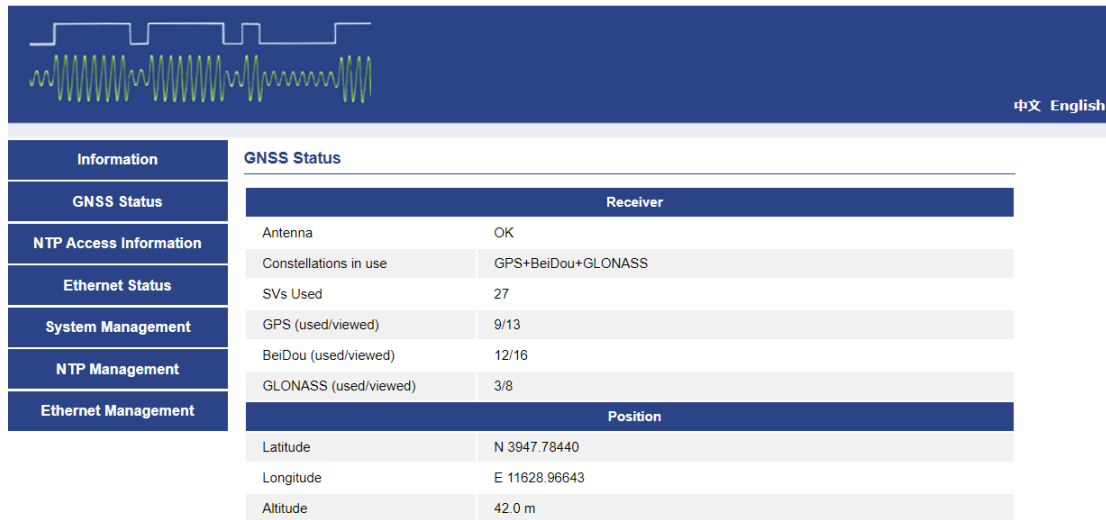


Information	
<b>System</b>	
Product Name	TF-NTP-LITE
Firmware Version	1.0.0
Runtime	0 Day 00:41:45
Current Time (UTC)	2022/02/04 10:59:49
Current Time (Local)	2022/02/04 18:59:49
Holdover Time	0 Day 00:00:00
<b>NTP Service Status</b>	
NTP Server	ACTIVE
NTP Port	123
Stratum	1
<b>Management Ethernet Port</b>	
Address Type	Static IP
IP Address	192.168.0.100
Subnet Mask	255.255.255.0
Default Gateway	192.168.0.1
MAC Address	00:01:02:03:04:05

Timing & Frequency

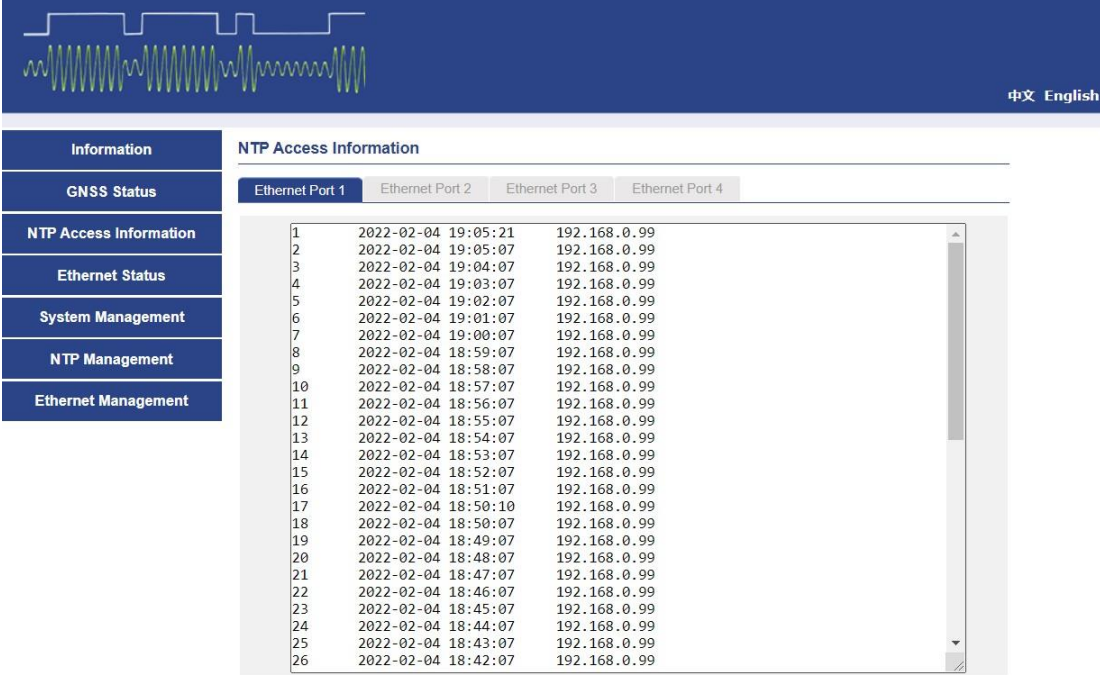
## 7.2 GNSS Status

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 (highlighted), Ethernet Status, System Management, NTP Management, and Ethernet Management. The main content area is titled 'NTP Access Information' and has four tabs: Ethernet Port 1 (selected), Ethernet Port 2, Ethernet Port 3, and Ethernet Port 4. Below the tabs is a table with the following data:

ID	Date/Time	IP Address
1	2022-02-04 19:05:21	192.168.0.99
2	2022-02-04 19:05:07	192.168.0.99
3	2022-02-04 19:04:07	192.168.0.99
4	2022-02-04 19:03:07	192.168.0.99
5	2022-02-04 19:02:07	192.168.0.99
6	2022-02-04 19:01:07	192.168.0.99
7	2022-02-04 19:00:07	192.168.0.99
8	2022-02-04 18:59:07	192.168.0.99
9	2022-02-04 18:58:07	192.168.0.99
10	2022-02-04 18:57:07	192.168.0.99
11	2022-02-04 18:56:07	192.168.0.99
12	2022-02-04 18:55:07	192.168.0.99
13	2022-02-04 18:54:07	192.168.0.99
14	2022-02-04 18:53:07	192.168.0.99
15	2022-02-04 18:52:07	192.168.0.99
16	2022-02-04 18:51:07	192.168.0.99
17	2022-02-04 18:50:10	192.168.0.99
18	2022-02-04 18:50:07	192.168.0.99
19	2022-02-04 18:49:07	192.168.0.99
20	2022-02-04 18:48:07	192.168.0.99
21	2022-02-04 18:47:07	192.168.0.99
22	2022-02-04 18:46:07	192.168.0.99
23	2022-02-04 18:45:07	192.168.0.99
24	2022-02-04 18:44:07	192.168.0.99
25	2022-02-04 18:43:07	192.168.0.99
26	2022-02-04 18:42:07	192.168.0.99

Timing & Frequency

## 7.4 Ethernet Status

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



Information	Ethernet Status
GNSS Status	Ethernet Port 1   Ethernet Port 2   Ethernet Port 3   Ethernet Port 4
NTP Access Information	<b>Ethernet Status</b>
Ethernet Status	Connection Status: Not Connected
System Management	MAC Address: 00:01:02:03:04:05
NTP Management	<b>IP Assignments</b>
Ethernet Management	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.

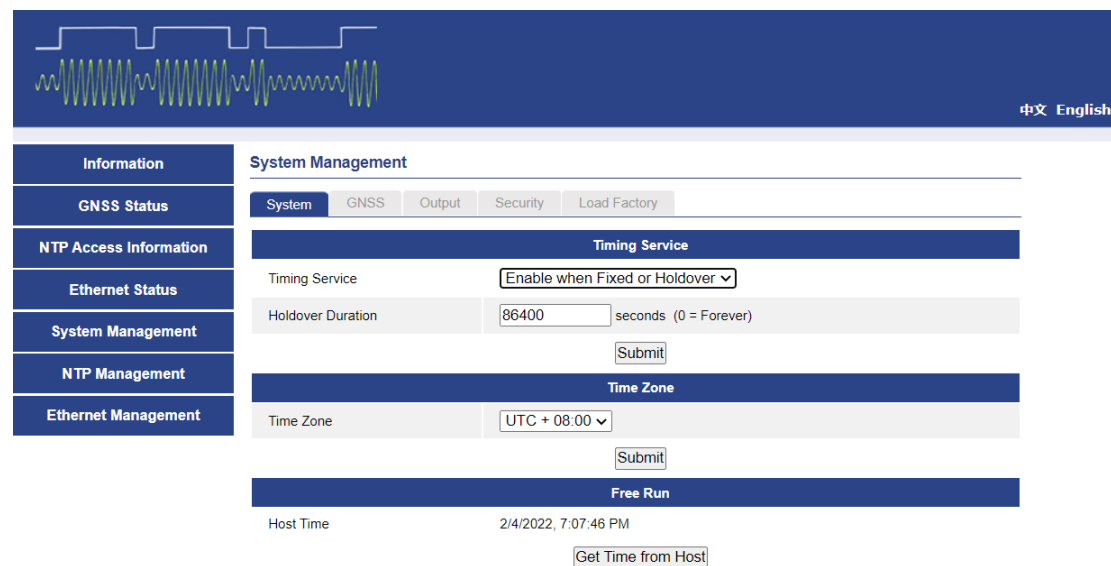
The holdover duration is adjustable in ‘seconds’ increments. To always allow time dissemination and always consider the internal clock source “valid”, set the duration to a value of zero “0”

#### 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.

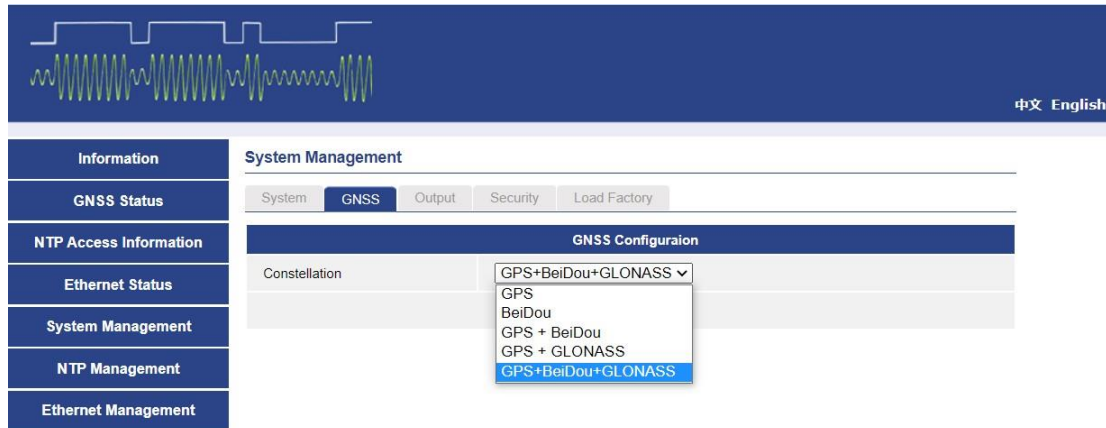


The screenshot displays the web interface for System Management. The top navigation bar includes a language selector (中文 English) and a sidebar menu with options: Information, GNSS Status, NTP Access Information, Ethernet Status, System Management, NTP Management, and Ethernet Management. The main content area is titled 'System Management' and contains three sections:

- Timing Service:**
  - Timing Service:
  - Holdover Duration:  seconds (0 = Forever)
  -
- Time Zone:**
  - Time Zone:
  -
- Free Run:**
  - Host Time: 2/4/2022, 7:07:46 PM
  -

## 7.5.2 GNSS

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



Timing & Frequency

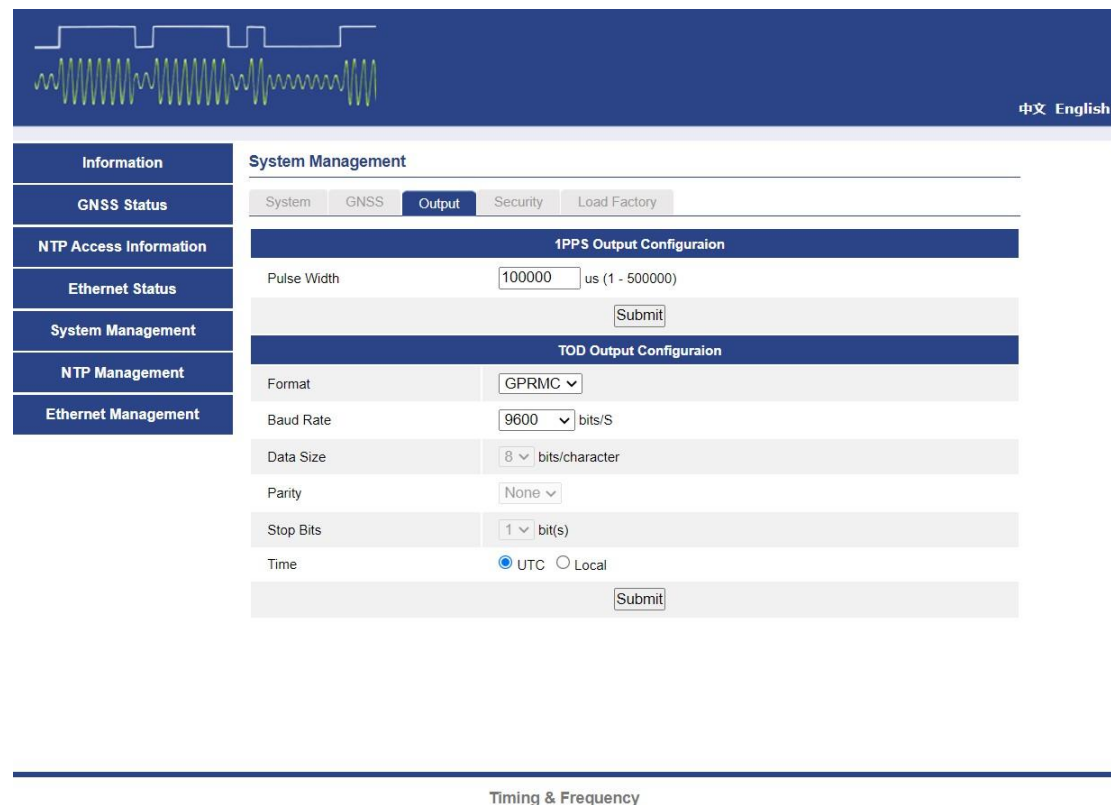
## 7.5.3 Output

### 1PPS Output:

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

### TOD Output:

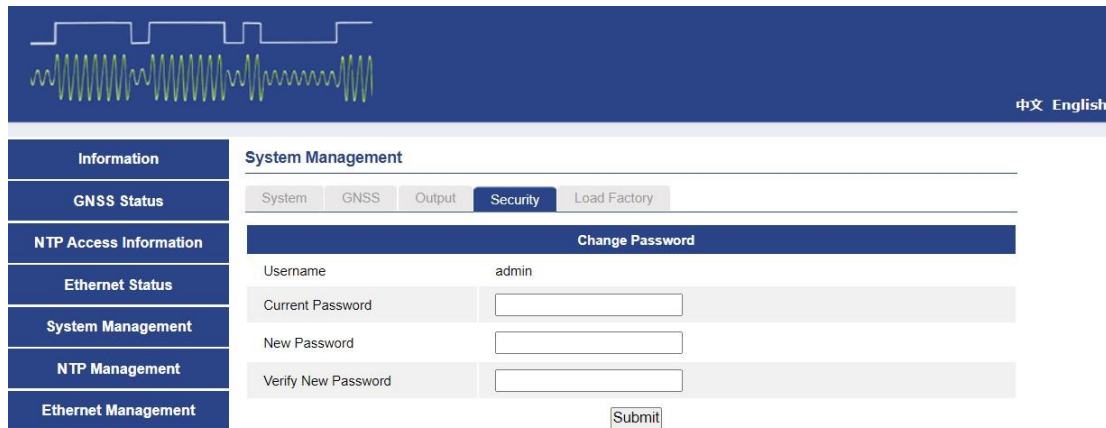
The TOD format is GPRMC or GPZDA, baud rate is 9600 by default, the date size, parity and stop bits are not configurable. The time can be configured as UTC or local.



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.

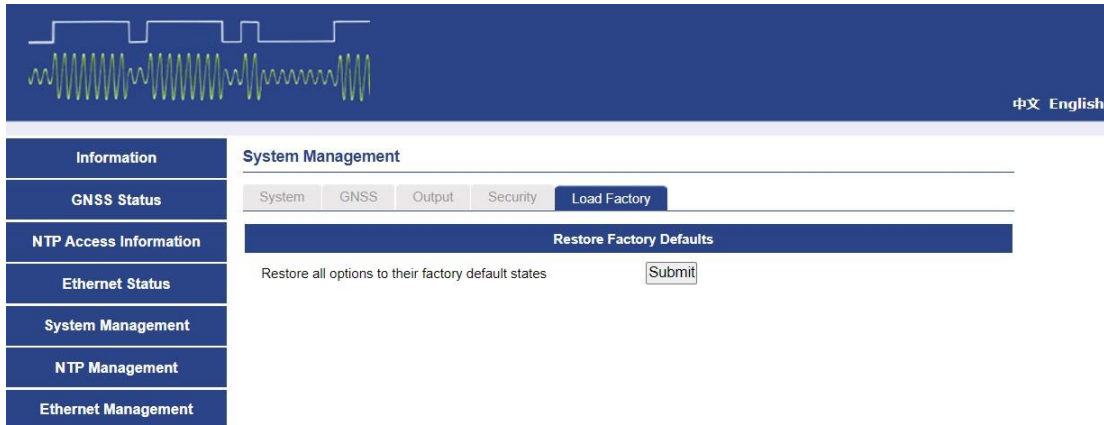


The screenshot displays the web interface for a Network Time Server. At the top, there is a blue header with a white waveform icon on the left and the text "中文 English" on the right. Below the header is a navigation menu with the following items: Information, GNSS Status, NTP Access Information, Ethernet Status, System Management (highlighted), NTP Management, and Ethernet Management. The main content area is titled "System Management" and contains a sub-menu with "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" (with an empty input field), "New Password" (with an empty input field), and "Verify New Password" (with an empty input field). A "Submit" button is located at the bottom right of the form.

Timing & Frequency

## 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 active, showing sub-tabs for System, GNSS, Output, Security, and Load Factory. The 'Load Factory' tab 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

#### 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.

Information

GNSS Status

NTP Access Information

Ethernet Status

System Management

NTP Management

Ethernet Management

### Ethernet Management

Ethernet Port 1 | Ethernet Port 2 | Ethernet Port 3 | Ethernet Port 4

#### IP Assignments

Address Type:

IP Address:

Subnet Mask:

Default Gateway:

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 × 4
<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>	$\leq 50\text{ns}$ ( $1\sigma$ )
<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>DC Input Voltage</b>	9 ~ 60 VDC
<b>Power Consumption</b>	< 5W

## Environmental

Parameter	Description
<b>Operating Temperature</b>	-20 ~ 60°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)