

## **L300/L600 User Manual**



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## Chapter I L300/L600 Survey System Brief

### 1.1 Brief

In recent years, the α-GEO company has been committed to making field measurement easier and easier. According to the engineering experience accumulated in the past 30 years and the experience in the research and development of Surveying and mapping related instruments, I am familiar with the current situation and development direction of Surveying and mapping products, and can organically introduce other disciplines and technologies into the field of surveying instruments.

L300/L600 is a high-end intelligent GNSS receiver launched by α-GEO, which is made of solid magnesium alloy body and exquisite appearance design. It adopts multi-satellite and multi-frequency technology, with built-in all constellation motherboard, supports beidou No.3 satellite, with advanced IMU technology, and Linux operating system runs more stably and smoothly. The operation mode is simple and flexible, in terms of function, performance, speed and power consumption Meet the higher requirements of users

### 1.2 Product features

Good design, advanced algorithm, smart interaction, and equipped with an efficient Linux platform; The miniaturized zero phase antenna adopts multi-satellite and multi-frequency GNSS main board, supports multiple satellite system signals of BDS, GPS, GLONASS and Galileo, with good electromagnetic shielding and stable receiving satellite signals;

The built-in high-performance 9-axis IMU module eliminates the need for users to perform complicated calibration. The maximum inclination angle can reach 60 degrees, and the accuracy can be maintained within 2cm. What you reach is what you measure, no more waiting;

Provide rich data link mode, with Wi-Fi and 4G Internet access function to transmit differential data; when using network to transmit differential data, the mobile station receiver of other manufacturers can connect to the reference station established by the measurement receiver, and the measurement mobile station can also connect to the CORS reference station of other companies;

Wi-Fi hotspot technology, the host can connect any device with Wi-Fi (including mobile hotspot, router) for differential data transmission;

### 1.3 Specifications

#### MEASUREMENTS

- ◆ 1408 Tracking Channels
- ◆ Satellite signals tracked simultaneously
  - GPS: L1/ L2/ L5
  - GLONASS: L1/ L2/
  - SBAS: L1
  - Galileo: E1/ E5A/ E5B

- BDS: B1, B2, B3
- QZSS: L1/ L2/ L5
- ◆ Positioning rates
  - 1Hz~20Hz
- ◆ Initialization time < 5s
- ◆ Initialization reliability >99.99%

#### POSITIONING

- ◆ Code differential GNSS positioning
  - Horizontal: 0.25 m + 1 ppm RMS
  - Vertical: 0.50 m + 1 ppm RMS
  - SBAS differential positioning accuracy: typically, <5m 3DRMS
- ◆ Static GNSS surveying
  - Horizontal: 2.5 mm + 0.5 ppm RMS
  - Vertical: 5mm + 0.5 ppm RMS
- ◆ Real time kinematic surveying
  - Single baseline < 30km
    - Horizontal: 8 mm + 1 ppm RMS
    - Vertical: 15mm + 1 ppm RMS
  - Network RTK
    - Horizontal: 8 mm + 0.5 ppm RMS
    - Vertical: 15m m + 0.5 ppm RMS
- ◆ Real time kinematic tilt compensated
  - Additional Hz pole tip uncertainty typically less than 8 mm + 0.4 mm/° tilt down to 30° tilt

#### HARDWARE

##### PHYSICAL

- ◆ Material: Magnesium alloy
- ◆ Dimensions: φ160mm × 53mm (With bottom connector 74mm)
- ◆ Weight: 1.0kg
- ◆ Operating temperature: -40°C to +75°C
- ◆ Storage temperature: -55°C to +85°C
- ◆ Ingress protection: IP67 dustproof, protected from 30min immersion to depth of 1m
- ◆ Shock: Survive a 2m pole drop onto concrete
- ◆ Vibration: MIL-STD-810G
- ◆ Humidity: 100%, condensing

##### ELECTRICAL

- ◆ Power 9-24 V DC external power input on 5 pin LEMO port
- ◆ Support Type-C fast charging
- ◆ Internal 6800mA Lithium-ion battery
- ◆ Battery life
  - Rover mode: 12 hours
  - Base mode: 7h hours
  - Static mode: 15 hours

#### COMMUNICATIONS & DATA STORAGE

- ◆ I/O Interface
  - 1 LEMO port (5pin): Supports power input, serial port control, and external radio communication
  - 1 Type-C USB port: Data download
  - 1 sim card slot: Supports Nano-SIM
  - 1 antenna port: UHF antenna interface
- ◆ Radio modem
  - Transmit power: 1w/2w switchable, the work range is greater than 4km
  - Frequency band: 410MHz-470MHz; supports to freely set the frequency
  - Supports to retransmit correction from CORS; Compatible with other brands
- ◆ Cellular
  - Integrated full frequency band 4G modem, supports WCDMA/CDMA2000/TDD-LTE/FDD-LTE
- ◆ Wi-Fi
  - 802.11 b/g standard, access point and client mode, supports to access to hotspot to transfer corrections
- ◆ Bluetooth
  - Fully integrated Bluetooth V4.0, range ≤ 50m
- ◆ Data format
  - RTCM3.2, RTCM 3.x input and output
  - Dat, Rinex, NMEA outputs
- ◆ Storage
  - 8GB internal memory optional, supports cyclic storage; over one-year raw observations based on 5 seconds interval

## OTHERS

### PRACTICAL

- ◆ OS system: Intelligent LINUX operating system
- ◆ Tilt compensation: Calibration free
- ◆ Supported controllers: All Android devices with supported software

### DESIGN

- ◆ Button: 1 power key
- ◆ Indicator: 1 power indicator, 1 data link indicator, 1 satellite indicator, 1 Bluetooth indicator
- ◆ Voice: Intelligent voice prompts
- ◆ WEB UI: Support WEB UI configuration

## 1.4 Precautions

L300/L600 receiver is a precision instrument. Although it is designed to resist chemical corrosion and earthquake, it should be used and maintained carefully in actual use.

1. Packing and transportation: please make sure that the receiver and all accessories are placed in the instrument box in the correct position to prevent the instrument from being damaged by impact and vibration during transportation. Please dry the instrument surface with a cloth when it is wet by rain, and then pack it after it is dried. The receiver and data collector are equipped with built-in lithium battery. Please ensure to comply with the national laws and regulations during express transportation.

2. Storage: when using and storing the receiver, please make sure it is within the specified temperature range. Before storage, take out the lithium battery from the host and turn off the manual. After using the instrument at ordinary times, it shall be packed in time to prevent the loss of accessories.
3. Please do not disassemble the instrument when using the GNSS receiver. In case of failure, please contact the supplier;
4. Please use the original battery charger. When using an external power supply, you must ensure that the nominal voltage is correct.
5. Do not use receiver and pole in thunderstorm days to prevent accidental injury caused by lightning stroke.
6. In order to ensure the quality of the satellite observation signal, the sky over the station should be as wide as possible, and there should be no obstacles above the altitude angle of 15 degrees. High voltage line, microwave station, TV Tower and other strong electromagnetic interference equipment shall be avoided within 200m around the station. In order to reduce the influence of multipath effect on the observation, the station should be far away from large water areas, glass curtain walls of high-rise buildings and other areas with strong electromagnetic wave reflection.




## Chapter II Introduction


### 2.1 Housing & Indicators



#### 2.1.1 Indicators

Table.2-1 Descriptions

	Green	Satellites locked	
	Off	No tracking satellites	
	Green	Bluetooth connected	
	Off	Bluetooth disconnected	
	Base	Blink	Transmitting data
		Off	No transmitting
	Rover	Blink	Receiving data

	Plug in	Off	No data received
		Green	The receiver battery is fully charged
	No plug in	Red	Receiver is charging
		Green	Battery power is full
		Red	Battery power is low

**2.1.2 Bottom**



**5-pin LEMO interface:** support external power supply; serial cable connection control; external radio data transmission.

**Antenna interface:** Built-in radio antenna interface, the antenna must be inserted to use the built-in radio.

**Nano SIM card slot:** Used to install a nano SIM card for data link communication,.

**Type-C interface:** To charge the device and download the data.



## 2.2 Configuration Brief

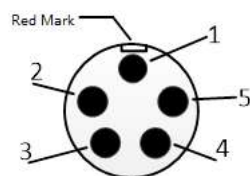
### 2.2.1 Carry Case

If there is water on the surface of the instrument or inside the box, please do not directly pack the box, and then cover it tightly after drying. If the inside of the box is wet and the field is eager to transport it, it should be opened and dried in time when returning to the room.



### 2.2.2 5-PIN cable & USB cable

#### 1. 5-Pin interface



Note: The 5-pin interface are all arranged in a counterclockwise direction when looking at the front (that is, facing the front side of the notch of the 5-pin interface of the rece



i v e r ) .

(1) Three uses of the 5-pin interface:

1. When the interface is connected to the computer, it is used to connect the PC control software of the test;
2. When the interface is connected to the external radio, the data cable used for the receiver and the external radio;
3. When the interface is connected to the adapter, it can supply power to the receiver.

(2) Signal description

5-Pin LEMO	
1	Power(12V)
2	Signal (Ground)
3	RXD
4	TXD
5	Power (Ground)

Note: When connecting the 5-pin interface, make sure that the red mark of the 5-pin head is aligned with the red point on the small 5-pin interface, and then it can be inserted gently. If it is not aligned, it cannot be inserted to protect the 5-pin interface.

### 2.2.3 TYPE-C Cable

The USB interface is located on the side of the receiver. Open the rubber plug on the side of the receiver to see the interface. The Micro USB interface of the receiver is used as follows:

- (1) Connect the charger via the TYPE-C USB cable and charge the device;



For TYPE-C USB cable, one end is a standard USB interface, and the other end is a TYPE-C USB interface, which is mainly used for data transmission between computers and receivers and charging.

### 2.2.4 Internal UHF antenna

The receiver is equipped with a UHF built-in radio antenna, the specific use is as follows:

- (1) In any case where the built-in radio is used as a data link, whether it is a dual-transmission mode or a radio repeater mode, the UHF built-in radio antenna must be inserted.
- (2) The receiver integrates a 4G built-in antenna, and users do not need to plug in a 4G antenna.



Internal UHF antenna



When using the built-in radio as the data link, the radio communication protocol and radio frequency can be set on the data collector.

### 2.2.5 SIM Card Installation

When using the built-in network communication, a mobile phone card needs to be inserted, and the receiver supports Nano-SIM card. SIM card installation method: Open the battery cover, as shown in Figure 2.3.5-1, insert the SIM card notch into the card slot with the chip facing down. When removing, just press the SIM card to automatically eject part of it, then pull out the card

Tip: The receiver has a built-in 4G antenna, and no external antenna is required when using the built-

in network communication



Insert the sim card as indicated

Fig 2.3.4-1

### 2.2.6 Other Accessories

#### Extension Pole & Plate



Extension Pole



Plate

The extension pole is used to set up the base station and raise the receiver, which is convenient to install the antenna or part of the cable at the bottom of the receiver, and at the same time can improve the receiver's ability to receive satellite signals.

The extension pole can be installed on the base, as shown in Figure 2.3.6-1. If the base is set up freely at any position, the extension pole can be directly fixed to the tripod, and the receiver can be roughly horizontal. If the base is set on a known point, the plate is required at this time.



Figure 2.3.6-1

## Chapter III WEB UI Introduction

### 3.1 Connecting to the WEB UI

L300/L600 can be fully configured and monitored by using the WEB UI. Any Wi-Fi device can connect to L300/L600 via the WEB UI. The steps how to connect to Wi-Fi is as below.

1. Wait till L300/L600 has fully booted after switching on (about **20 seconds**).
2. The wireless access point name will be shown up which is same as the serial number as shown in Figure 3-1. There is no password needed by default.
3. Open a browser and type the IP **192.168.10.1** in the address bar. The browser will open the ‘Overview’ page of the Web Interface shown in Figure 3-2.

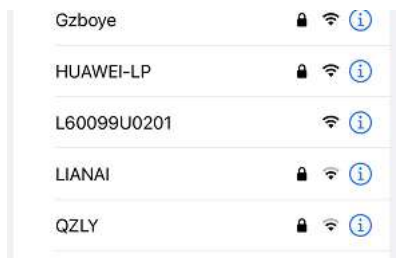


Figure 3-1: Access point name

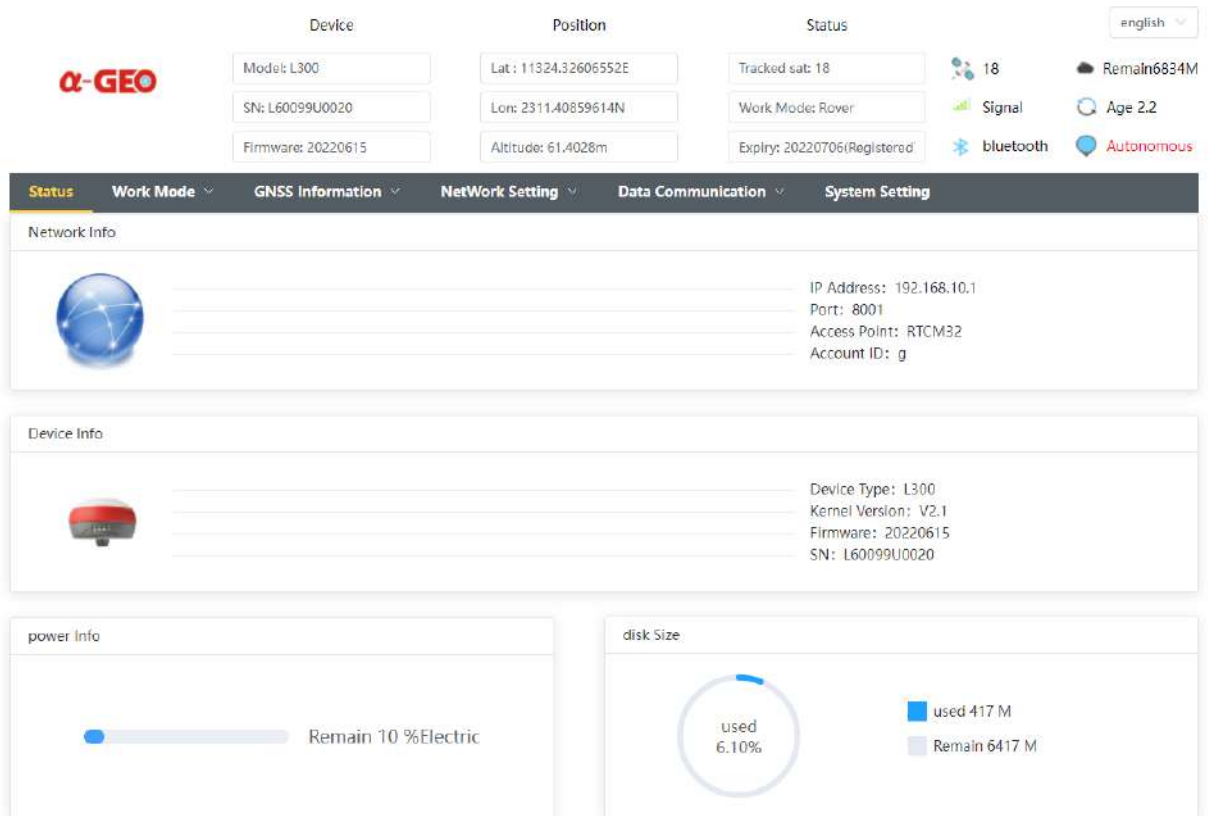


Figure 3-2: Web UI overview

### 3.2 Configuring the device as a Base

The L300/L600 is available to be set as **Base**, and can be started as internal **UHF/Network/Ntrip Ca**ster. Check the **Base** in work mode field as shown in Figure 3-2-1.

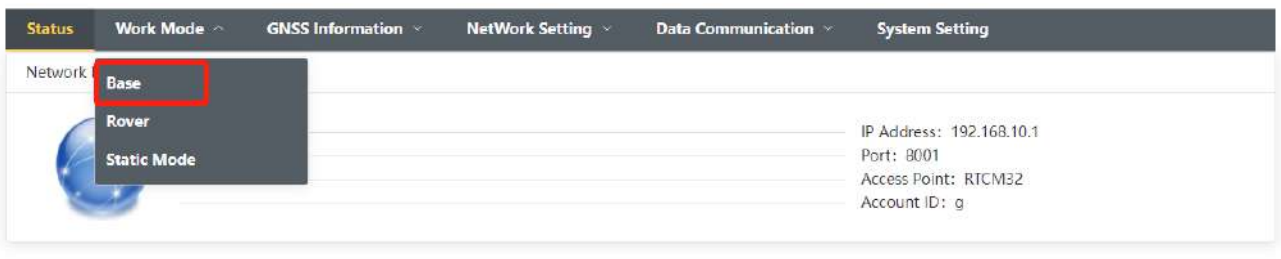


Figure 3-2-1

#### 3.2.1 Transmitting via Internal UHF

1. Insert the UHF antenna to the L300/L600 for transmitting the signal.
2. Select the **Base** work mode field, set the coordinate, antenna height, the differential message type, PDOP and mask angle as shown in Figure 3-2-1-1.
3. Select the Built-in Radio in Datalink field, set the required radio protocol, channel, frequency and power level as shown in Figure 3-2-1-2.

Base Mode

---

Coordinate

Latitude

Longitude

Altitude

Antenna Height  Pole

Differential

Mask Angle

PDOP

PPK

Figure 3-2-1-1

DataLink Set

---

Protocol

Channel

Frequency

Power

---

An antenna needs to be inserted to use the built-in radio

Figure 3-2-1-2

### 3.2.2 Transmitting via Network

1. Insert a sim card into the device and configure the APN parameters in Network Setting field **Cellular** to activate it as shown in Figure 3-2-2-1.
2. Select the Built-in Network in Datalink field, and enter the Ntrip Server parameters in the corresponding field. You will need provide a name of the mountpoint in Access Point field as shown in Figure 3-2-2-2.

Parameter Setting

Start

APN

APN ID

APN Password

Figure 3-2-2-1

DataLink Set Built-in Network

Ntrip Version Ntrip

IP 47.107.136.238

Port 6060

Account ID 8885

Password 8885

Access Point www

Set

Figure 3-2-2-2

### 3.2.3 NTRIP Caster

The **NTRIP Caster** is a HTTP server which receives streaming RTCM data from one or more NTRIP Servers and in turn streams the RTCM data to one or more NTRIP Clients via the internet. L300/L600 is equipped with Wi-Fi module, so it can be a server and perform as Ntrip Caster to transmit the RTCM data, which is a very good feature for drone’s application.

#### Base Configuration

1. Set the **Base** start parameters as usual, and select the external radio as datalink method.
2. Select the **NTRIP Caster** in Data Communication field as shown in Figure 3-2-3-1.
3. Set the port number and the mountpoint name as shown in Figure 3-2-3-2.

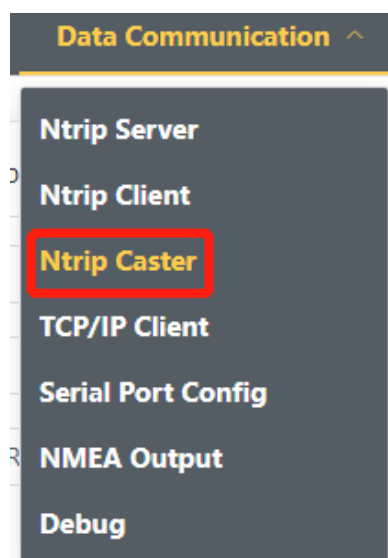


Figure 3-2-3-1

Ntrip Caster

---

DataLink

Port

Access Point

Figure 3-2-3-2

**Rover Configuration**

1. Connect data collector or Drone’s controller to L300/L600’s Wi-Fi hotspot without entering any password as shown in Figure 3-2-3-3.
2. Open the controller software and go to the **Ntrip Configuration** menu, enter the **IP 192.168.10.1** and **port (e.g., 8001)** as set in Figure 3-2-3-2. The mountpoint (e.g., **RTCM32\_RTK**) will be shown in the list as below Figure 3-2-3-4.

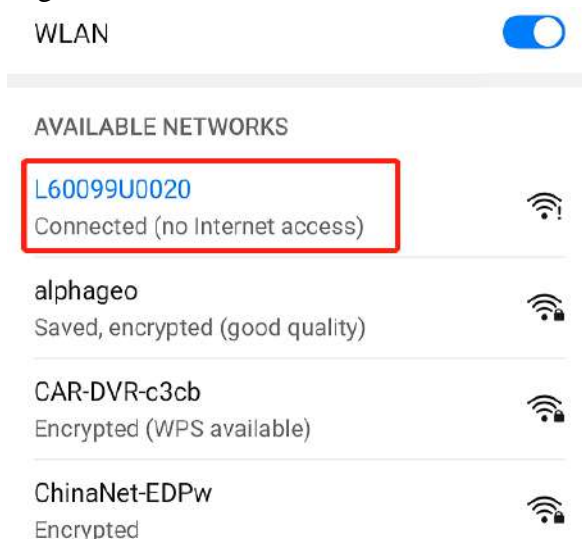


Figure 3-2-3-3



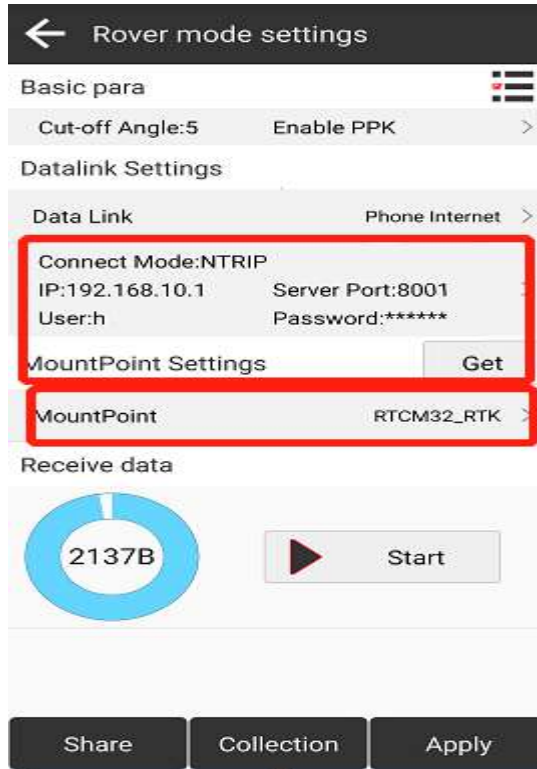


Figure 3-2-3-4

### 3.3 Configuring the device as a Rover

#### 3.3.1 Standard Rover settings

For the L300/L600 to operate as a rover and accept differential correction data from a Base station, check that **Rover** is selected in the 'Work Mode' field as shown in Figure 3-3-1-1. This is the default operating mode of the L300/L600.

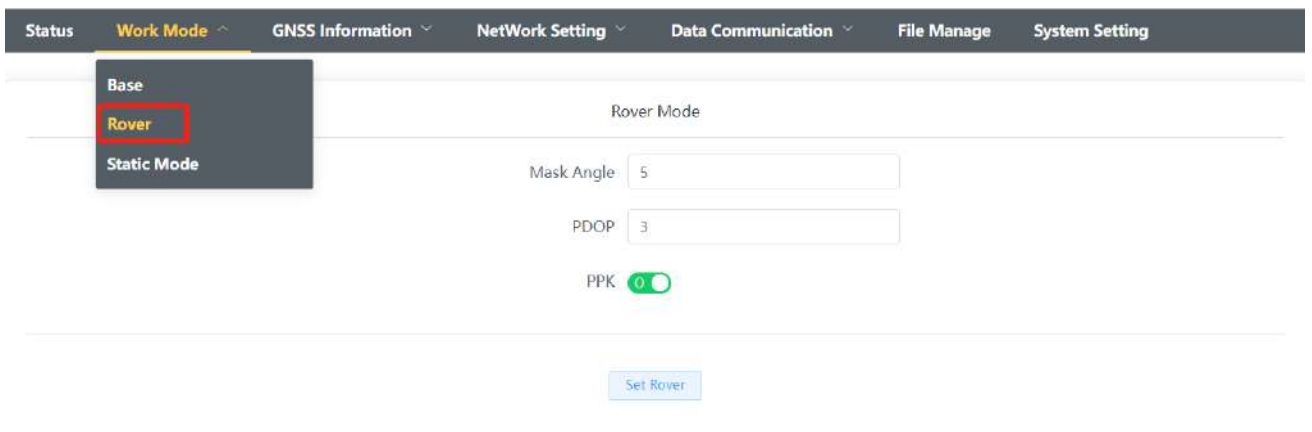


Figure 3-3-1-1

**Note:** When the PPK button is checked, the receiver will record raw data in Rover mode.

### 3.3.2 Data link in Rover mode

#### Built-in Radio

Configure the radio parameters as same as Base as shown in Figure 3-3-2-1. And the radio antenna must be inserted when using internal radio.

DataLink Set Built-in radio

Protocol Trimtalk

Channel Custom

Frequency 441

Set An antenna needs to be inserted to use the built-in radio

Figure 3-3-2-1

#### Built-in Network

When built-in network is selected, a NANO SIM card must be inserted to the L300/L600 to get the 4G signal. At the same time the APN parameters would be set in 'Network Settings' field Cellular menu. After that, the CORS details will be set as Figure 3-3-2-2.

DataLink Set Built-in Network

IP 42.207.85.7

Port 2101

Account ID test

Password test

Access Point RTCM32

Set

Figure 3-3-2-2

## 3.4 NTRIP and TCP/IP configuration

### 3.4.1 NTRIP Server

An **NTRIP server** is a broadcast Internet server that manages authentication and password control for differential correction sources such as VRS networks, and relays corrections from the source that you select. NTRIP is the acronym for Networked Transport of RTCM via Internet Protocol which is fully supported by the L300/L600 receiver as shown in Figure 3-4-1-1. The settings are as below:

1. Make sure you have a cellular connection as described in the previous section.

2. Select the corresponding NTRIP version and fill the **NTRIP Sever** details in the corresponding box. The user name and password can be any letters, and the mount point name needs to be set in 'Access point' field.

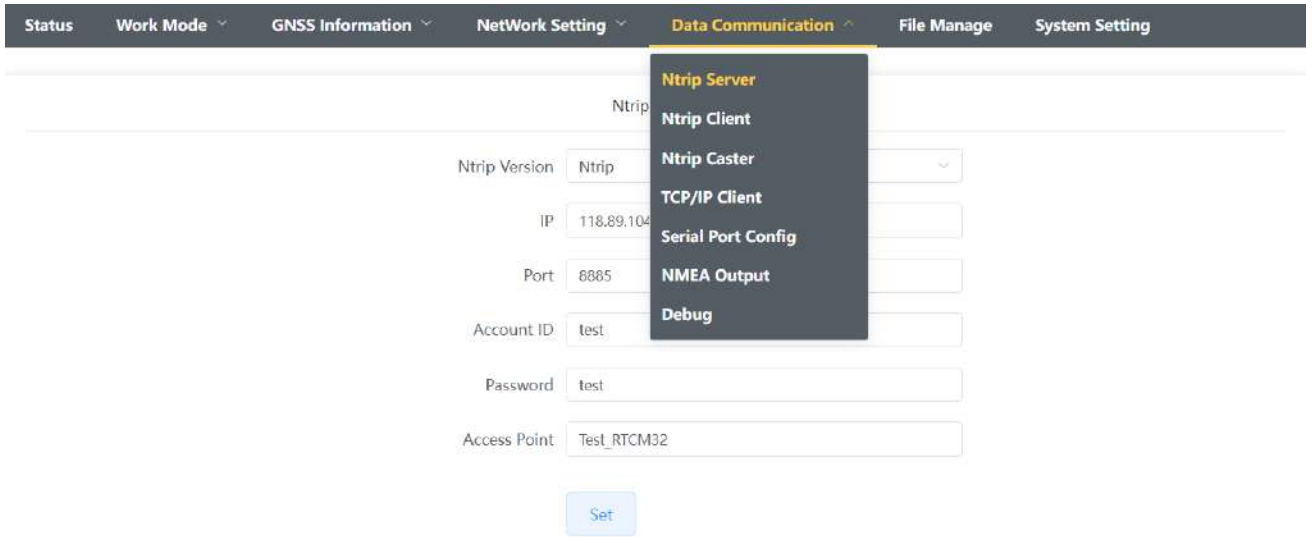


Figure 3-4-1-1: NTRIP Server

### 3.4.2 NTRIP Client

An NTRIP Client is the software element used by the rover (the GNSS devices out in the field) used to connect to an NTRIP Caster such as SurPro6.0 to gain access to the data stream with the positional corrections it needs. There are also two methods to get the correction data, one is via internal network of receiver and the other is via data collector internet. But there is only internal network available when configuring it in WEB UI. You can find the related settings in 'Data Communication' field NTRIP Client as shown in Figure 3-4-2-2.

1. Make sure you have a cellular connection as described in the previous section.
2. Input the CORS details in the corresponding box. The user name and password must be correct, and the mount point list can be updated in 'Access point' field.

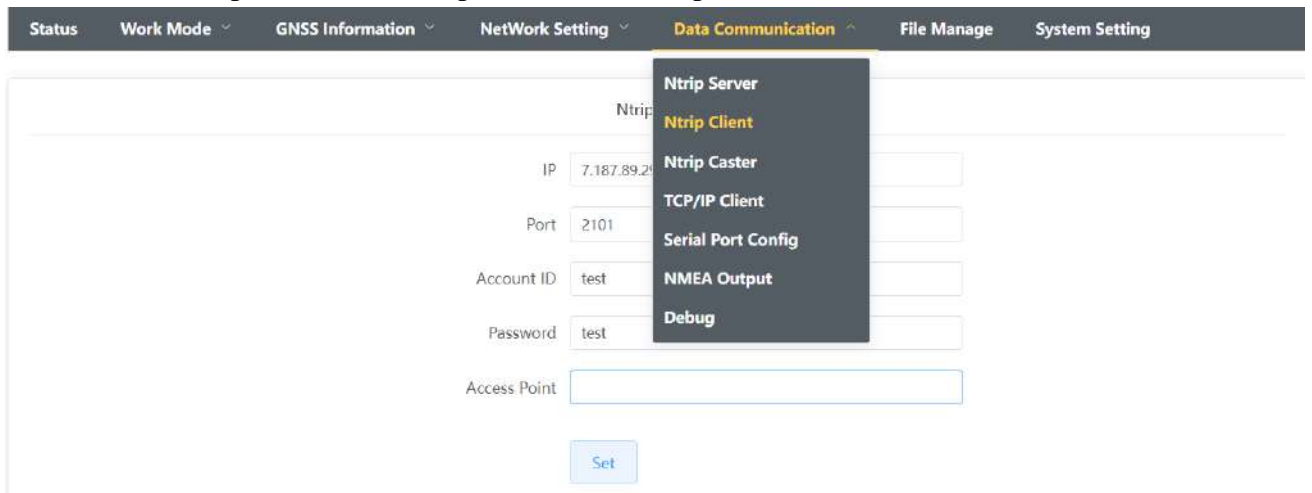
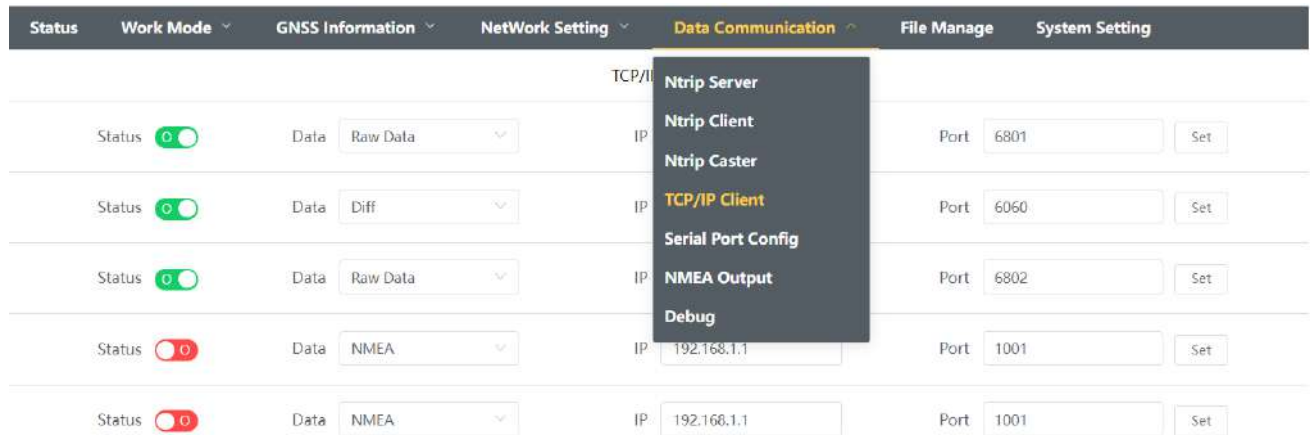


Figure 3-4-2-2: NTRIP Client

### 3.4.3 TCP/IP

The L300/L600 can be set as a reference station to broadcast the raw data/differential data to the specified server. There are 5 channels supported which allows to send data to 5 servers at the same with different data format as shown in below Figure 3-4-3-3. When the server is connected to L300/L600, the 'Status' button will become green and that means it is connected successfully.



### 3.4.4 Data Stream

#### 3.4.4.1 Serial Port Configuration

Select the Serial Port Config in 'Data Communication' field, here allows to set the serial port outputs and Bluetooth outputs. There are two format options of data to output as shown in Figure 3-4-4-1-1. And there are several baudrate in the list, which allows users to select the required one according to the project. When the connection is done successfully, the box will be checked and connection status will be shown as 'connected'.

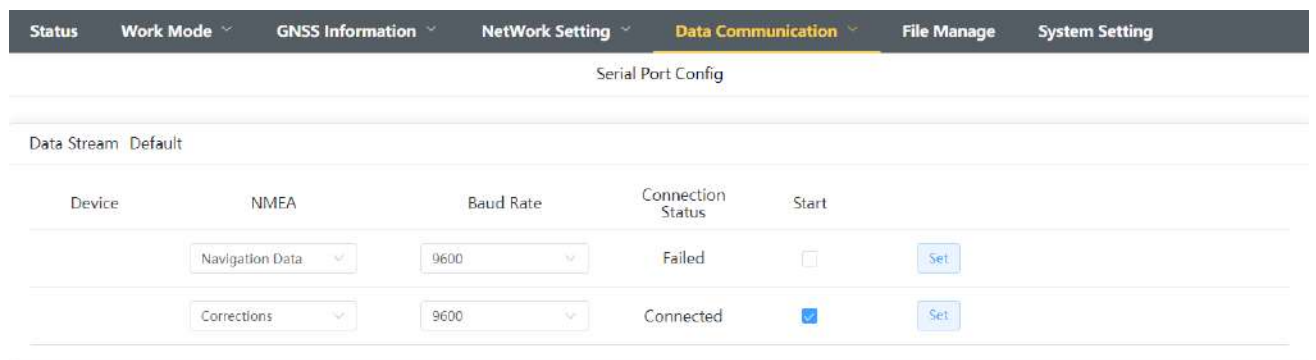


Figure 3-4-4-1-1

#### 3.4.4.2 Debug

This window provides a debug function which you can send the commands to check the receiver's working status. And the NMEA data stream can be shown here as the Figure 3-4-4-2-1.

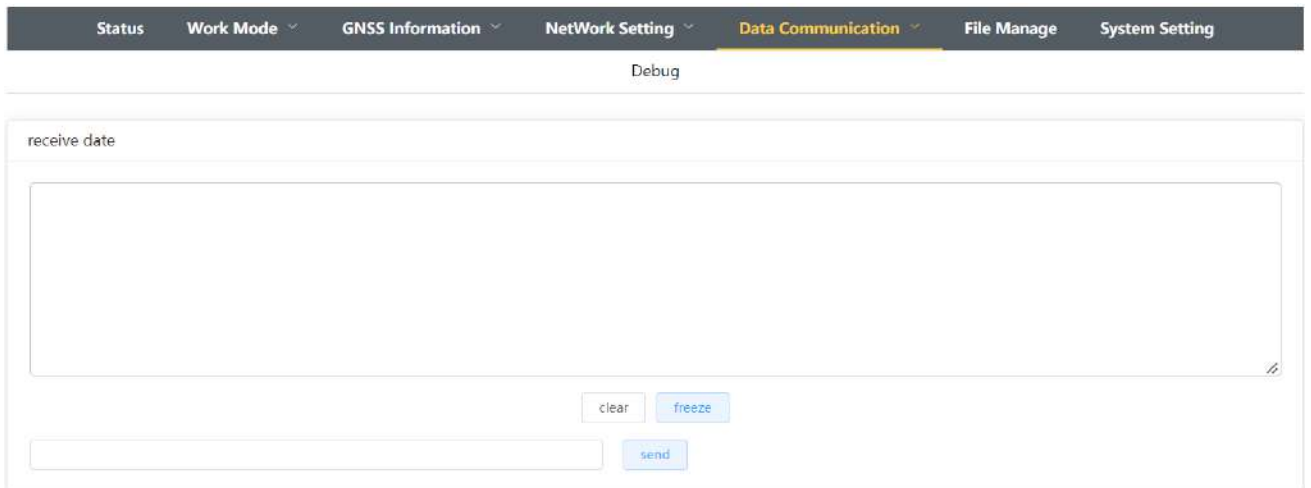
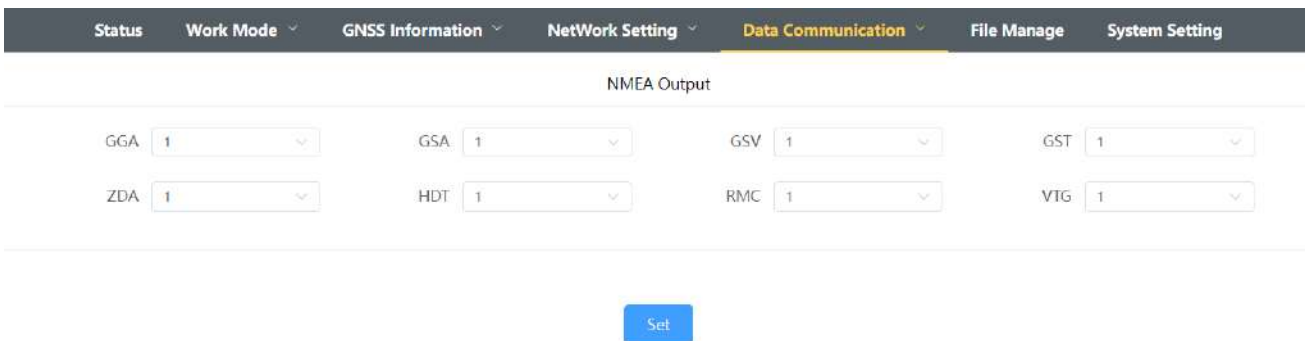


Figure 3-4-4-2-1

### 3.4.4.3 NMEA settings

In WEB UI, it provides a windows to set the NMEA output rate as shown in Figure 3-4-4-3-1. There are several frequencies of output to set, and the receiver will take action immediately once the setting s are applied.



### 3.4.4.4 File Manage

L300/L600 provides two methods to download the static data, via USB or WEB UI.

#### USB

Connect receiver to computer, and there are two disks will be prompt, the 'update' and 'static'. Enter into the 'static' disk to download the data.

#### WEB UI

When the static data is stored, the data list will be shown in this page as Figure 3-4-4-4-1. Users can download the data by clicking it.

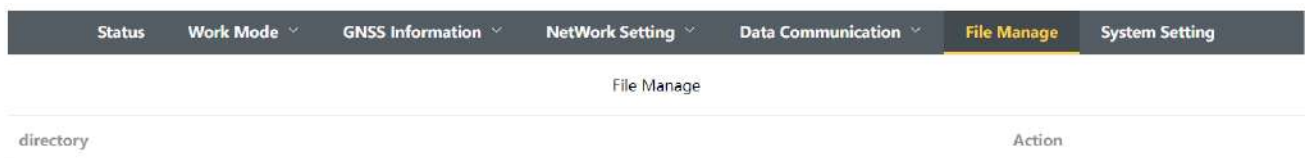


Figure 3-4-4-4-1

### 3.4.4.5 System Setting

L300/L600 provides some system settings, such as factory reset, restart, OEM reset, update and register as shown in Figure 3-4-4-5-1. If there is system error, the factory reset may fix the problem.

For registration, we provide two different ways, to register in WEB UI or in field software. You can c

choose the most convenient way to register the code.

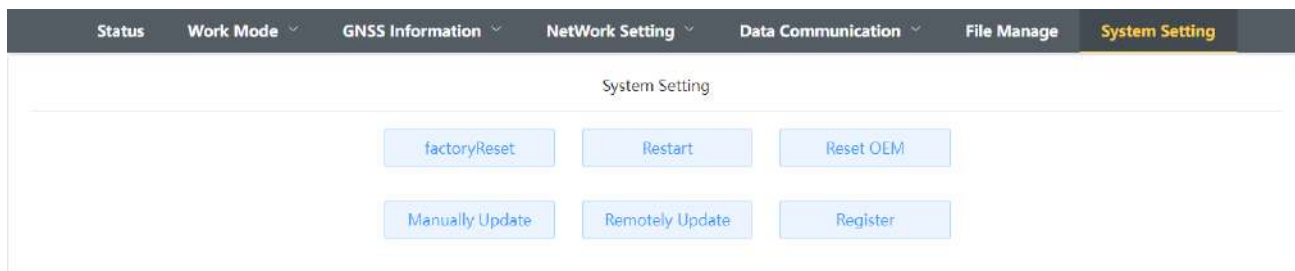


Figure 3-4-4-5-1

There are two methods as well to do **firmware upgrading**. One is to update from WEB UI as above figure shows. The other one is to update via USB cable. Connect receiver to computer, and there are two disks will be prompt, the 'update' and 'static'. Copy the firmware to the 'update' disk and restart the receiver, then the receiver will enter into update mode automatically. It takes some minutes to complete the procedure, and it will auto restart once it is done.

## Chapter IV Warranty and Safety Notices

### 4.1 Warranty and Limited Liability

- a. The warranty period of our products is 12 months from purchase. If a defective is found due to qualified problems of the products, we perform two commitments: repair and replace.
- b. During the warranty period, if the instrument is damaged due to human factors, it will not be covered by the warranty.
- c. In the event that claims are made against the customer due to product liability, the supplier is obliged to indemnify the customer from such claims if and to the extent that the damage was caused by a defect in the contractual item delivered by the supplier. In cases of fault-based liability, however, this only applies if the supplier is at fault. If the cause of the damage is the responsibility of the supplier, the supplier bears the burden of proof.

### 4.2 Safety Notices

- a. Compliance is required with respect to voltage, frequency, and current requirements indicated on the manufacturer's label. Connection to a different power source than those specified may result in improper operation, damage to the equipment or pose a fire hazard if the limitations are not followed.
- b. Do not leave your device for charging more than one week. Doing so runs the risk of overcharging the battery and shortening its total life span.

#### CE Marking

CE marking on this product represents the product is in compliance with all directives that are applicable to it.

#### RoHS Compliance Statement

European Directive 2002/96/EC requires that the equipment bearing this symbol on the product and/or its packaging must not be disposed of with unsorted municipal waste. The symbol indicates that this product should be disposed of separately from regular household waste streams. It is your responsibility to dispose of this and other electric and electronic equipment via designated collection facilities appointed by the government or local authorities. Correct disposal and recycling will help prevent potential negative consequences to the environment and human health. For more detailed information about the disposal of your old equipment, please contact your local authorities, waste disposal service, or the shop where you purchased the product.

### 4.3 Recycling

1. Do not place the product as household waste.

2. According to local regulations for proper disposal of discarded electronic products.
3. We actively encourage you to participate in electronics recycling program.