

L100 Pro User Manual



GUANGZHOU ALPHA GEO-INFO CO., LTD

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Chapter I L100 PRO 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.

L100 PRO is a high-end intelligent GNSS receiver launched by α -GEO, which is a compact new generation of smart LASER AR RTK designed for any surveying project using the latest GNSS technology. 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 120 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;

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: $\phi 160\text{mm} \times 53\text{mm}$ (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 15km
 - 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 $\leq 50\text{m}$
- ◆ 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

L100 PRO 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

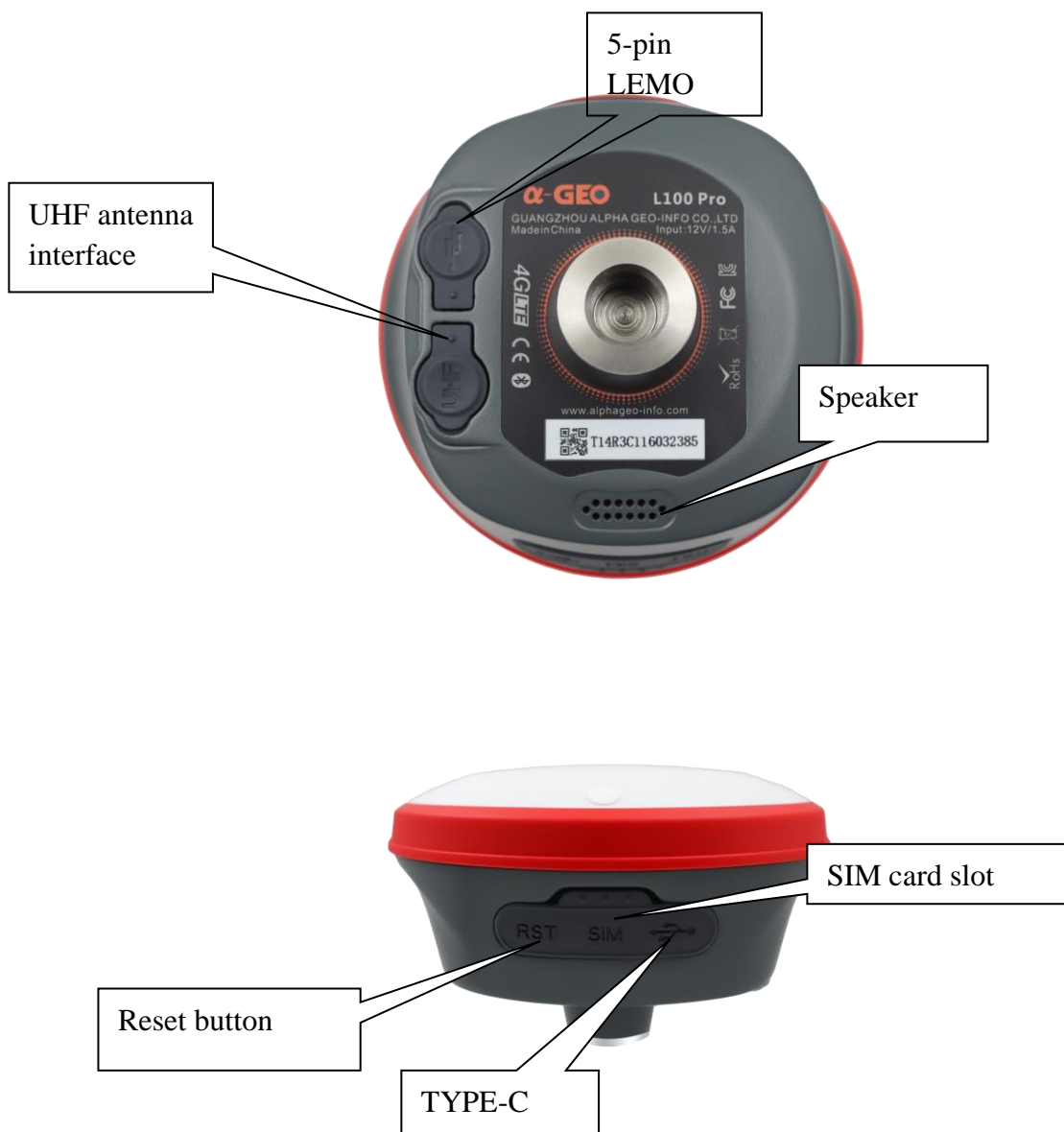


2.1.1 Indicators

Table.2-1 Descriptions

	Green	Satellites locked	
	Off	No tracking satellites	
	Base	Blink	Transmitting data
		Off	No transmitting
	Rover	Blink	Receiving data
		Off	No data received
	Green	Bluetooth connected	
	Off	Bluetooth disconnected	
	Plug in	Green	The receiver battery is fully charged
		Red	Receiver is charging
	No plug in	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.

Reset Button: For reset the device when some unexpected issue happens.

2.2 Configuration Brief

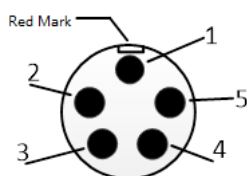
2.2.1 Carry Case

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 receiver).

(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

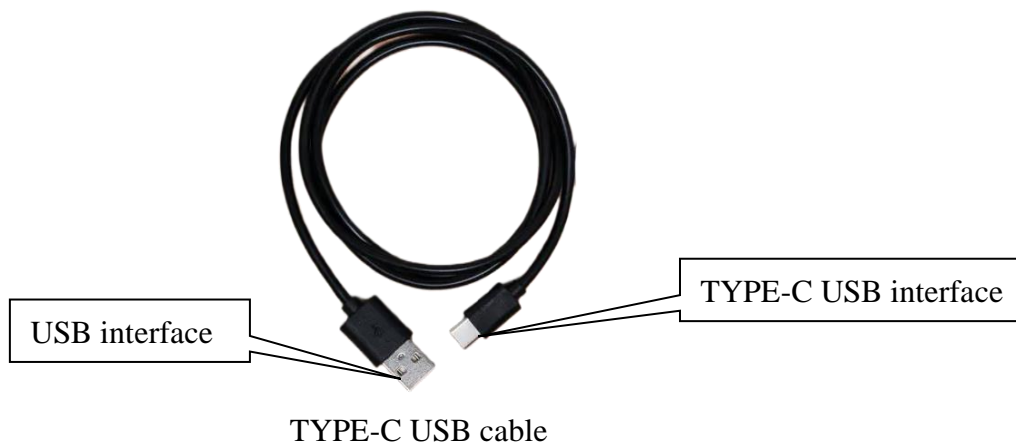
5-Pin LEMO	
1	Power(12V)
2	Signal (Ground)
3	RXD
4	TXD
5	Power (Ground)

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

Chapter III WEB UI Introduction

3.1 Connecting to the WEB UI

L100 PRO can be fully configured and monitored by using the WEB UI. Any Wi-Fi device can connect to L100 PRO via the WEB UI. The steps how to connect to Wi-Fi is as below.

1. Wait till L100 PRO has fully booted after switching on (about **10 seconds**).
2. The wireless access point name will be shown up which is same as the serial number as shown in Figure 3-1. The password is **12345678**.
3. Open a browser and type the IP **192.168.10.1** in the address bar, type ID: **admin** Password: **admin** to log in. The browser will open the ‘Overview’ page of the Web Interface shown in Figure 3-2.

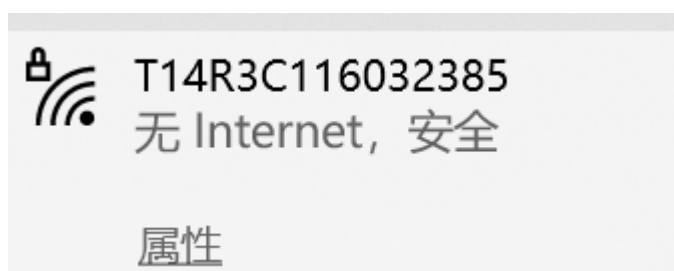


Figure 3-1: Access point name

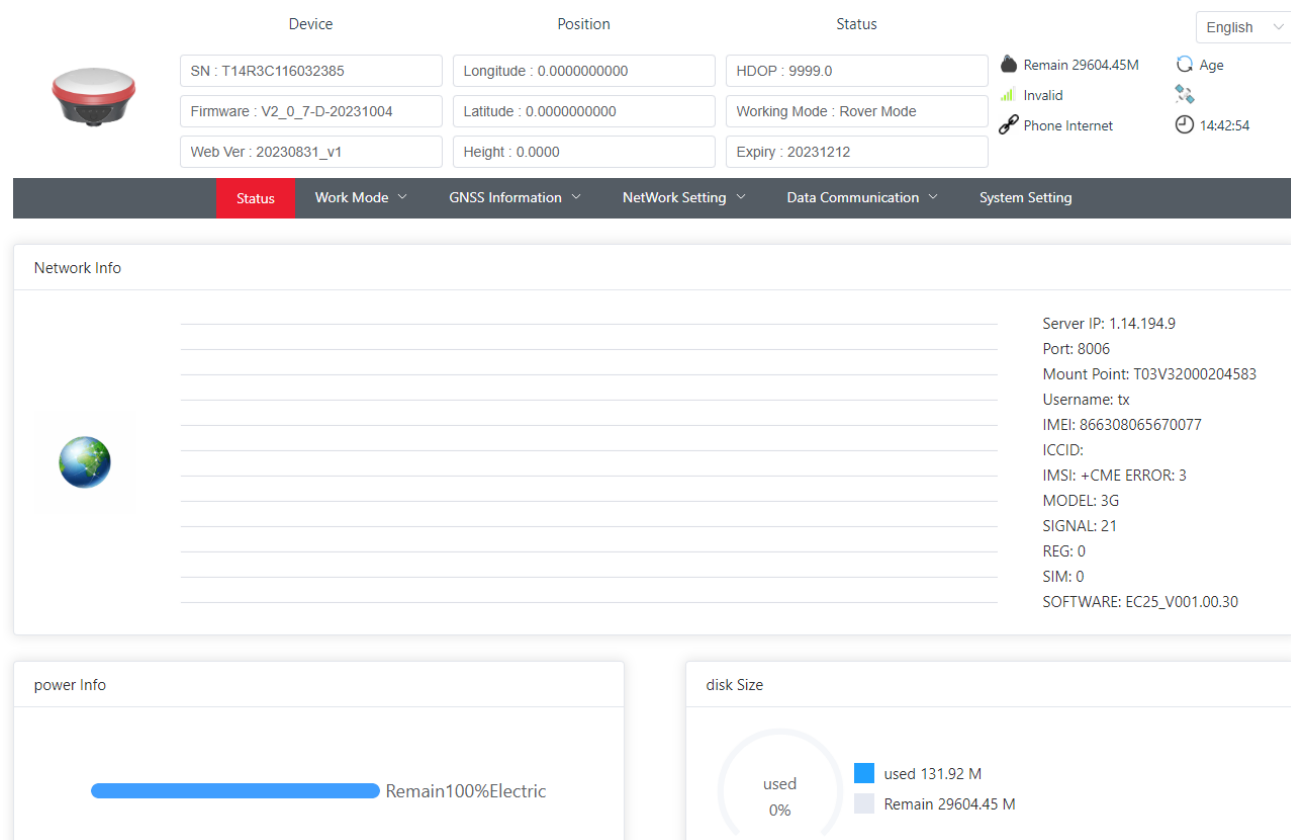


Figure 3-2: Web UI overview

3.2 Configuring the device as a Base

The L100 PRO 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.

The screenshot shows the L100 Pro web interface. At the top, there are sections for Device (SN: T14R3C116032385, Firmware: V2_0_7-D-20231004, Web Ver: 20230831_v1), Position (Longitude: 0.0000000000, Latitude: 0.0000000000, Height: 0.0000), and Status (HDOP: 9999.0, Working Mode: Rover Mode, Expiry: 20231212). A 'Work Mode' dropdown menu is open, showing 'Base' as the selected option. Other options include 'Rover' and 'Static'. The 'Base' mode is highlighted in red. Below the dropdown, there is a 'Record Raw Data' field set to 'Disable'.

Figure 3-2-1

3.2.1 Transmitting via Internal UHF

1. Insert the UHF antenna to the L100 PRO 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.

The screenshot shows the 'Base' configuration settings in the L100 Pro web interface. The settings include: 'Record Raw Data' set to 'Disable', 'StartUp Mode' set to 'Single Point Auto Start', 'Message Format' set to 'RTCM32', 'Mask Angle' set to '10', 'Transmitting Interval' set to '1', and 'PDOP Limit' set to '3.0000'. A 'Set Base' button is located at the bottom of the configuration section.

Figure 3-2-1-1

The screenshot shows the 'DataLink Set' configuration settings in the L100 Pro web interface. The settings include: 'DataLink Set' set to 'Internal Radio', 'Radio Protocol' set to 'TRIMTALK', 'Radio Baudrate' set to '9600', 'Radio Channel' set to 'Channel2', and 'Radio Frequency' set to 'Channel1' with a value of '450.125'. There are also fields for 'Channel2' (451.125) and 'Channel3' (452.125). An 'Expand All Channels' link is visible. A 'Set' button is located at the bottom of the configuration section.

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 **Mobile Config** 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.

Mobile Config

Parameter Setting

APN Name

CMNET

APN User

APN Password

Figure 3-2-2-1

DataLink Set Built-in Network ▼

Tip : Please go to <Ntrip Caster> and <Ntrip Server> under menu <Data Communication> to set data link

Ntrip Server

Status

Enable ▼

Server IP

1.14.194.9

Port

8006

Username

alphageo

Password

1234

Mount Point

test

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. L100 PRO 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.

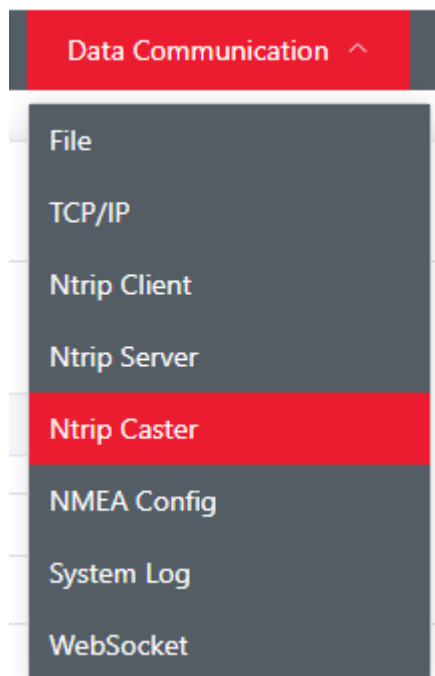


Figure 3-2-3-1

 A screenshot of the "Ntrip Caster" configuration screen in a mobile application. The title "Ntrip Caster" is at the top. Below it, there are three input fields: "Status" with a dropdown menu showing "Enable", "Port" with a text box containing "8000", and "Mount Point" with a text box containing "T10R2A116000000". At the bottom right, there is a blue button labeled "Set".

Figure 3-2-3-2

Rover Configuration

1. Connect data collector or Drone's controller to L100 PRO'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.

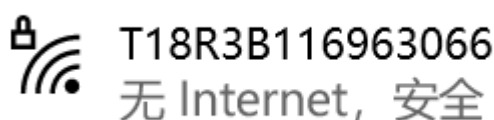


Figure 3-2-3-3

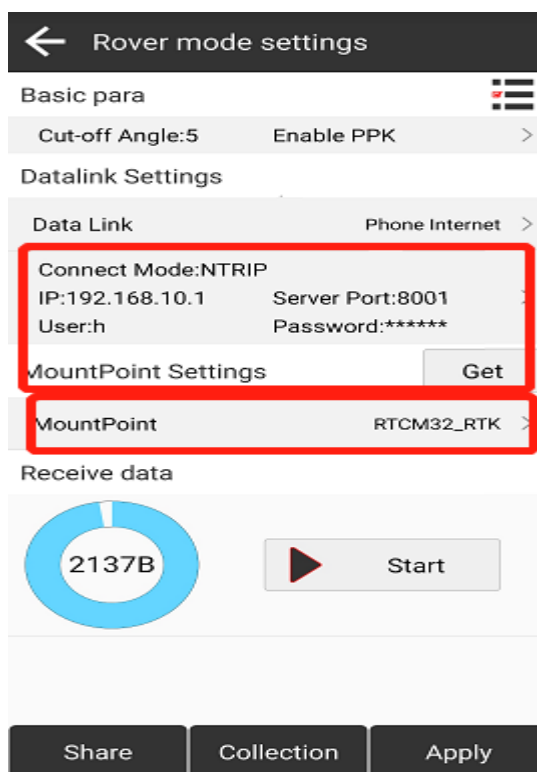


Figure 3-2-3-4

3.3 Configuring the device as a Rover

3.3.1 Standard Rover settings

For the L100 PRO 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 L100 PRO.

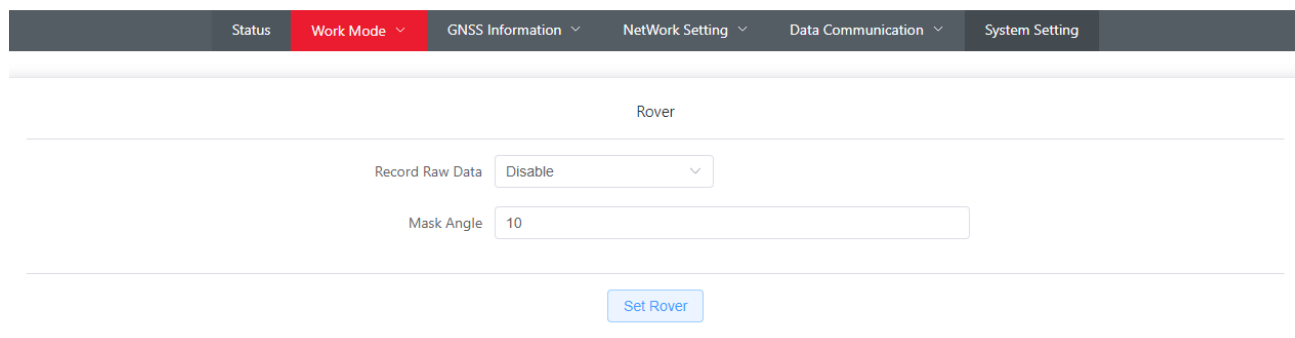


Figure 3-3-1-1

Note: When the 'record raw data' 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
Internal Radio

Radio Protocol
TRIMTALK

Radio Baudrate
9600

Radio Channel
Channel2

Radio Frequency
Channel1
450.125
Channel2
451.125
Channel3
452.125
.....

Expand All Channels

Set

Figure 3-3-2-1

Built-in Network

When built-in network is selected, a NANO SIM card must be inserted to the L100 PRO 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

Status
Enable

Ntrip Mode
Ntrip

IP
1.14.194.9

Port
8006

Username
alphageo

Password
1234

Mount Point
T03V32000204583
Get

APN Name
CMNET

APN Username

APN Password

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 L100 PRO 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 Server** 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.

The screenshot shows the 'Ntrip Server' configuration page. The top navigation bar includes 'Status', 'Work Mode', 'GNSS Information', 'NetWork Setting', 'Data Communication' (active), and 'System Setting'. The main content area is titled 'Ntrip Server' and contains the following fields:

- Status: Enable (dropdown)
- Server IP: 1.14.194.9
- Port: 8006
- Username: alphageo
- Password: 1234
- Mount Point: T03V32000204583

A 'Set' button is located at the bottom center. On the right side, there is a sidebar menu with the following items: File, TCP/IP, Ntrip Client, Ntrip Server (highlighted in red), Ntrip Caster, NMEA Config, System Log, and WebSocket.

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 L100 PRO 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 L100 PRO, the 'Status' button will become green and that means it is connected successfully.

Status	Data	Server IP	Server Port	Set
on	Raw Data	123.25.3.279	2101	Set
on	Diff Data	123.25.3.279	6010	Set
off	Select			Set
off	Select			Set
off	Bidirectional			Set

3.4.4 Data Stream

3.4.4.1 NMEA output

Select the NMEA Config in 'Data Communication' field, here allows to define the NMEA message outputs as shown in Figure 3-4-4-1-1.

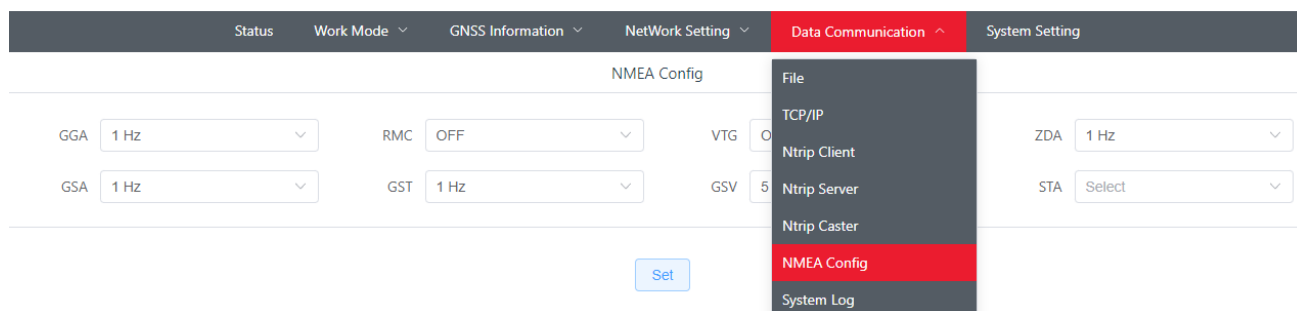


Figure 3-4-4-1-1

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.

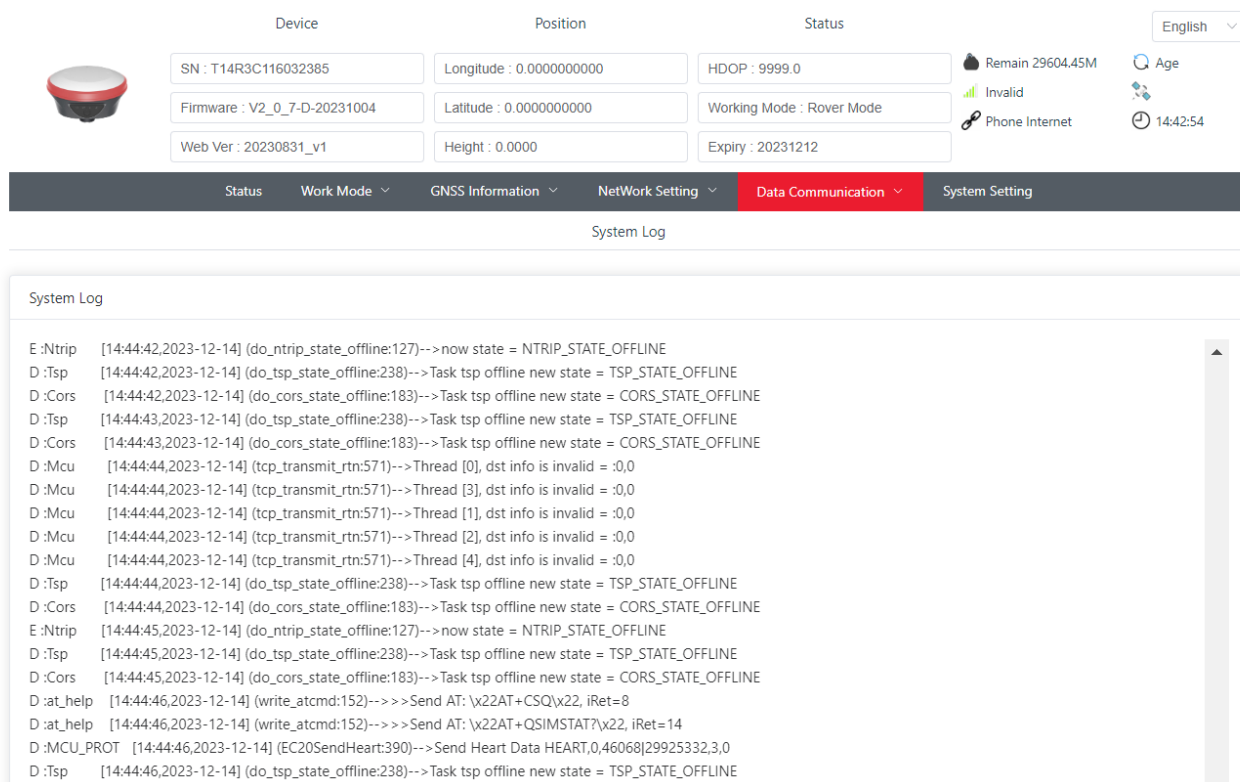


Figure 3-4-4-2-1

3.4.4.3 File Manage

L100 PRO allows to download the static data via WEB UI which is very convenient to share the data in the field.

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.

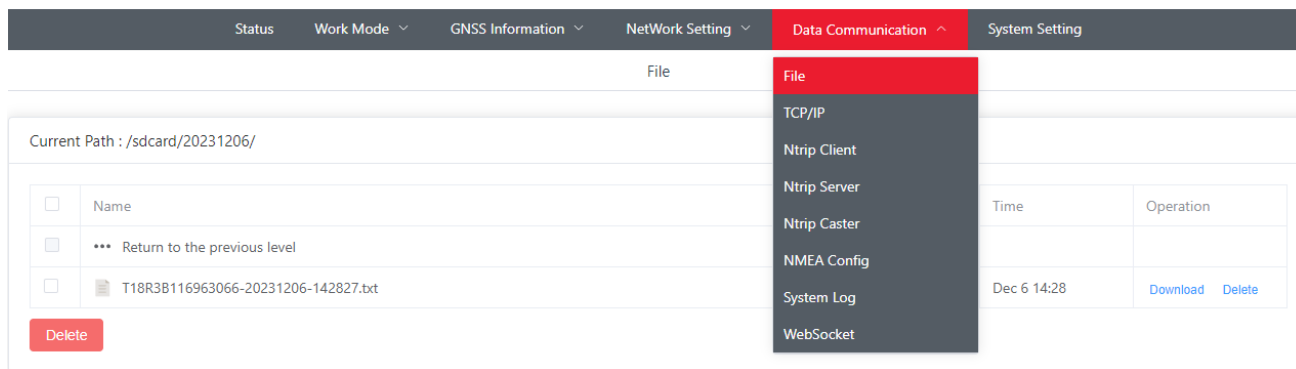


Figure 3-4-4-1

3.4.4.4 System Setting

L100 PRO 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 choose the most convenient way to register the code.

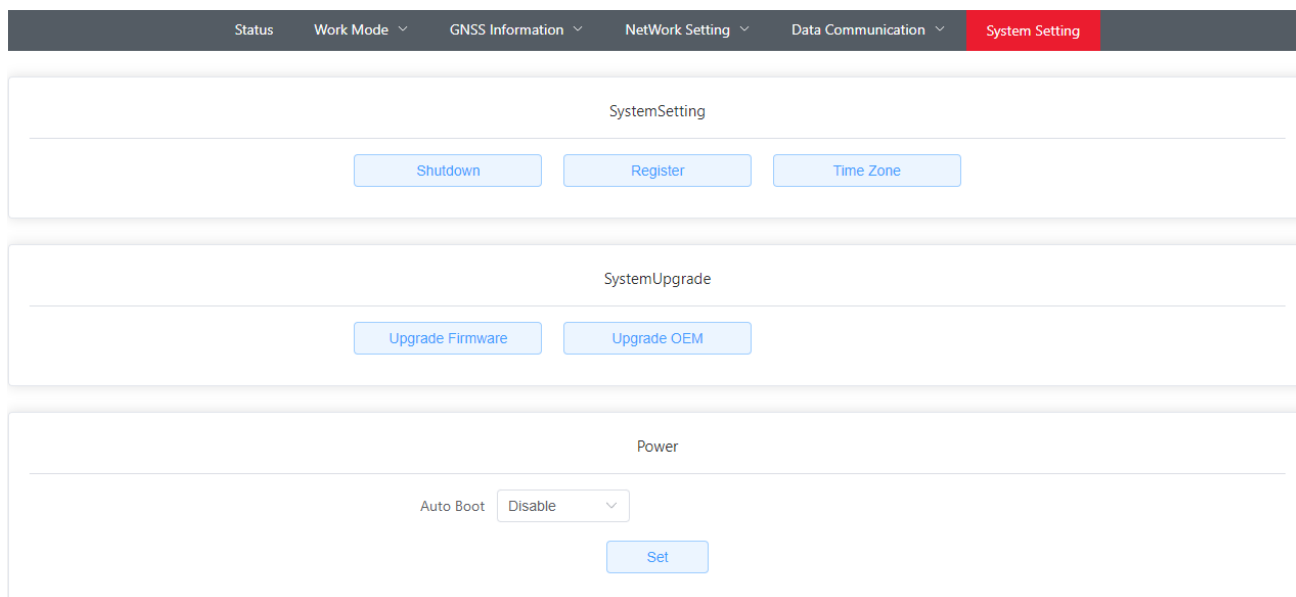


Figure 3-4-4-5-1

Firmware upgrading can be completed on WEB UI as above figure shows. It takes some minutes to complete the procedure, and it will auto restart once it is done. As well as the OEM board upgrading, choose the 'Upgrade OEM' and it will take around 3minutes to complete. Once it is done, the receiver will automatically restart.

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.