APOGEE
Leading with Technology

ALGR-1
GNSS Receiver

User Guide

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Technical Assistance

If you have any question and can't find the answer in this manual, please contact your local dealer from which you purchased the ALGR-1 GNSS Receiver. Alternatively, request technical support from Apogee Precision LLP Website: http://www.apogeeprecision.com/

Safety Information

Before using the receiver, please make sure that you have read and understood this user Guide, as well as the safety requirements.

- Connect your devices strictly based on this User guide.
- Install the GNSS receiver in a location that minimizes vibration and moisture.
- Avoid falling to ground, or colliding with other items.
- Do not rotate 7-pin Lemo port.
- Do not cover the radio, keep a sound ventilation environment.
- To reduce radiation, please keep above 2 meters away from the radio station.
- Take lighting protection measures when installing antennas.
- Change the cable if damaged.

Related Regulations

The receiver contains integral Bluetooth® wireless technology and UHF. Regulations regarding the use of the data link vary greatly from country to country. In some countries, the unit can be used without obtaining an end-user license. But in some countries the administrative permissions are required. For license information, please consult your local dealer.

Use and Care

The receiver can withstand the rough treatment that typically occurs in the field. However, the receiver is high-precision electronic equipment and should be treated with reasonable care.

Warning and Caution

An absence of specific alerts does not mean that there are no safety risks involved. A Warning or Caution information is intended to minimize the risk of personal injury and/or damage to the equipment.

WARNING- A Warning alerts you to a potential risk of serious injury to your person and/or damage to the equipment, because of improper operations or wrong settings of the equipment.
CAUTION- A Caution alerts you to a possible risk of damage to the equipment and/or data loss.

Warranty Notice

Apogee Precision LLP does not warranty devices damage because of force majeure (lighting, high voltage or collision).
Apogee Precision LLP does not warranty the disassembled devices.

CONTENTS

1 Introduction

The ALGR-1 GNSS Receiver User Guide is aimed to help you get familiar with the ALGR-1 receiver and start your project effectively. We highly recommend you to read this manual before surveying.

1.1 About the Receiver

ALGR-1 GNSS Receiver can be applied in RTK mode with all GNSS constellations. ALGR-1 Receiver has ultra-small size and strong anti-interference ability to make it possible to work even in harsh environments. It is the ideal RTK/GNSS product for surveyors.

1.2 Receiver Features

The ALGR-1 GNSS Receiver key features:

- Ultra small and super light
  - Size (W × H): 140 mm × 99 mm
  - Weight: 850 g
- 184 channels of simultaneously tracked satellite signals
- Cable-free Bluetooth wireless technology
- Keypad with on/off buttons and LED indicators for power, radio, WiFi /GPRS, and satellite tracking
- IP67 waterproof and dustproof
- Full base/rover interoperability
- Integrated receiving & transmitting radio with 12.5KHz frequency interval
- Integrated 4G module, support Ntrip and Point to Point/Points protocols

1.3 ALGR-1 Receiver Parts List

This section provides overall **ALGR-1** receiver parts list, including basic supplies and customized kits based on your requirements.

1.3.1 Basic Supply kit

ALGR-1 GNSS Receiver Basic Supply kit contains two receivers and related accessories.

1. ALGR-1 GNSS Receiver	
2. RF Antenna	
3. APG-50 Data Collector	
4. Lemo to DB9 Cable	
5. Adapter	
6. Quick start guide	
7. Survey Pole	
8. Power Supply	

2 Setting up the receiver

This chapter provides general information on environmental requirements, setup, power supply and connection of the **ALGR-1** receiver.

2.1 Environmental requirements

To keep the receiver with a reliable performance, it is better to use the receiver in safe environmental conditions:

- Operating temperature :0 ℃ to + 50 ℃
- Storage temperature :-10 ℃ to + 60 ℃
- Humidity : 90%
- Waterproof and dustproof : IP67
- Shock : Designed to withstand upto 2 m drop

2.2 Front panel

Receiver front panel contains five indicator light emitting diodes (LEDs), Power button. The indicator LEDs show the status of power, Satellite Tracking, GPRS Status and Differential Data.

2.3 Lower housing

Receiver lower housing contains a serial port, UHF radio antenna connector, one removable battery compartments (the SIM card slot is located in compartment), and a threaded insert.

2.4 Power supply

ALGR-1 GNSS receiver supports internal battery and external power input.

2.4.1 Internal battery

The receiver is equipped with one rechargeable Lithium-ion battery, which can be removed for charging. The ALGR-1 receiver adopts the hot swap battery design that provides you an effective survey workflow. Receiver is powered by high capacity 6800 mAh Li-ion battery. Its operating time depends on that it is working as a rover or as a base station with internal UHF Tx (transmit at 1 W adjustable). And, this operating time also varies based on environmental conditions.

Battery Safety

Charge and use the battery only in strict accordance with the instructions below:

- Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
- Do not expose the battery to fire, high temperature, or direct sunlight.
- Do not immerse the battery in water.
- Do not use or store the battery inside a vehicle during hot weather.
- Do not drop or puncture the battery.
- Do not open the battery or short-circuit its contacts.

Charging the Lithium-ion Battery

Although a battery charger is provided, the lithium-ion battery is supplied partially charged. To charge the battery, first remove the battery from the receiver, and then place it in the battery charger, which is connected to AC power. Please obey the following instructions when charging your batteries:

- Charge the battery completely before using it for the first time.
- Fully charge takes approximately 6-8 hours at room temperature.
- If the battery has been stored for a long time, charge it before your field work.
- Re-charge the battery at least every three months if it is to be stored for long time.

Storage of the Lithium-ion Battery

- Do not keep batteries inside the receiver if the receiver not used for long time.
- Keep batteries in dry conditions.
- Take out the batteries from receiver for shipment.

Dispose of the Lithium-ion Battery

- Discharge a Lithium-ion battery before dispose of it.
- Dispose of batteries is an environmentally sensitive manner, and adhere to any local and national regulations concerning battery disposing or recycling.

WARNING – Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage.

2.4.2 External Power Supply

The receiver is connected to an external power supply through a lemo to RS232 cable, and make sure that the red alligator clip is connected to the positive of external power supply, black one to negative. Over-voltage function cannot protect your ALGR-1 receiver if reverse connection.

2.5 Pole-mounted setup

To mount the receiver on a range pole as the figure shown below:

- Thread the receiver onto the range pole
- Mount the controller bracket to the pole
- Install the controller into the bracket

3 General Operation

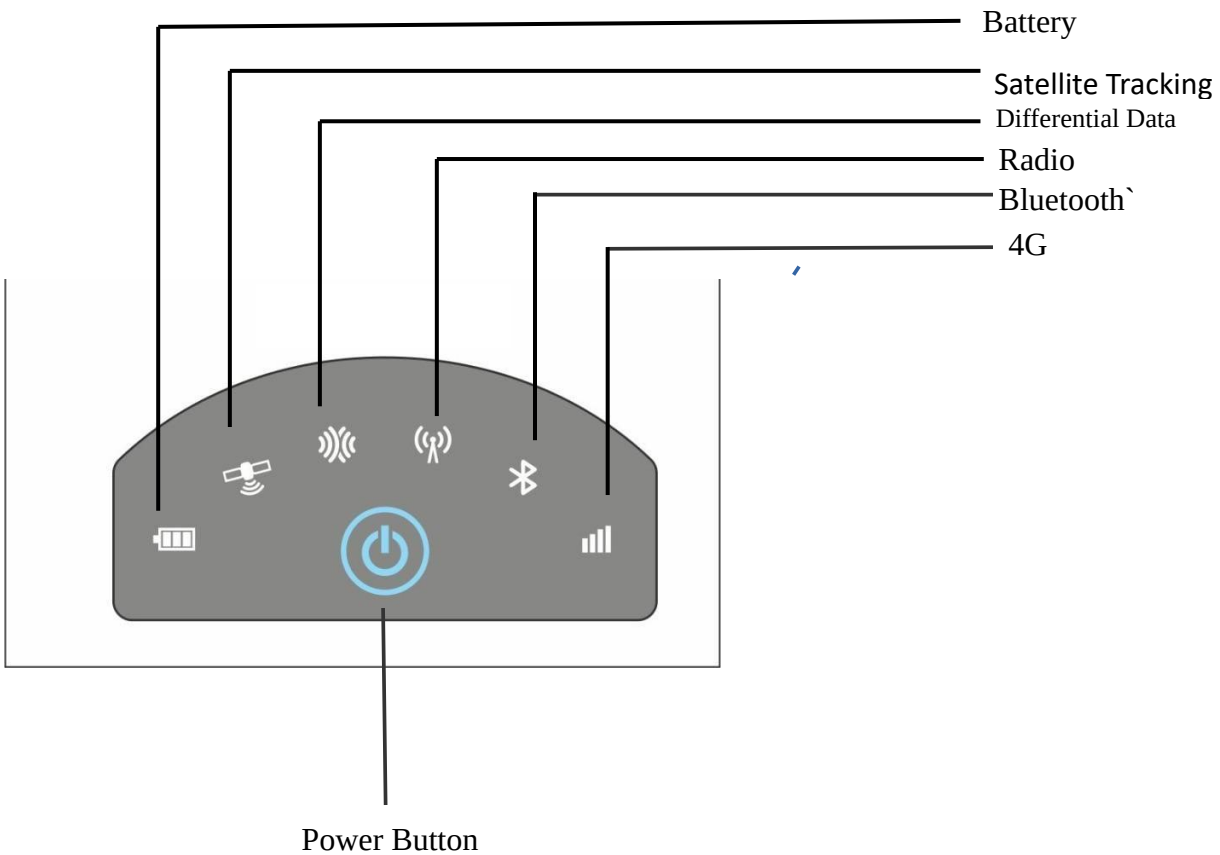
This chapter introduces all controls for the general operation, including button functions and all LED behaviours on the front panel.

3.1 Button functions

- **Power button:** Press the power button for about 1 second to turn on the receiver;
  To turn off the receiver, long press the button for 3 seconds until all LEDs off.

3.2 LED behaviour

The LEDs on the front panel indicate receiver working status. Generally, a lit or slowly flashing indicates normal operation, and an unlit LED indicates that no operation is occurring. The following figure defines each possible LED state:



4 Static Survey

Static GNSS surveys deliver the highest-accuracy positions available in a system, which occupies a point for longer periods of time than kinematic systems. Static systems include a range of survey styles from rapid static surveys to continuously operating stations, such as CORS sites. The equipment setup varies significantly, depending on how long the site will be operational, which could vary from 15 minutes to several years. For the practicality of this field module, instructional material will focus on surveys ranging from rapid static to semi permanent installations.
Static surveys rely on long occupation times to produce high-accuracy positions, and the details of their setup will vary to reflect the quality of measurements required. A static survey typically consists of a single receiver and antenna combination, which individually records satellite observations that are post-processed using a variety of techniques to receive a position. Static surveys require much more stable and precise mounts than kinematic surveys.

Equipment:

Various types and combinations of antennas, receivers, and controllers are available in the modern market and are constantly evolving. Generally, it is easiest to work with antennas and receivers from the same manufacturer, unless other compatibility is specifically mentioned, although the data is completely interchangeable once retrieved and processed. Because processing software and workflow is manufacturer dependent, instructions provided here are manufacturer independent.

- **Antennas :**

Antennas are the physical equipment that receive the carrier frequency and positioning code from the satellites and transmits it to the receiver for processing. Antennas may consist of just an antenna or include one or more signal-modifying or blocking apparatus, which are aimed at reducing or enhancing multi-path signals and atmospheric distortion.

- **Receivers :**

Receivers are the central processing units of the GNSS system. They connect the various other hardware including antennas, radios, and power. They receive signals from the antenna and compare the satellite and receiver time codes to calculate distance between them. This time differential is fed into a complex code for determining position based on at least 4 satellite signals. Positional data may be stored in various formats, most of which are proprietary for each manufacturer.

- **Power and Batteries :**

Receivers, antennas, and controllers use both internal and external batteries for power. Average running time for batteries depends on manufacturer design but typically last 4–10 hours for internal setups, with external setups limited only by ability to transport larger batteries to the site. Battery technology will depend on environmental conditions.

- **Data Collection :**

Data collected with geodetic GNSS receivers must be downloaded as soon after data collection as possible to free up receiver memory (if needed) and to back up the data. As a field precaution, a duplicate copy of the data should be made as soon as it is downloaded from the receiver.

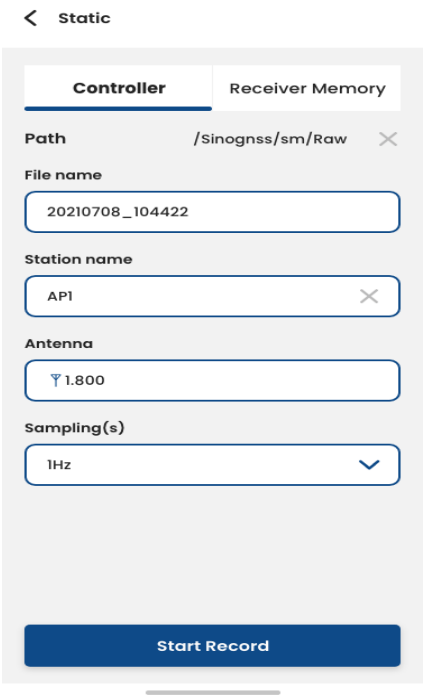
- **Data formats :**

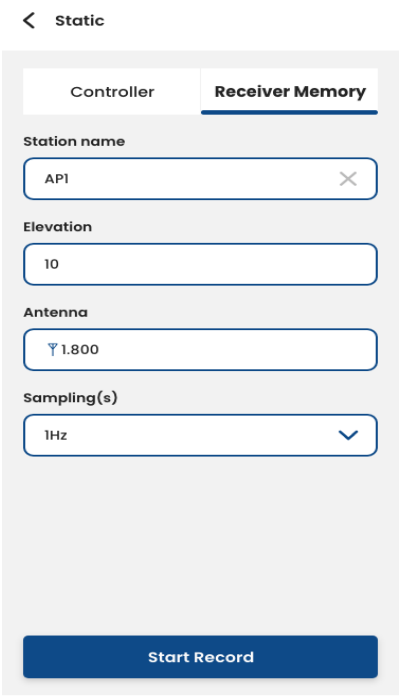
GNSS receivers generally collect and store the raw GNSS data in a proprietary format, which may need to be translated into a different format for data processing or data sharing. RINEX (Receiver Independent Exchange Format) is the ubiquitously accepted data format for raw GNSS data. Reference site data is generally provided in RINEX. RINEX is read by most processing software, almost any raw high-precision GNSS data can be converted to RINEX using many post processed software. While most raw data are stored as binary files, RINEX is in an ASCII format and can therefore be viewed in a text editor.

- **Data processing :**

GNSS data collected for high-precision applications must be post-processed to provide Millimetre - to meter-level precision. Typically, the post-processing involves differential processing relative to a fixed base location. For static surveys this is usually a CORS site in close proximity to the study area. Post-processing the data accomplishes several things. First, there are numerous error sources in GNSS positioning, the most significant of which are:

- Receiver and satellite clock errors,
- Delay of the GNSS signal through the Earth's atmosphere (most significantly, the ionosphere and the troposphere),
- Use of imprecise satellite orbits, and
- Multi-path (multiple signal arrivals resulting from the signal bouncing off nearby objects or the ground). Many of these errors can be greatly minimized or eliminated in post-processing by using data from at least two receivers with at least four satellites in common.





5 Real-Time Kinematic Survey (RTK)

This chapter introduces how to conduct RTK Survey with Geo Master app, including software installation, start a new project, receiver connection and RTK working modes (Radio and GPRS).

5.1 Installation of GEO Master

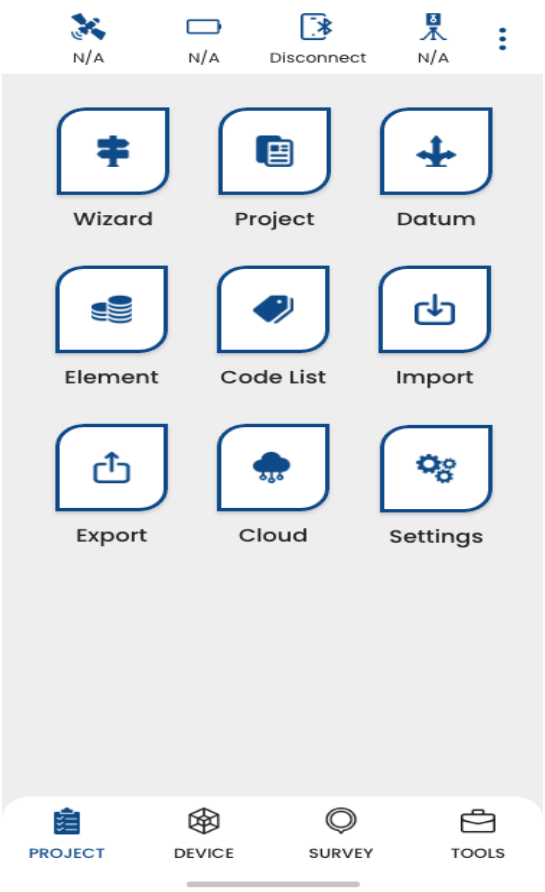
We can download the GEO Master app from the download center tab of the company section of the website apogeeprecision.com. In this tab, from the app heading you can download the latest version of the Geo Master app: link.....

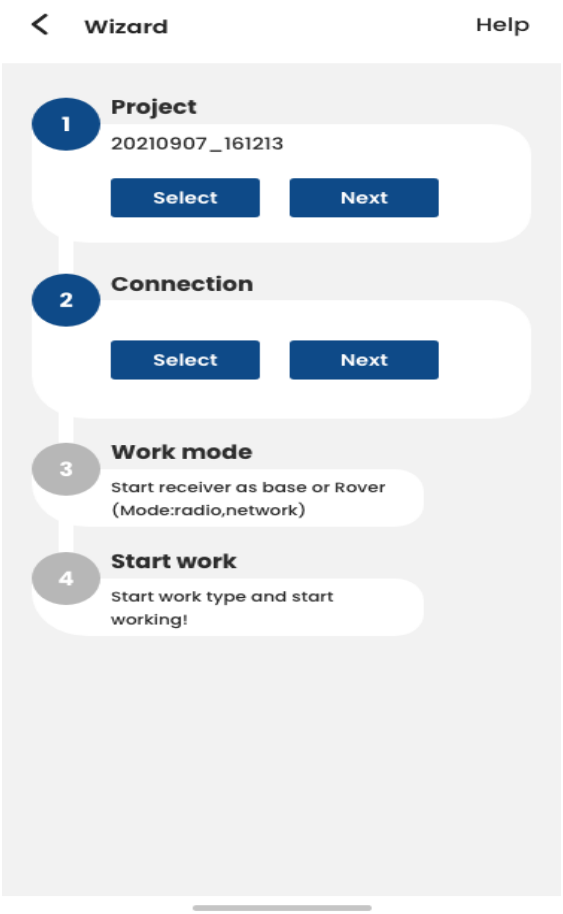
5.2 Wizard function in Geo Master

Follow the Wizard, you can quickly learn the general workflow of Geo Master, also you can quick start your survey by this function no matter you are experienced one or new user.

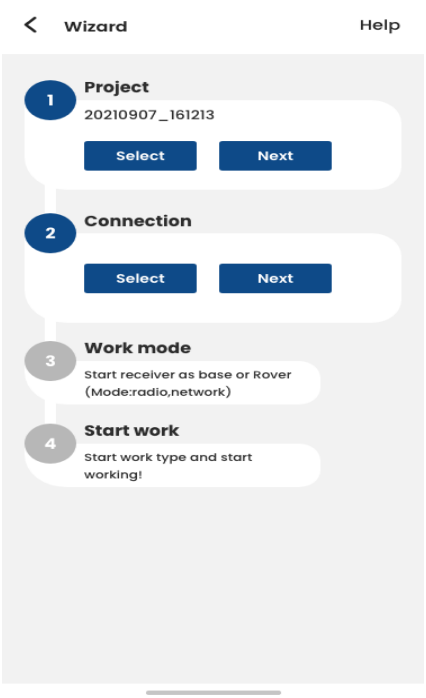
In Project menu, tap **Wizard.**

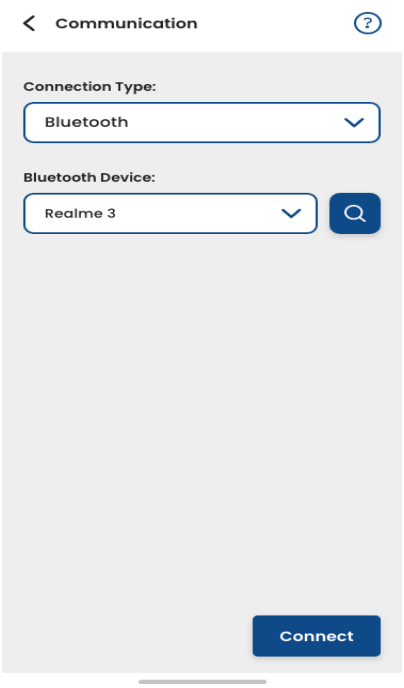
1. Project: Click **Select** to go into Project interface to create or select a project. For detailed information,

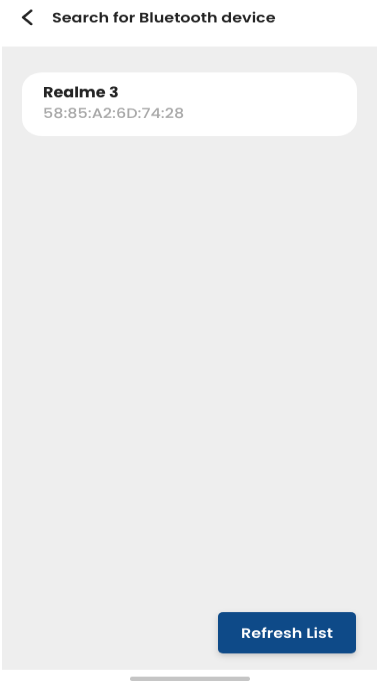




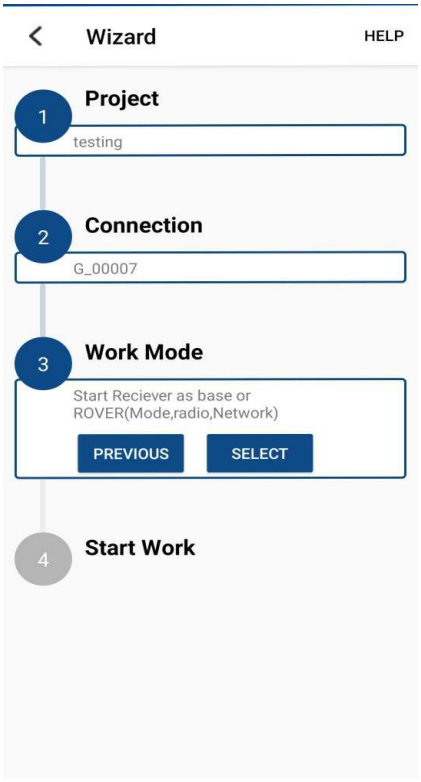
2. Connection: Click Select to go into Bluetooth connection interface.

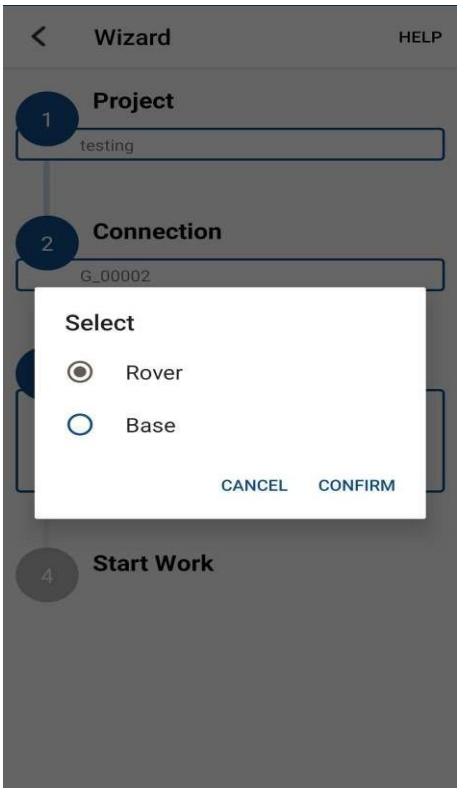


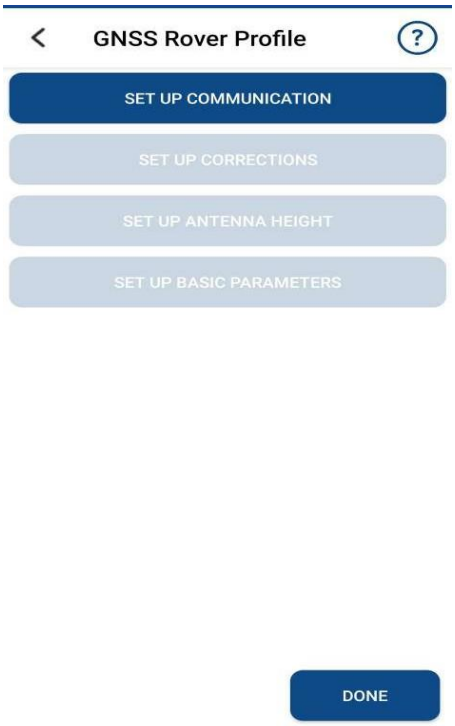




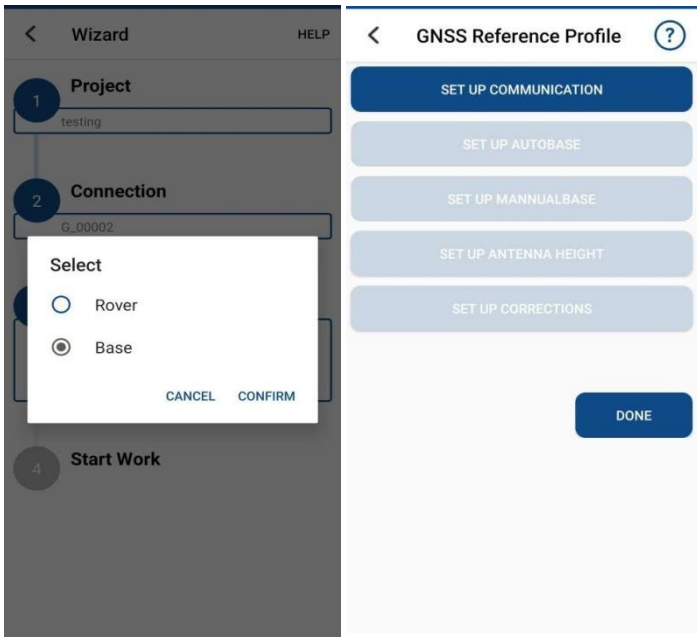
3. Work mode: Click select to go into Quick Setup interface to start your receiver as Base/Rover. If you start your receiver as Rover, then you can start work directly of Topo survey or stakeout.





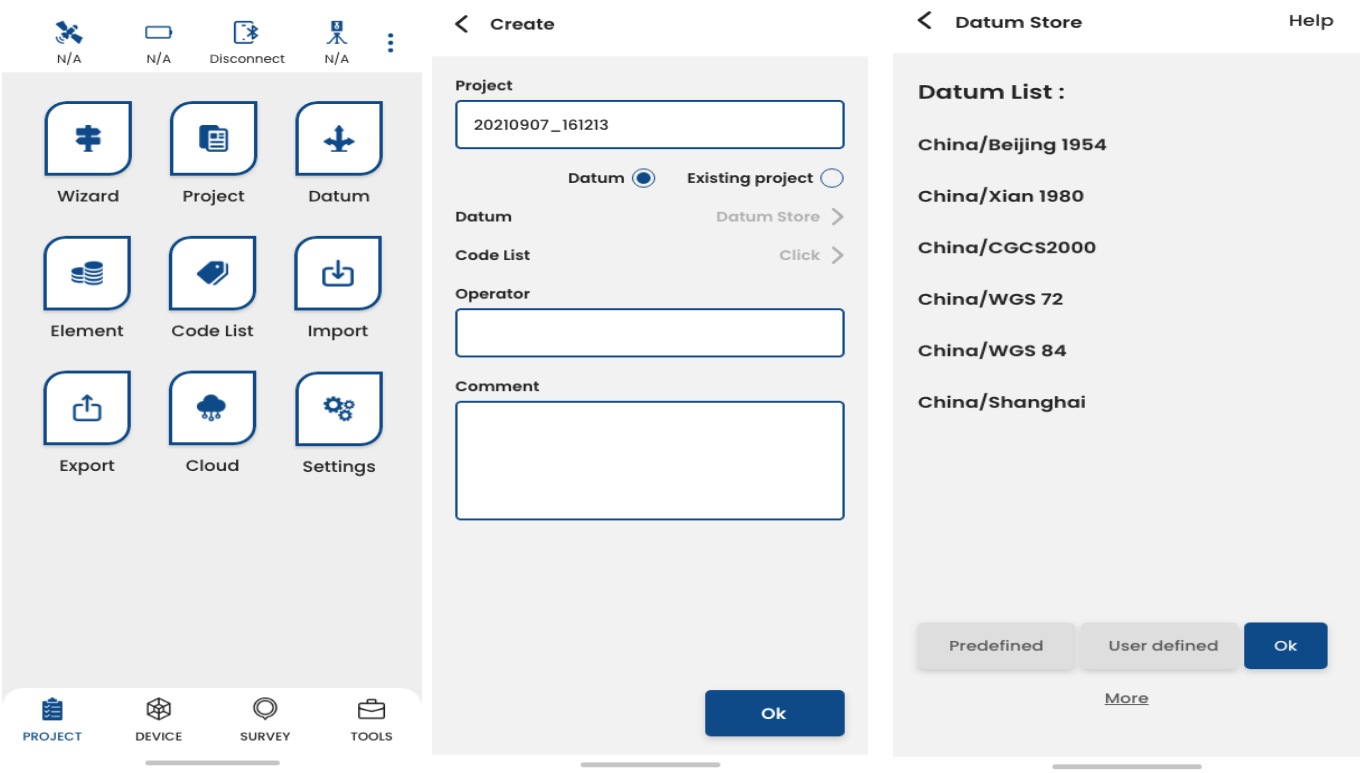


If you start your receiver as Base, after Disconnect with Base, there will be a Prompt.
YES: will guide you to start Rover in Wizard interface;
NO: will exit Wizard.



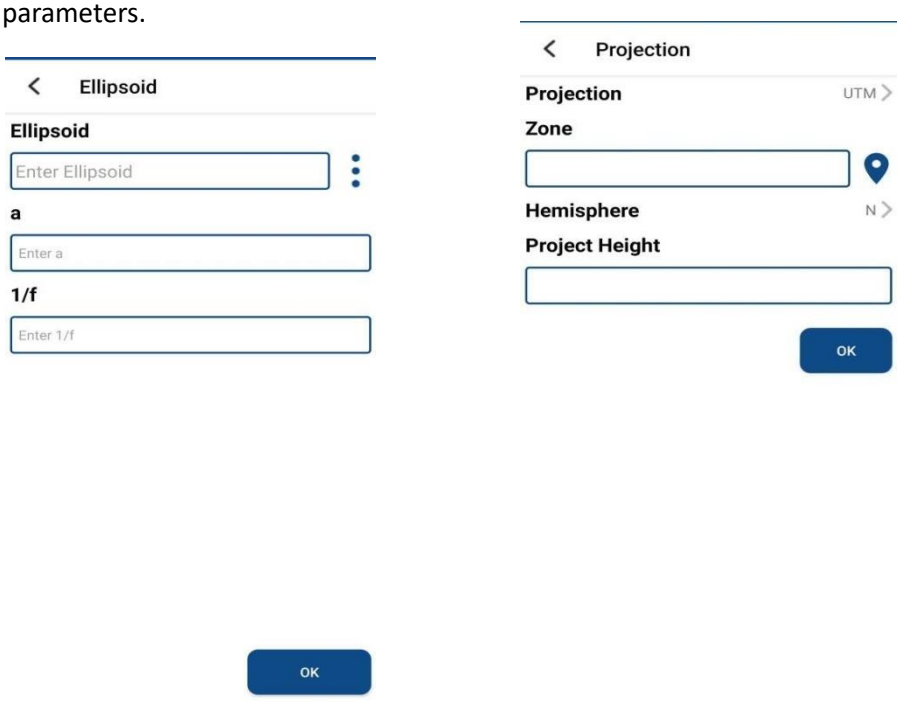
5.3 Start a New Project

Click **Project**, select **Predefined** or **User defined** coordinate system. Also you can use the same Datum with an existing project.

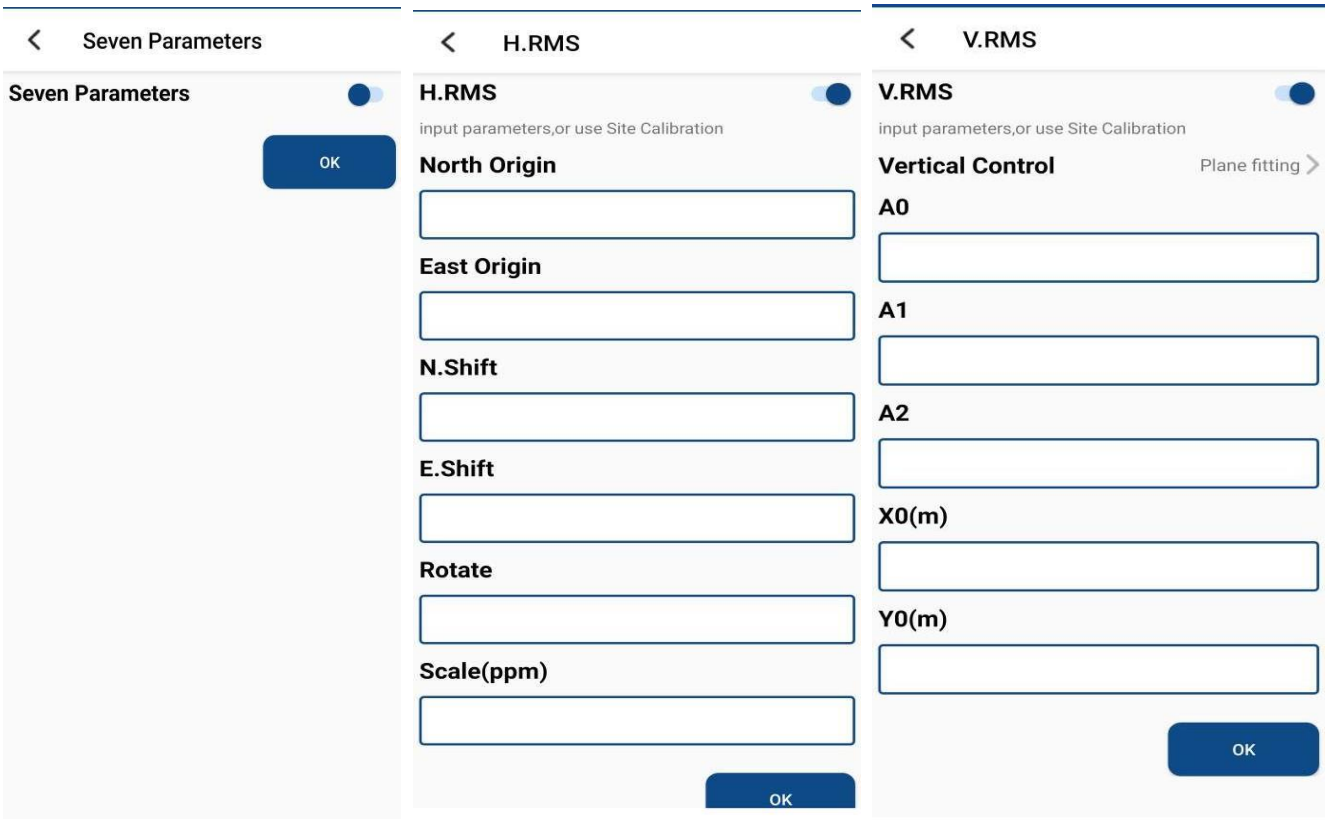


- **Predefined**: You can select the coordinate system directly. GEO Master has coordinate systems of all countries in the list.
- **User defined**: If you cannot find the coordinate system you want in predefined, follow instructions below to add a datum.

Enter Name—select an existing **Ellipsoid—**select a proper **Projection** and input the corresponding parameters.

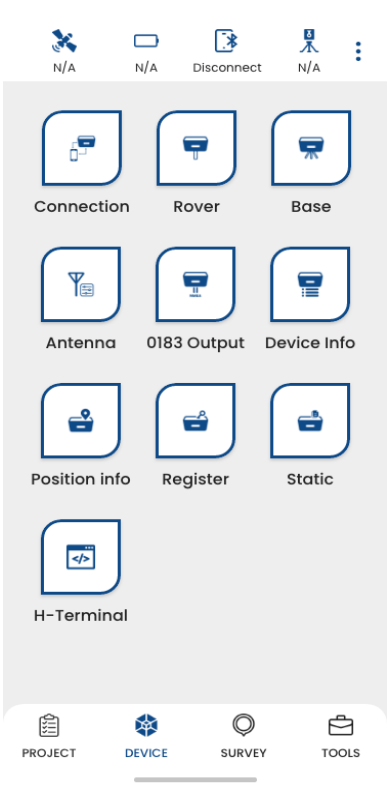


You can enter seven parameters, For H.RMS and V.RMS, it will be shown after Site Calibration.



5.4 Bluetooth Connection

To connect GEO Master with ALGR-1, switch to Device interface, tap Connection to go into Bluetooth connection interface.



5.5 Internal Radio Mode

ALGR-1 GNSS receiver supports transmit & receive the correction data in internal radio mode. To conduct the RTK survey in internal radio mode, it requires:

1) A controller with software installed
2) An extension bar
3) Two units of ALGR-1 GNSS receiver
4) Two whip antennas
5) A range pole with bracket
6) Tripod and tribrach

More: Aim to improve the radius of work field, we can change the base receiver's Whip Antenna to External Antenna. And others no need change.

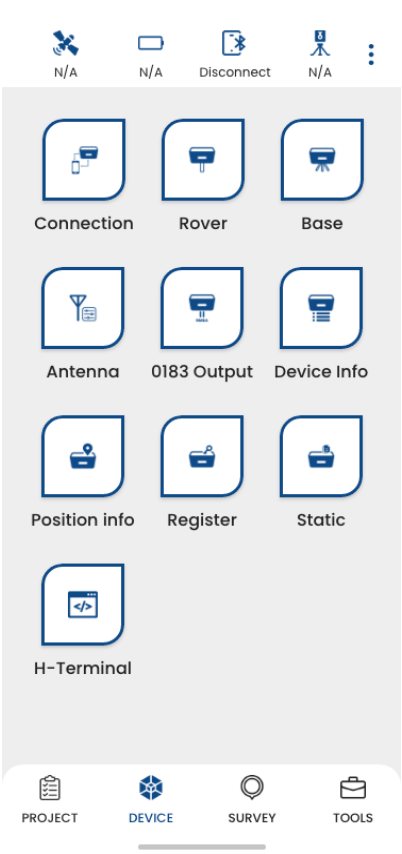
- ALGR-1 GNSS Receiver
- External Antenna

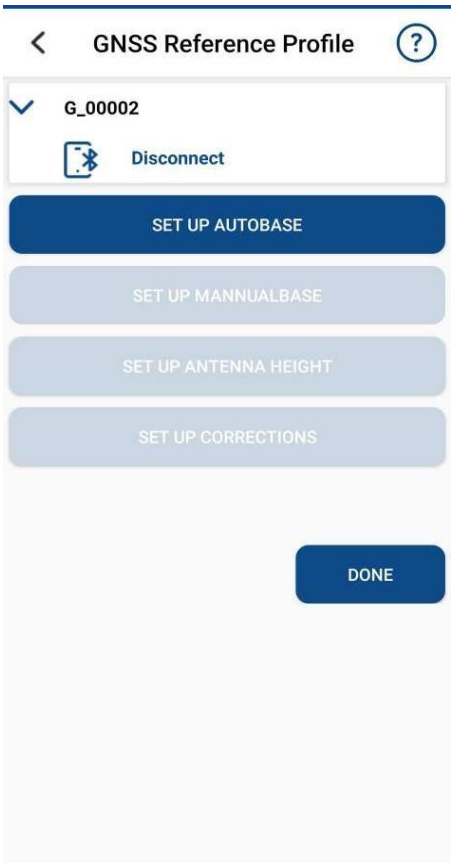
1. 

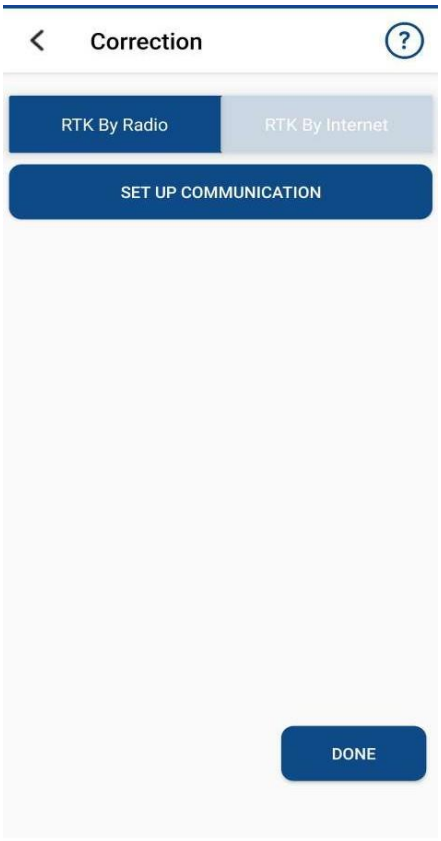
2. 

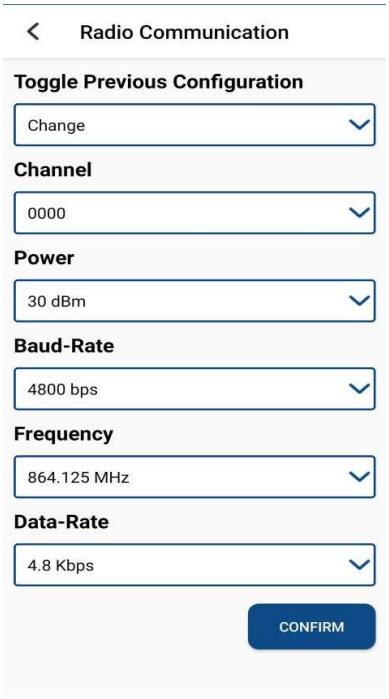
5.5.1 Start Base Station by GEO Master

Firstly, build Bluetooth connection between the ALGR-1 receiver and your controller. Secondly, modify parameters including correction format, antenna type and communication protocols:



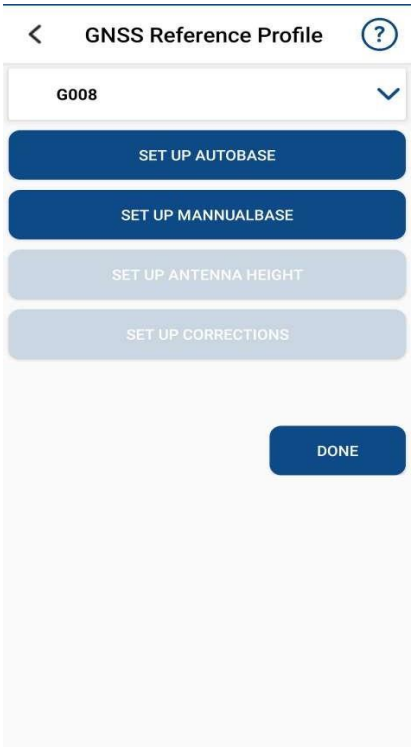


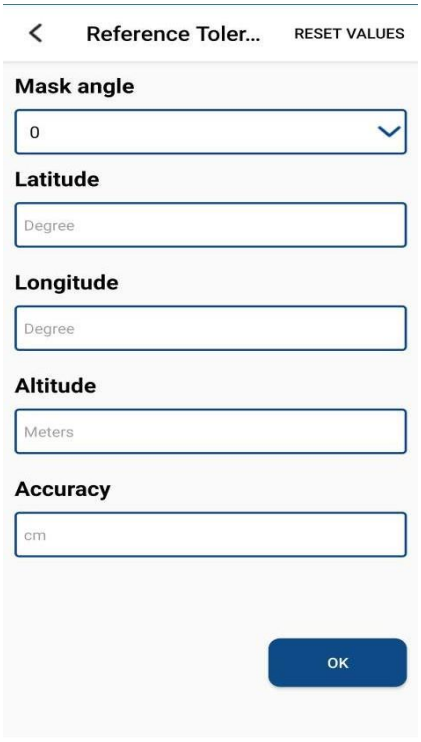


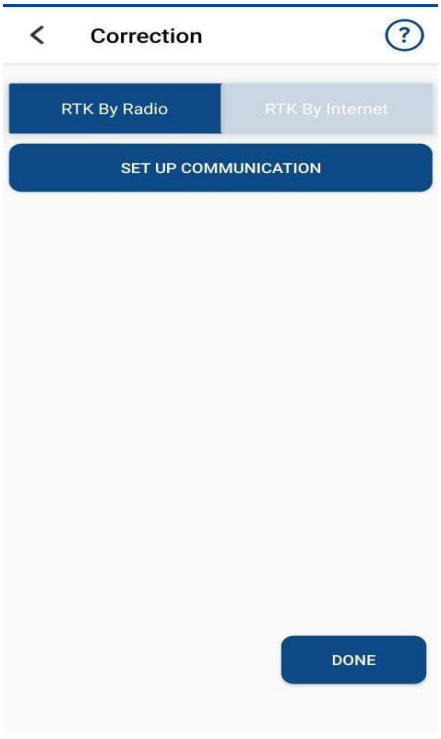


- Choose Protocol and Frequency for Base receiver.

Start mode: Fix position (Manual Base setup) means you have a known coordinate for Base, or get a point from GNSS.

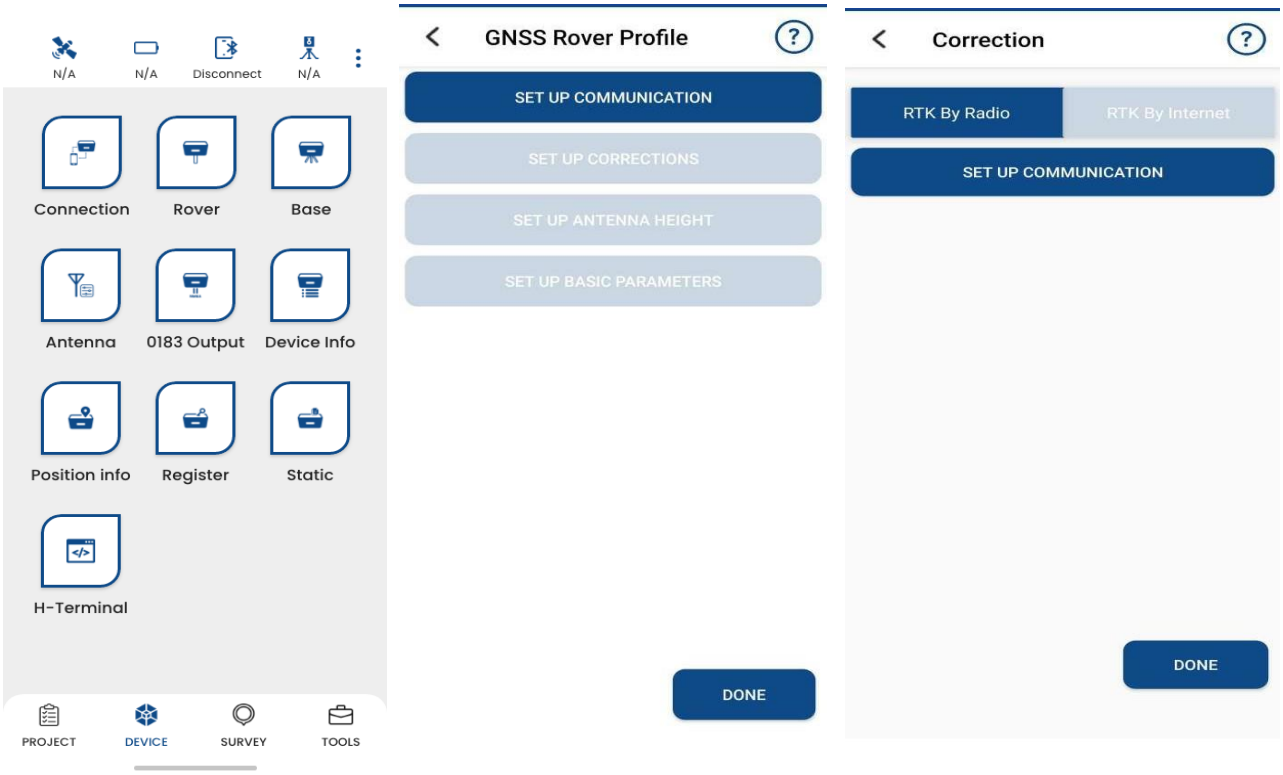


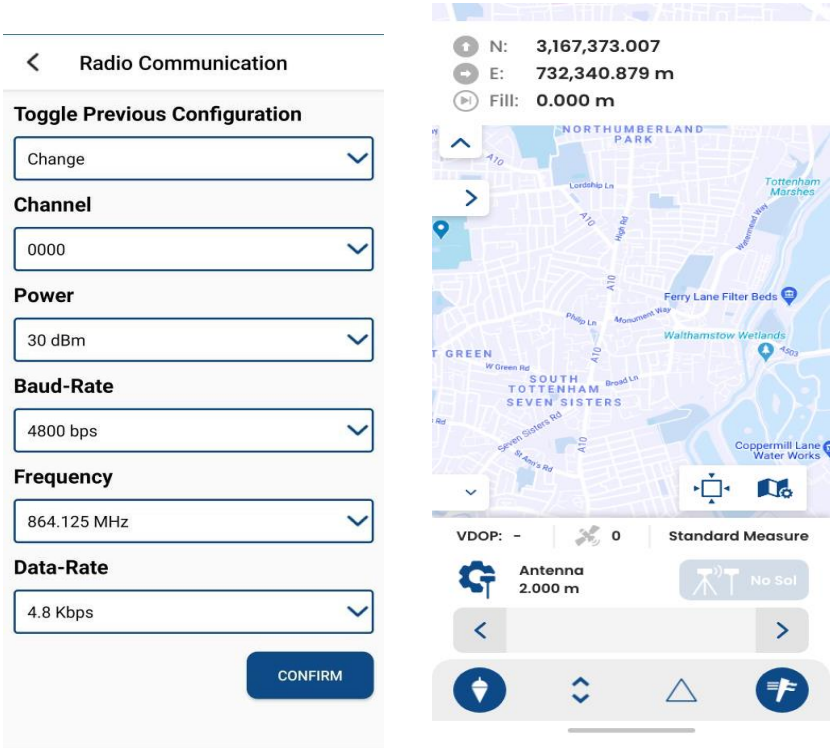




5.5.2 Start Rover Station by Geo Master Survey App

- Connect GEO Master with ALGR-1 receiver via Bluetooth.
- Set same protocol and frequency with Base receiver.
- The current status on the bottom will change from Single to Fixed.





5.6 External Radio

The external radio mode can extend RTK working distance, which is ideal for areas with high constructions or strong signal interference. To set up external radio mode, it requires:

- Base station

I. An external radio
II. An external power supply
III. A long whip antenna
IV. Transmission cables
V. An ALGR-1 receiver
VI. Tripod and tribrach

1. 
3. 
5. 
2. 
4. 
6. 

- Rover

I. An ALGR-1 receiver
II. A Whip Antenna
III. A controller with software installed
IV. A range Pole with bracket

1. 
2. 
3. 
4. 

5.7 Internal GPRS Mode

For Internal GPRS mode, ALGR-1 receiver supports Internal GSM and Ntrip client mode.

5.7.1 Internal GSM

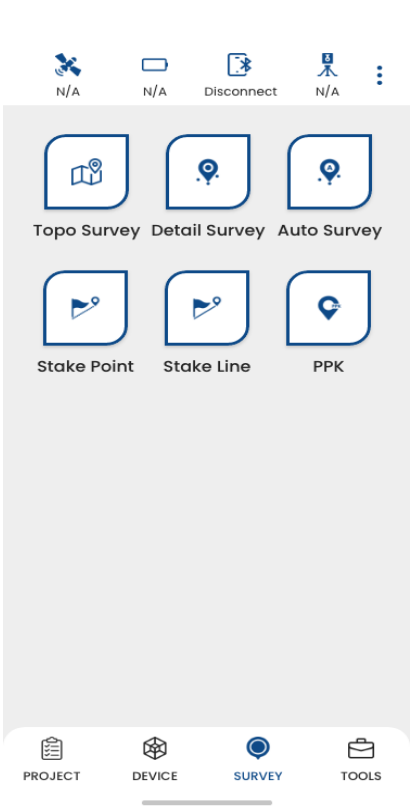
In Internal GSM mode, you need to set the data link as Internal GSM, Sever, IP Port.

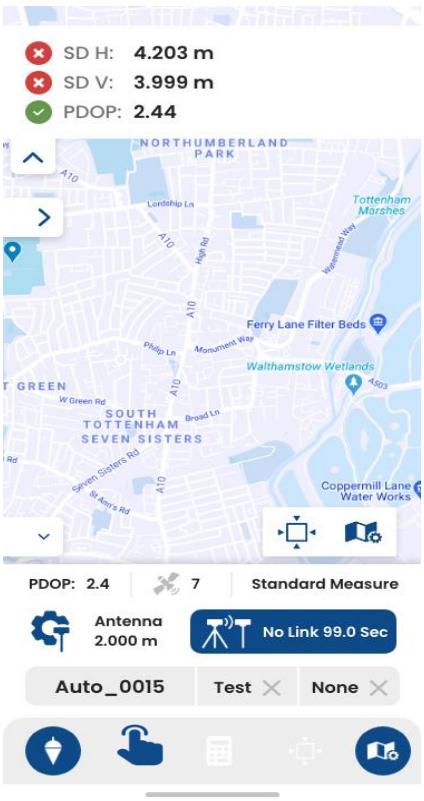
6 Basic Survey Functions

This section describes the basic survey functions of Geo Master, including point measurement, Topo survey, Auto survey, Area survey, Static, PPK, staking, site calibration, import and export measured points.

6.1 Topo survey

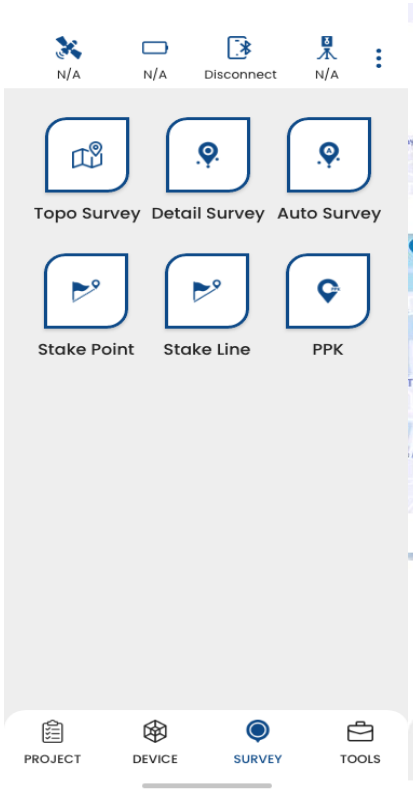
- Click **Topo Survey**-> enter point name, - >click to start or stop collecting data.
- You can quickly change antenna height in the survey interface.
- Click to change the map view.

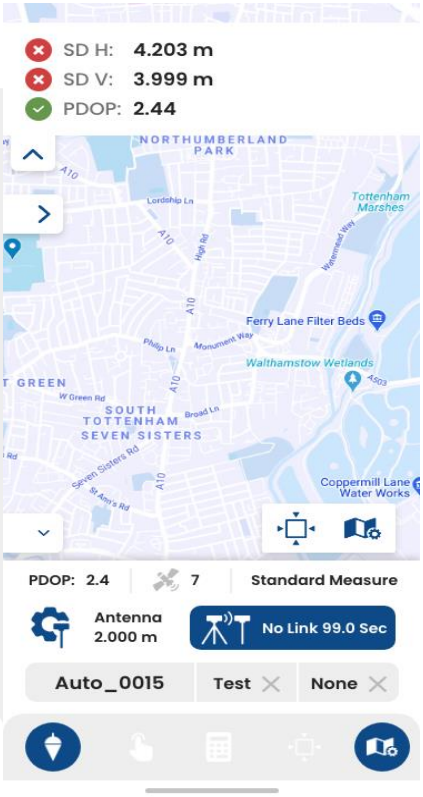


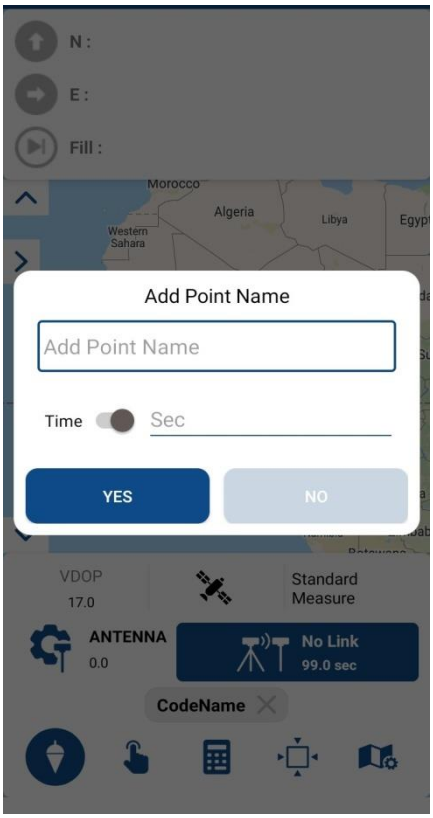


6.2 Auto Survey

For Auto survey, it supports automatic and continuous survey according to **Time or Distance.**

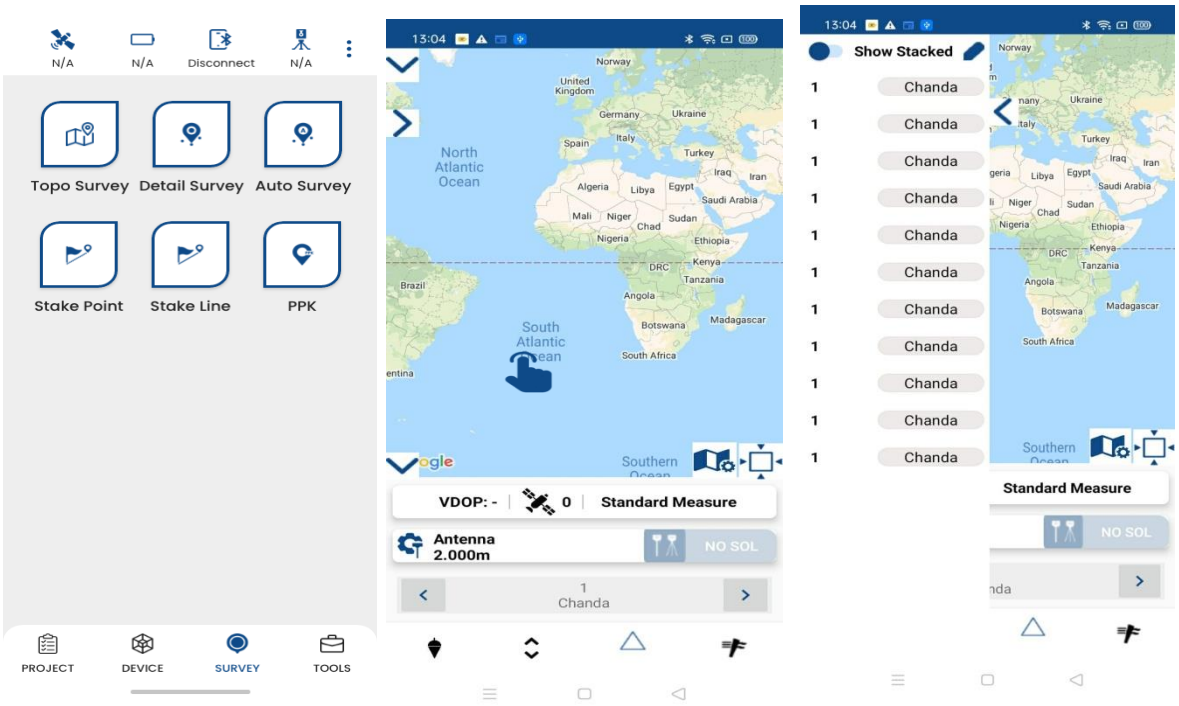






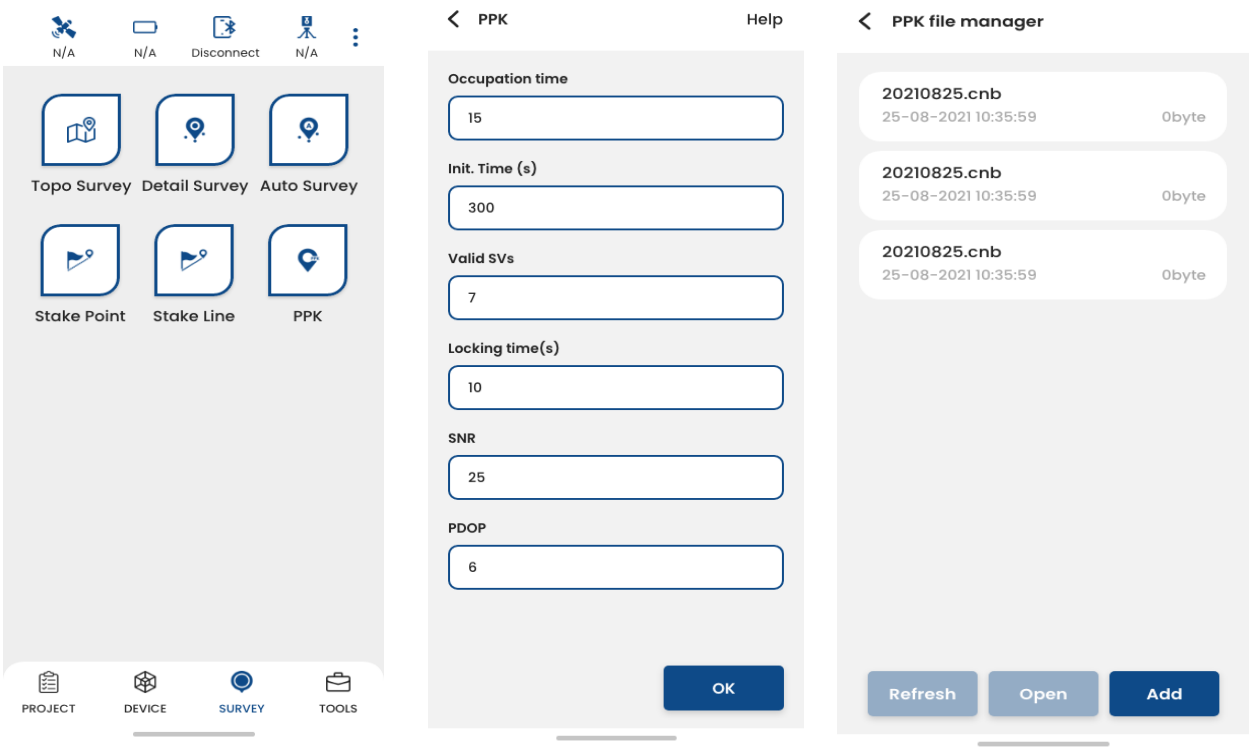
6.3 Stake points/lines

Go into **Stake point** interface, click to choose a point and tap Stake. GEO Master provides a navigation map when staking points/lines. If you are close to the target point enough, it will alarm you based on the alarm range you set. Enter the point name and code based on your requirements.



6.4 PPK

PPK (post processing kinetic) is the unique function of GEO master, which is used for post-processing dynamic measurements. It also needs two receivers to work together, one work as Base to record static data, and another one work as Rover as shown below.



6.5 Site calibration/Grid Reset

Site calibration is commonly needed once in one project, and all the points will be collected based on calibrated datum system.

6.5.1 Site Calibration

This is in the progressing state.

6.6 Area Calculation and COGO

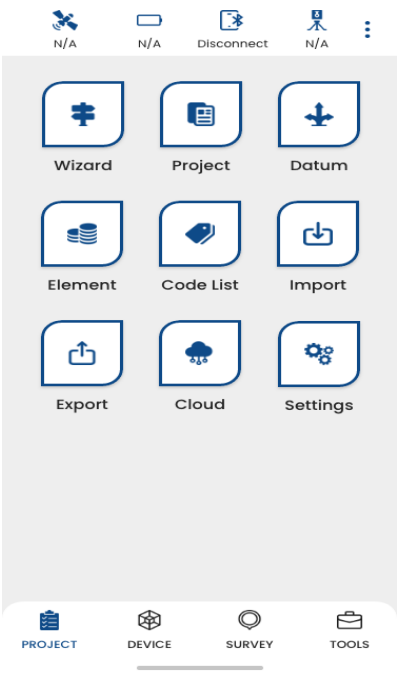
This is in the progressing state.

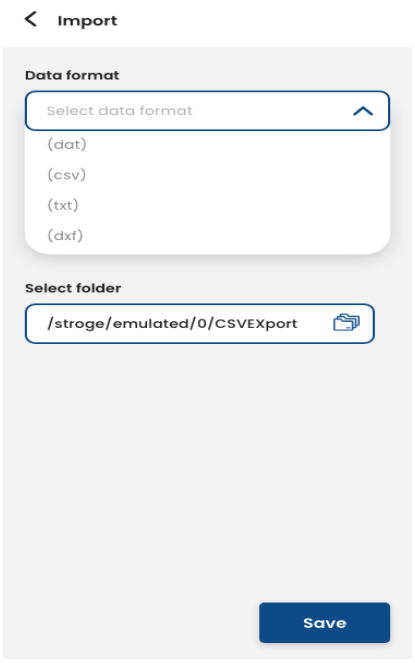
7 Data Export/Import

With import/export functions, you can import and export any survey data, files and stake points/lines fluently.

7.1 Import

- Click Import in project interface ->Click Path to add files.
- File format: support *.csv, *.dxf, *.txt format

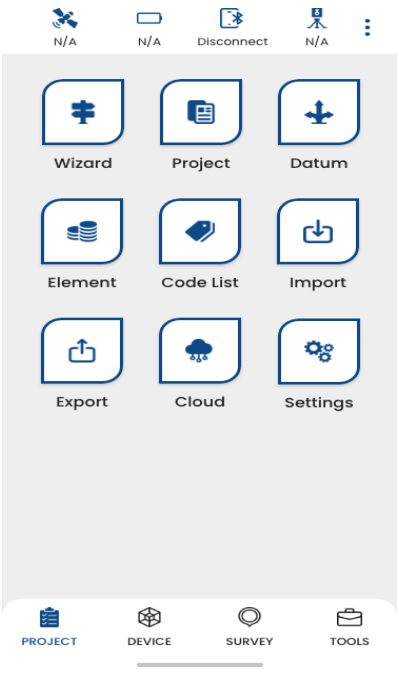


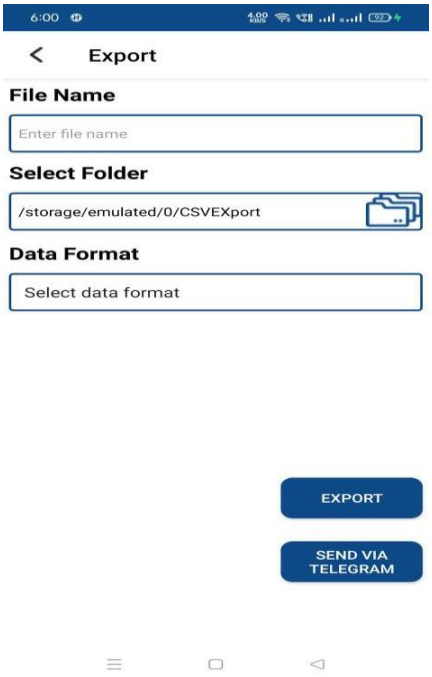


7.2 Export

Tap **Export to export** survey points.

- File format: support *.csv, *.dxf, *.txt format
- The default export path is .../...../....





7.3 NMEA 0183 Output

With NMEA 0183function, you can quickly set to output NMEA data from lemo port or Bluetooth. In fact, this function is same as enter commands “log comXgpXXXontime X”.

Choose NMEA Port -> Baud -> check commands you want to output -> click to **ok**
start