Total station CTS-A100

User Guide

Content

Part 1

Total station introduction

1. Features

1.1 Rich functions

This series of total station has a rich measurement program, data storage function, parameter setting function, powerful, suitable for a variety of professional measurement and engineering measurement.

1.2 Touch-screen operation, quick and easy

This series of total station adopts Android mobile touch screen technology, quick and easy operation. Adopting Android cell phone system makes the operation of the instrument more comfortable, which greatly improves the speed of operation and the efficiency of measurement.

1.3 Rich interfaces

Support SD memory card, support USB flash disk, support USB and computer for connection. Can be connected with PDA through Bluetooth to complete the measurement. Make data transmission easy and simple.

1.4 Automated data collection

The automated data collection program can automatically record the measurement data and coordinate data, and can directly transfer the data with the computer to realize the real digital measurement.

1.5 Advanced hardware configuration

On the basis of the original, this series of total stations has made more scientific and reasonable design on the appearance and internal structure, and adopted various advanced technologies, including ultra-long-distance prism-free ranging technology, the latest generation of absolute coding technology, high-precision dual-axis compensation technology, and the high-strength large body with the latest structure and so on.

1.6 Special measurement programs

In addition to the commonly used basic measurement modes (angle measurement, distance measurement, and coordinate measurement), it also has a variety of measurement programs and calculation programs, including road software, which is quite versatile and can meet the

requirements of a variety of professional measurements. And it can be customized according to specific conditions.

1.7 Convenient operation interface and menu

This series of total station adopts a new interface, generally only has a second level menu, greatly accelerating the speed of access to the function program.

2. Cautions

1.Daylight measurements should avoid aiming the objective lens directly at the sun. Filters should be installed if working in the sun.

2.Avoid storing instruments at high and low temperatures, and avoid sudden temperature changes (except temperature changes during use).

3.When the instrument is not in use, it should be packed into a box and placed in a dry place, paying attention to shock-proof, dustproof and moisture-proof.

4.If the temperature difference between the working place and the storage place is too large, the instrument should be left in the box until it is adapted to the ambient temperature before using the instrument.

5.When the instrument is not used for a long time, the battery on the instrument should be removed and stored separately. The battery should be recharged once a month.

6.Transportation of the instrument should be carried out in a box, the transportation should be careful to avoid extrusion, collision and violent vibration, it's best to use soft cushions around the box for long-distance transportation

7.When the instrument is mounted on a tripod or disassembled, hold the instrument with one hand first to prevent it from falling.

8.When the exposed optical parts need to be cleaned, gently wipe them with absorbent cotton or lens paper. Do not wipe them with other items.

9.After the instrument is used, clean the dust on the surface of the instrument with a flannel or brush. After the instrument is wet by rain, do not turn on the power, dry it with a clean soft cloth and put it in a ventilated place for a period of time.

10.Before operation, the instrument should be carefully and comprehensively checked to ensure that the indicators, functions, power supply, initial Settings and correction parameters of the instrument meet the requirements.

11.Even if the function of the instrument is abnormal, non-professional maintenance personnel should not disassemble the instrument without permission to avoid unnecessary damage.

12.This series of total stations emit laser light and should not be aimed at the eyes when used.

13.Keep the touch screen clean and do not scratch the touch screen with sharp objects.

Declaration of conformity

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

3. Safety guide

WARNING

The total station is equipped with an EDM of a laser grade of 3R/a. It is verified by the following labels. On the vertical tangent screw sticks an indication label “CLASS III LASER PRODUCT”. A similar label is stick on the opposite side. This product is classified as Class 3R laser product, which accords to the following standards. IEC60825-1:2001 “SAFETY OF LASER PRODUCTS”. Class 3R/a laser product: It is harmful to observe laser beam continuously. User should avoid sighting the laser at the eyes. It can reach 5 times the emitting limit of Class2/II with a wavelength of 400 mm-700 mm.

WARNING

Continuously looking straight at the laser beam is harmful.

Prevention:

Do not stare at the laser beam or point the laser beam to other’s eyes. Reflected laser beam is a valid measurement to the instrument.

WARNING

When the laser beam emits on prism, mirror, metal surface, window, etc., it is dangerous to look straight at the reflex.

Prevention:

Do not stare at the object which reflects the laser beam. When the laser is switched on (under EDM mode), do not look at it on the optical path or near the prism. It is only allowed to observe the prism with the telescope of total station.

WARNING

Improper operation on laser instrument of Class 3R will bring dangers.

Prevention:

To avoid being harmed, each user is required to take safety precautions, and take everything under control within the distance that would incur dangers (according to IEC60825-1:2001).

The following shows the explanation related to the key sections of the Standard. Laser instrument of Class 3R is applicable outdoors and in construction field (measurement, defining lines, leveling).

- Only those persons who are trained with related course and authenticated can install, adjust, and operate this kind of laser instrument.
- Stand related warning symbols in the scale of use.

- Prevent any person to look straight at or use optical instrument to observe the laser beam.
- To prevent the harm caused by laser, block the laser beam at the end of the working route.
- When the laser beam exceeds the limit area (harmful distance) and when there are motivating persons, stopping the laser beam is a must.
- The optical path of the laser should be set higher or lower than the line of sight.
- When the laser instrument is not in use, take care of it properly. The person who is not authenticated is not allowed to use.
- Prevent the laser beam from irradiating plane mirror, metal surface, window, etc.; especially bewareof the surface of plane mirror and concave mirror.

Harmful distance means the maximum distance between the start point and the point which the laser is weakened to a degree that doesn't harm people.

4. Description of the instrument

4.1 Component Name

4.2 Instrument open box and store

Open Box

Gently lower the case with the lid facing up, unlatch the case, remove the lid, and remove the instrument.

Store

Put the telescope mirror cover so that the vertical drive handwheel of the aligning part and the circular level of the Tribrach face up to put the instrument in the box horizontally （Telescope objective end down）, gently tighten the vertical drive handwheel, close the box cover and close the lock bolt.

4.3 Set up instrument

The instrument is installed on a tripod, Precisely leveling and centering to ensure the accuracy of the measurement results, and a special tripod with a central connection screw should be used.

Operation reference: instrument leveling and centering

1.Use the vertical ball to centering and leveling

1) Set up the tripod

① First, the tripod is opened so that the three legs of the tripod are approximately equidistant, and the top surface is approximately horizontal, and the three fixed spirals are tightened.

②The center of the tripod is approximately on the same plumb line as the measuring point.

③Step on the tripod to support it firmly on the ground.

2) Set the instrument on a tripod

Carefully set the instrument on the tripod, loosen the center attachment spiral, gently move the instrument on the head of the rack until the hammer ball is aligned with the center of the station marker, and gently tighten the attachment spiral.

3) use circular bubble roughly leveled instrument

①Rotate the two foot spirals A and B so that the circle level bubble moves to a straight line perpendicular to the center line of the above two foot spirals.

②Rotate the foot spiral C so that the circular level bubble is centered.

4) Use the long level bubble to level the instrument

①Release the horizontal brake screw and rotate the instrument so that the pipe level is parallel to the connection line of a pair of spirals A and B. Then rotate the foot spiral A and B to center the bubble.

②Rotate the instrument 90° (100gon) around the vertical axis, and then rotate the other foot spiral C to center the tube level bubbles.

③Rotate 90° again and repeat (1) (2) until the bubble is centered in the four positions.

2.Alignment with an optical center

1) Set up the tripod

Extend the tripod to the appropriate height, make sure that the three legs are of equal length, open, and that the top surface of the tripod is approximately horizontal and located directly above the station. Support the tripod legs on the ground so that one of the legs is fixed.

2) Place the instrument and pair

Carefully place the instrument on the tripod, tighten the center connection spiral, and adjust the optical aligner to make the crosswire image clear. Hold the other two unfixed legs with both hands and adjust the position of the two legs by observing the optical counter. When the optical pointer is roughly aimed at the side station, fix the three legs of the tripod on the ground. Adjust the three-foot spiral of the total station so that the optical pointer is precisely aligned.

3) use circular bubble roughly leveled instrument

Adjust the height of the tripod's three legs so that the total station circular bubble is centered.

4) Use the long level bubble to level the instrument

① Release the horizontal brake screw and rotate the instrument so that the pipe level is parallel to the line of a diagonal spiral A and B. By rotating the angle spirals A and B, so that the long level bubble is centered.

②Rotate the instrument 90° so that it is perpendicular to the line of the angular helices A and B. Rotate the angular spiral C so that the long level bubble is centered.

5) Precise alignment and levelings

Through the observation of the optical pointer, slightly loosen the center connection spiral and pan the instrument (non-rotatable instrument) so that the instrument is precisely aligned with the station point. Tighten the center connection spiral again and level the instrument again. Repeat this until the instrument is precisely leveled and aligned.

3.Alignment with laser pointer(optional)

1) Set up the tripod

Extend the tripod to the appropriate height, make sure that the three legs are of equal length, open, and that the top surface of the tripod is approximately horizontal and located directly above the station. Support the tripod legs on the ground so that one of the legs is fixed.

2) Place the instrument and pair

Carefully place the instrument on the tripod, tighten the center connection spiral, and turn on the laser pointer. Hold the other two unfixed legs with both hands, and adjust the position of the two legs by observing the laser spot of the pointer. When the laser spotting spot is roughly aimed at the station, the three legs of the tripod are fixed on the ground. Adjust the three-foot spiral of the total station so that the laser spot of the pointer is precisely aligned with the station.

3) use circular bubble roughly leveled instrument

Adjust the height of the tripod's three legs so that the total station circular bubble is centered.

4) Use the long level bubble to level the instrument

①Release the horizontal brake screw and rotate the instrument so that the pipe level is parallel to the line of a diagonal spiral A and B. By rotating the angle spirals A and B, so that the long level bubble is centered.

②Rotate the instrument 90° so that it is perpendicular to the line of the angular helices A and B. Rotate the angular spiral C so that the long level bubble is centered.

5) Precise alignment and levelings

Through the observation of the laser spot, the center connection spiral is slightly loosened, and the instrument (non-rotatable instrument) is shifted to make the instrument accurately aligned with the station. Tighten the center connection spiral again and level the instrument again. Repeat this until the instrument is precisely leveled and aligned.

6) Turn off the laser pointer.

Note: Electronic bubbles can also be used instead of the above section of the instrument using the tube level.

Outside the ±3' range, it will automatically enter the electronic blister interface.

◆X: Displays the compensation value in the X direction

◆Y: Displays the compensation value in the Y direction

◆[Compensation-Off]: Turn off dual-axis compensation, click to enter [Compensation-X]

◆[Compensation-X]: Open X-direction compensation, click to enter [Compensation-XY]

◆ [Compensation-XY]: Turn on the compensation in the XY direction, and click to enter [Compensation-Off]

4.4 Loading and unloading, information and charging of batteries

Battery installing and removal

Installing the Battery - Place the battery into the battery slot on the instrument cover and push the battery firmly so that it clicks into the instrument.

Battery removal

Press and hold the button on the left and right sides of the battery to pull it out and take out the battery.

Battery information

When the battery level is less than one bar, it means that the battery power is running out, please end the operation as soon as possible, replace the battery and charge it.

Concentrate:

(1) The battery working time depends on the environmental conditions, such as: environment temperature, charging time and Battery cycle number, etc., for safety reasons, it is recommended to charge in advance or prepare some charged spare batteries.

Note：The standard battery capacity is 5000mAh

(2) The display level of the remaining capacity of the battery is related to the current measurement mode, in the angle measurement mode, the remaining capacity of the battery is sufficient, and it is not guaranteed that the battery can also be used in the distance measurement mode. Because the distance measurement mode consumes more power than the angle measurement mode, when switching from angle mode to distance mode, the distance measurement may be aborted and the instrument shut down due to insufficient battery capacity.

Battery charging

Dedicated charger for battery charging applications, this instrument is equipped with NC-V charger.

When charging, first connect the charger to the power supply 100-240V, remove the battery box from the instrument, and insert the charger plug into the charging socket of the battery box.

Precautions when removing the on-board battery compartment:

▲ Every time you remove the battery box, you must turn off the power of the instrument first, otherwise the instrument is easy to be damaged.

Precautions when charging:

▲ Although the charger has an overcharge protection loop, the plug should still be pulled out of the socket after charging.

▲ It should be charged in the temperature range of 0° ~ ±45° C, and the charging may be abnormal outside this range.

▲ If the charger and battery have been connected, but the indicator light does not light up, the charger or battery may be damaged and should be repaired.

Precautions when storing:

▲ A complete discharge of the battery will shorten its lifespan.

▲ In order to better get the longest service life of the battery, please make sure to charge it once a month.

4.5 Reflective prisms

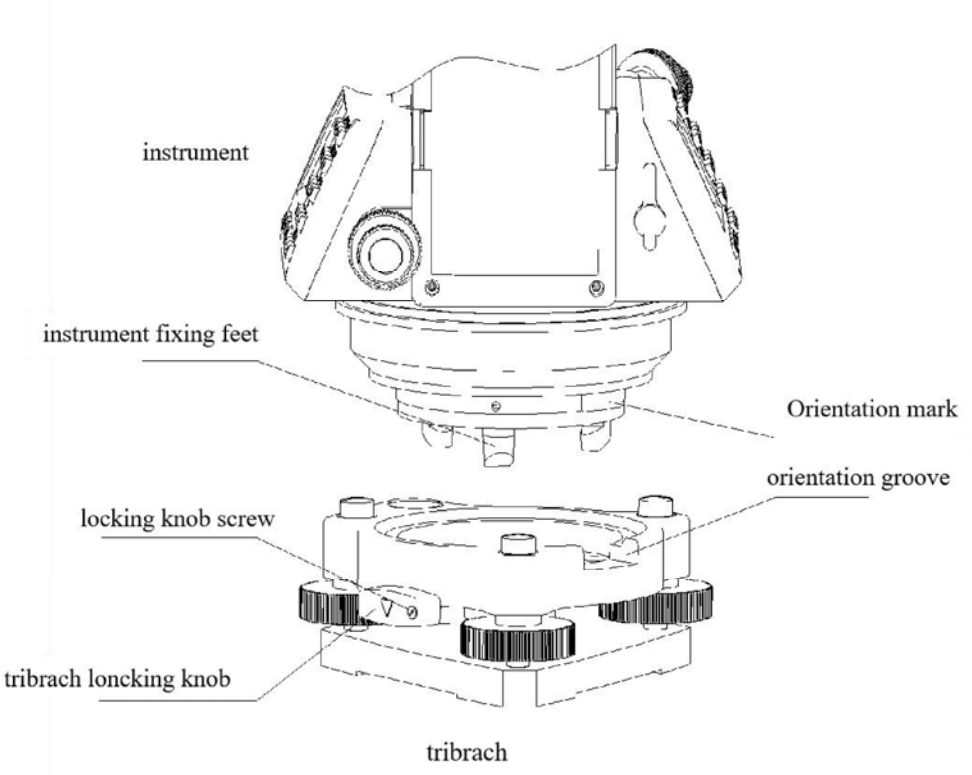
When this series of total stations is used to measure distances in prism mode, a reflective prism must be placed at the target. Reflective prisms are available in single (three) prism sets, which can be attached to the base and placed on a tripod through the base connector, or directly on the centering rod. The prism group is configured by the user according to the needs of the job.

The prism set produced by our company is shown in the figure:

4.6 Disassembly of the base

Disassembly

If necessary, the triangular base can be removed from the instrument (including the reflective prism base connector using the same base) by loosening the base lock button fixing screws with a screwdriver, and then turning the lock button counterclockwise about 180° to detach the instrument from the base.



Installation

Align the directional protrusion mark of the instrument with the directional groove of the base, put the three fixed feet on the instrument into the hole of the base, so that the instrument is mounted on the triangular base, turn the locking button clockwise about 180° to lock the instrument and the base, and then tighten the fixing screws of the locking button with a screwdriver.

4.7 Telescope eyepiece adjustment and target calibration

Methods of aiming at the target (for reference)

(1) Point the telescope at the bright sky, rotate the eyepiece tube, and focus to see the crosswire clearly (rotate the eyepiece tube in the counterclockwise direction and slowly screw in to focus the crosshair).

(2) Use the tip of the triangular mark in the thick sight to aim at the target point, and a certain distance should be reserved between the eye and the sight when illuminating.

(3) Use the telescope focusing spiral to make the target image clear.

When the eye moves up and down or left and right at the end of the eyepiece and finds that there is parallax, it means that the focus or the diopter of the eyepiece is not adjusted well, which will affect the accuracy of the observation, and the focus should be carefully adjusted and the program tube should be adjusted to eliminate the parallax.

4.8 Power on and off

Power on

1.Rough leveling of the instrument

2.Turn on the power switch (key)

Power off

1.Press and hold the power button for about 1 second until the shutdown menu pops up.

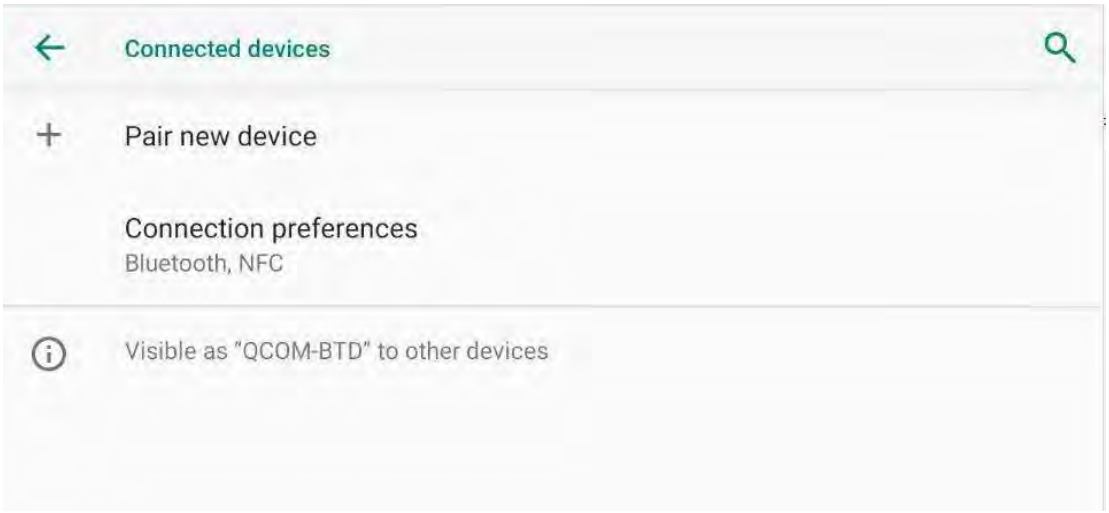
2.Try to ensure normal shutdown, otherwise it may lead to data loss.

Note: Make sure that there is enough battery power, when the display shows "battery power is low" (battery exhausted), the battery should be replaced or recharged in a timely manner, and note that the shutdown should be carried out in accordance with the normal shutdown operation.

***During data collection, never unplug the battery without shutting down, otherwise the measurement data will be lost!

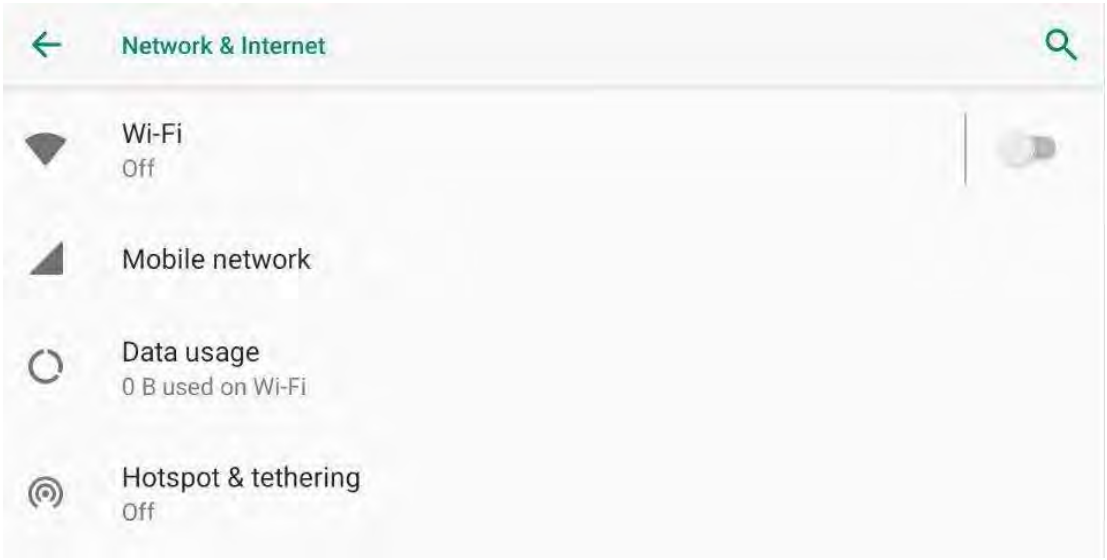
4.9 Bluetooth

When Bluetooth is enabled in the instrument system Settings, the instrument can communicate with other Bluetooth devices.



4.10 WIFI

After the WIFI function is enabled in the instrument system Settings, click on the device to be connected to connect communication.



4.11 3/4G Network

After the instrument is connected with the SIM card in accordance with the mark on the figure, the instrument can automatically communicate with the network connection.

Part 2

LandStar On Board

Overview

Software introduction and features

LandStar On Board software is a full-featured measurement software specially developed for intelligent Android total station. Based on the Android operating system, the software provides an excellent user experience with the following key features and benefits:

Simple operation process: users only need a small amount of time to quickly get started, greatly improving the efficiency of operation.

Rich functional design: The software is fully functional and can meet the efficient operation requirements of various application scenarios.

High Performance CAD Engine: The integrated high performance CAD engine enables users to bring design drawings to the field and select points or lines on the drawings for stakeout, making the job more intuitive and efficient. Even if it is 200M CAD base map, it will not be stuck when browsing.

Network function: Based on the Android operating system, users can make full use of network functions, upgrade software in real time, experience the latest functions, and share data quickly between Field and house work.

Export in multiple data formats: The collected data can be exported to a variety of data formats such as DXF for further processing and use.

These characteristics make LandStar On Board software perform well in practical applications, not only significantly improve the efficiency of measurement work, but also greatly enhance the user's operating experience.

Software interface

The main interface of LandStar On Board 1.0.0 software module is divided into four sections: [**Status bar**], [**Project and data**], [**Application**] and [**Setting**]. After opening the software, it will directly enter the main interface, and you can select the required section for operation.


-4.4
1.000
test
Default
Import
Export
Data
Applications
Station setup
Survey
Stakeout
Settings
Software setting
Exit

1. Status bar

This chapter introduces:

- Station setup
- Instrument setting
- Prism setup

The title bar is divided into three parts: left, middle and right, the left is the station setup, the middle is the instrument setting, and the right is the prism setting.

1.1 Station setup

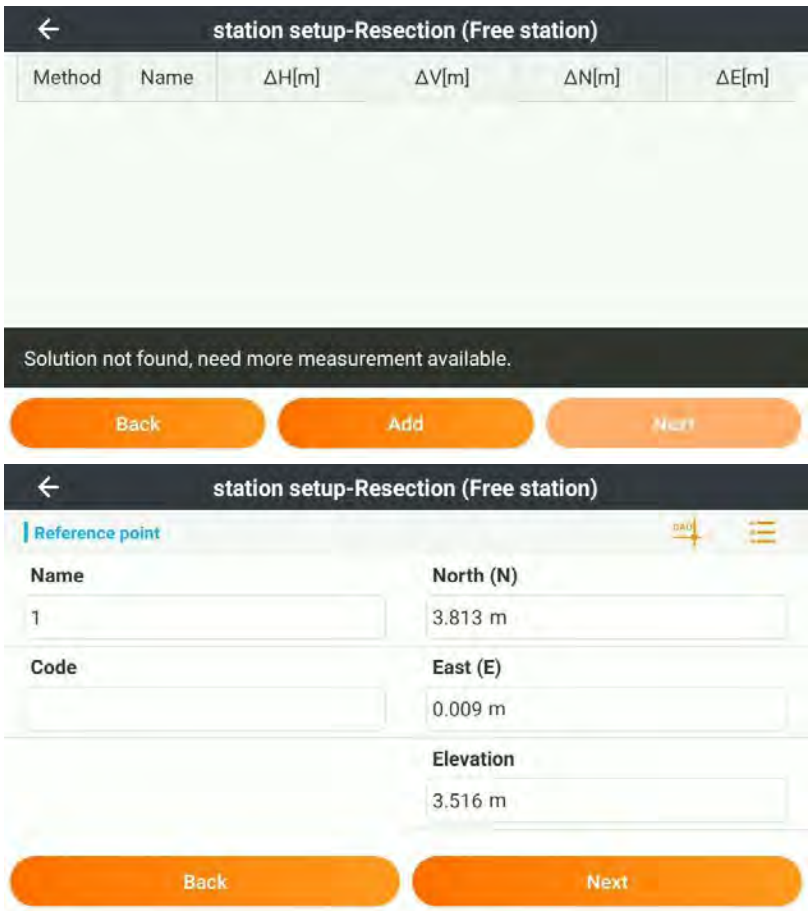
Clicking  , you can enter the station setup interface, which corresponds to the same function as the station setup  in the application, but the entrance is different.

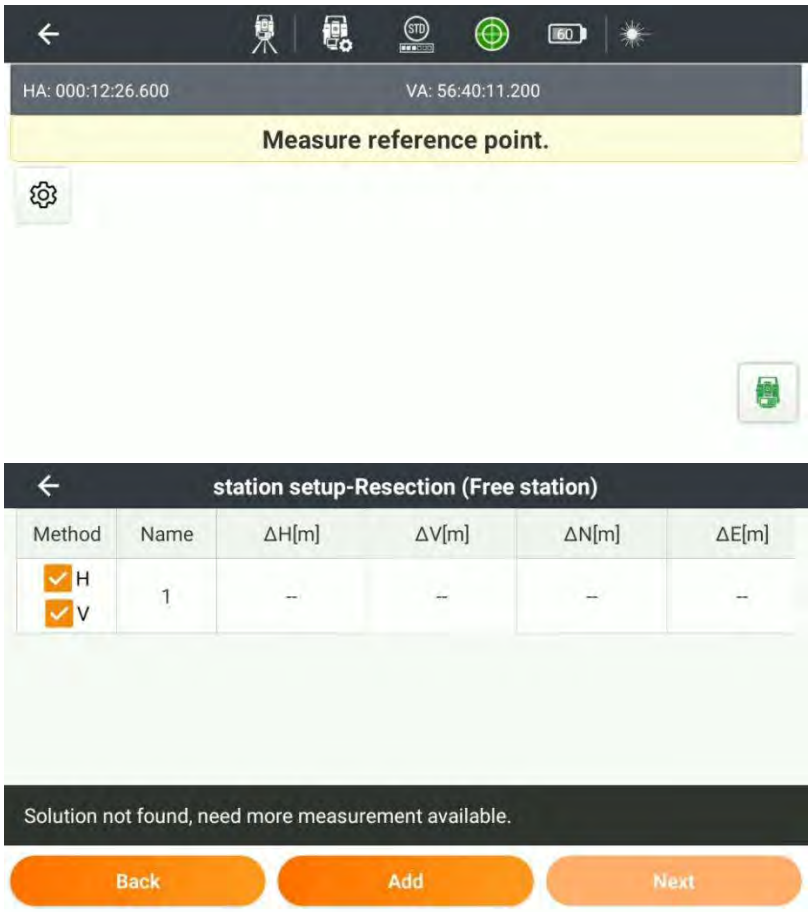
There are three kinds of station setup methods: Resection (Free station), Backsight to known point, Backsight by azimuth.

1.1.1 Resection (Free station)

1.Enter the station name and instrument height and click Next

2.Add known points and perform Resection (Free station)





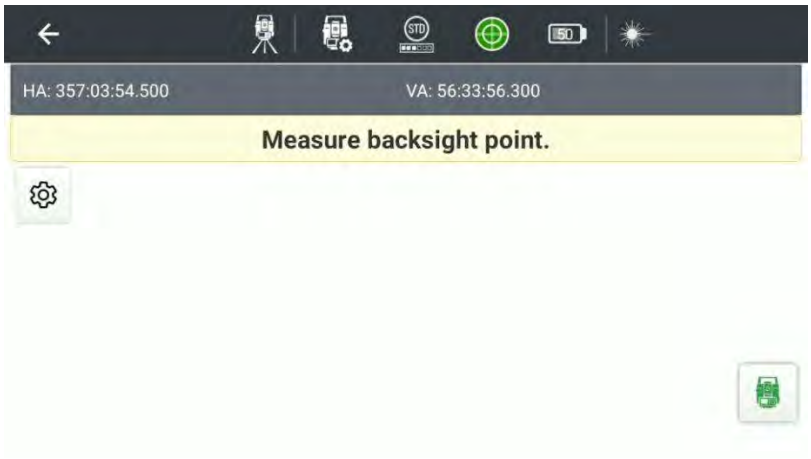
3.Repeat step 2, measure at least two known points

4.Complete station setup

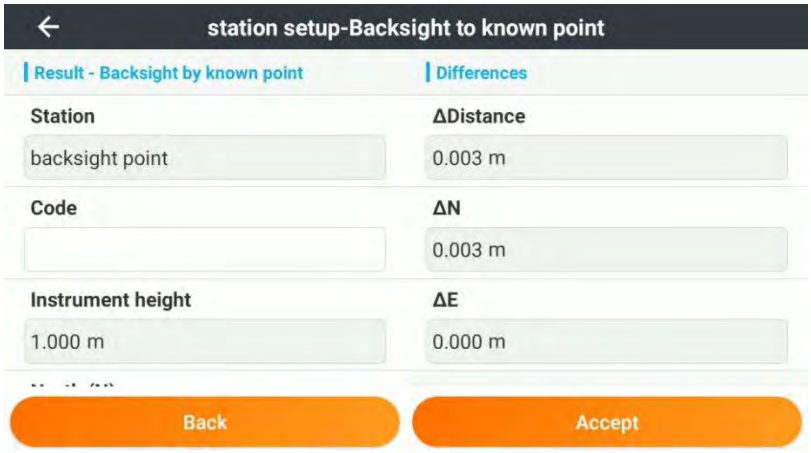
1.1.2 Backsight to known point

1.Select the known point as the setting station and enter the instrument height

2.Select the known point for the backsight measurement



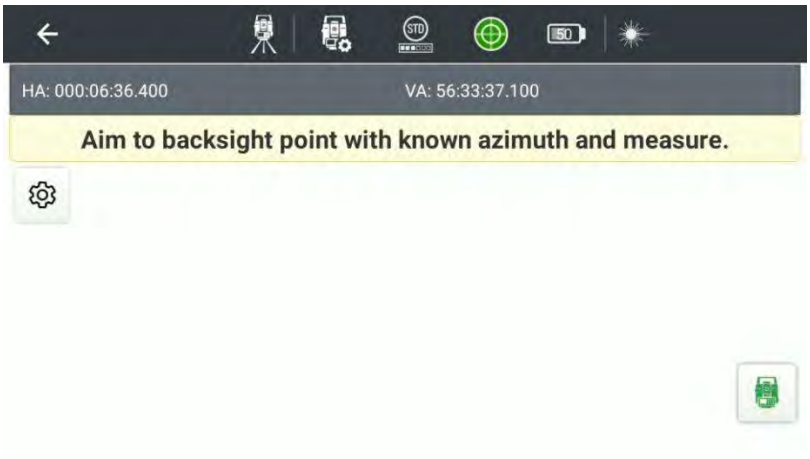
3.Complete station setup



1.1.3.Backsight by azimuth

1.Select the known point as the setting station and enter the instrument height

2.Enter the backsight azimuth to perform the backsight measurement



3.Complete station setup

1.1.4 Change the station information

After the completion of the station setup, enter the station setup page, you can check the station setup information, set the station again, and perform [**Check orientation**], [**Set instr.height**], [**Reset Z**] and [**Elevation from point**].

[Check orientation]: Select a known point for backsight measurement to verify that the current station is correct. If the current orientation of the station is wrong, the theoretical azimuth can be assigned to the actual measured direction to obtain a new station.

[Set instr.height]: If the instrument height of the current station is modified, no new station is generated, and the elevation of the point measured under the station will also change.

[Reset Z]: On the basis of the current station, the elevation of the station is set to 0, and a new station is obtained.

[Elevation from point]: Select a known point for backsight measurement, calculate the actual elevation of the station according to the measurement information, and get a new point to set the station.

1.2 Instrument setting

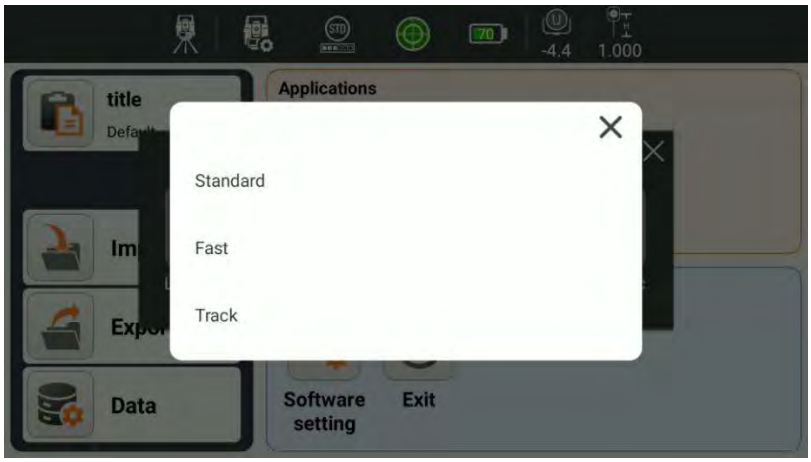
Instrument Settings display four icons by default, instrument Settings, measurement mode, level bubble and instrument power.

Click the instrument Settings, the instrument Settings list will pop up, including [Laser pointer], [Level bubble], [Measurement mode] and [Atmospheric correct].

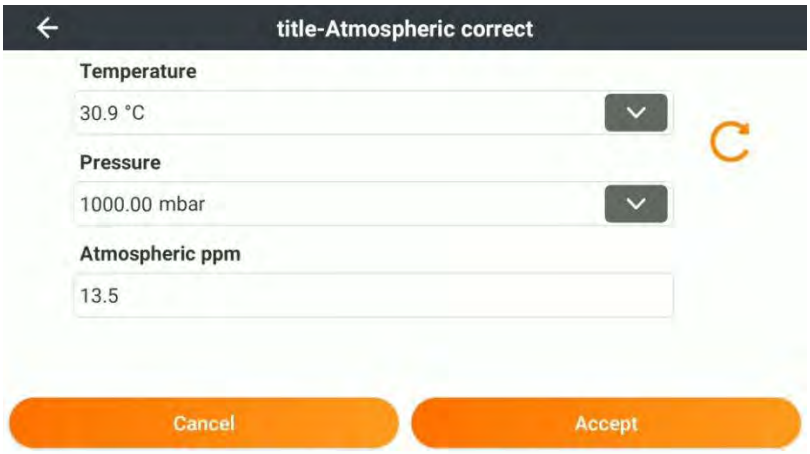
[Laser pointer] : Used to turn on or off the instrument laser indication.

[Level bubble] : Used to turn the compensator on or off, control the laser intensity, view the electron bubble, horizontal axis and collimation axis. When the compensator is off, the icon of the horizontal bubble is gray ; When the compensator is turned on and the instrument is not adjusted, the horizontal bubble icon is red ; When the compensator is turned on and the instrument is set, the horizontal bubble icon is green . The lower laser is only turned on when the software is at the horizontal bubble interface.

[Measurement mode] : Used to control instrument data output mode, divided into **Standard**, **Fast** and **Track**. The data output speed of fast mode is faster than that of standard mode. When the continuous mode is turned on for stakeout, the instrument will continuously output data.



[Atmospheric correct] : Temperature and pressure can be entered directly or read from the instrument sensor by clicking the refresh button to the right of the input box. The units of temperature and pressure can be modified by clicking the drop down button at the end of the input box. The software automatically calculates **ppm** based on the set temperature and pressure, and ppm can also be entered directly.



1.3 Prism setup

The prism setup consists of two parts: the left prism and the right prism height.

The prism height is only displayed when the target is a prism, and it is hidden when the target is a prism-free or reflector.

Click on the prism, the prism list will pop up, the top of the list shows the prism parameters being applied, and the bottom can add and select the prism you want to use.