Total Station CTS-A100

User Guide

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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.

Technical Support

If you have a problem and cannot find the information you need in this manual or CHC website (www.chcnav.com), contact your local CHC dealer from which you purchased the receiver(s).

If you need to contact CHC technical support, please contact us by email (support@chcnav.com) or Skype (chc_support) or Knowledge Base (https://support.chcnav.com/portal/en/kb).

The manual can also be downloaded from Knowledge Base:
https://support.chcnav.com/portal/en/kb.

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).

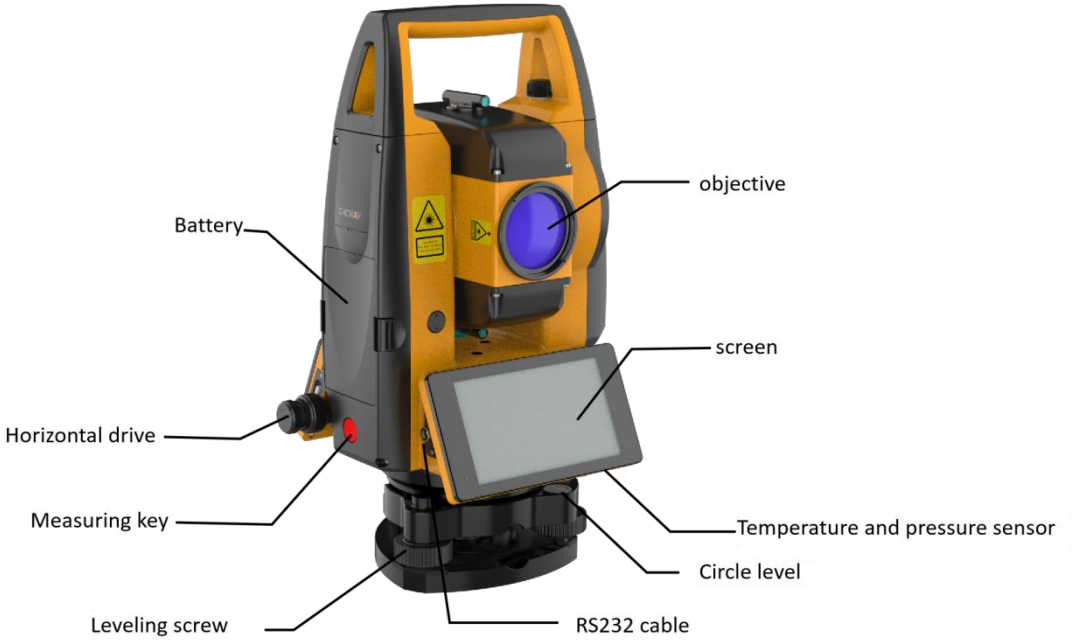
- Only those persons who are trained with related course and authenticated can install, adjust, and operate this kind of laser instrument.
- Stand related warning symbols in the scale of use.

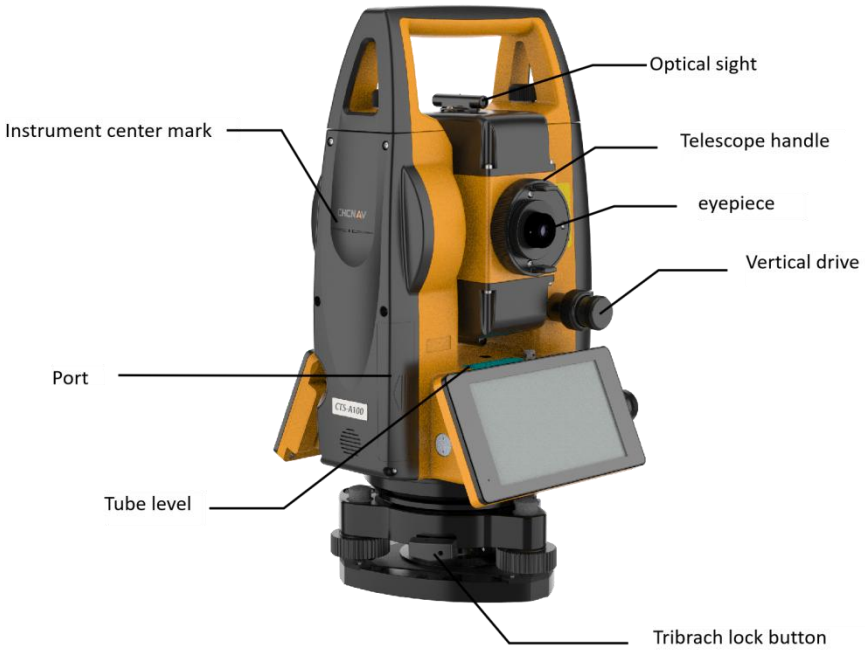
- Prevent any person to look straight at or use optical instrument to observe the laser beam.
- To prevent the harm caused by laser, block the laser beam at the end of the working route.
- When the laser beam exceeds the limit area (harmful distance) and when there are motivating persons, stopping the 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.

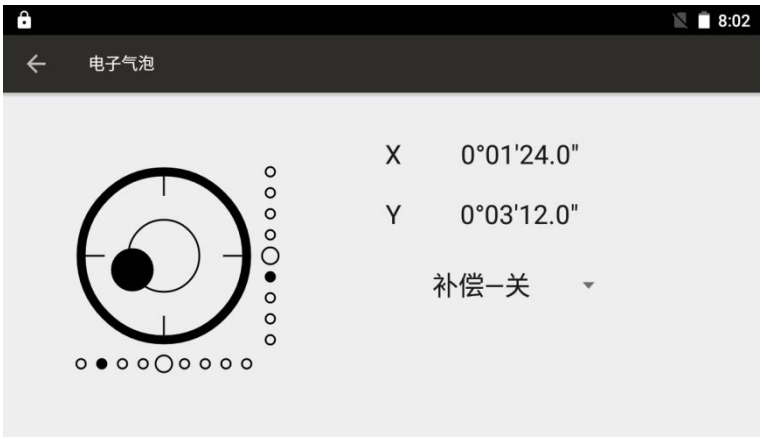
5) Precise alignment and levelings

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

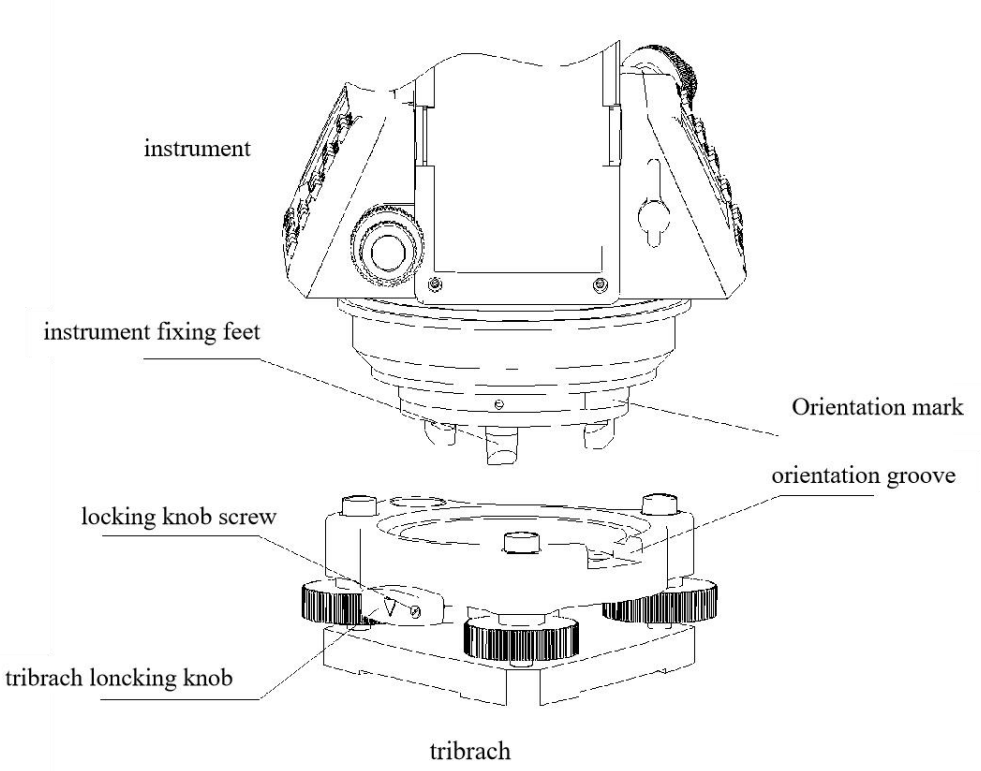
When this series of total stations is used to measure distances in prism mode, a reflective prism must be placed at the target. Reflective prisms are available in single (three) prism sets, which can be attached to the base and placed on a tripod through the base connector, or directly on the centering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

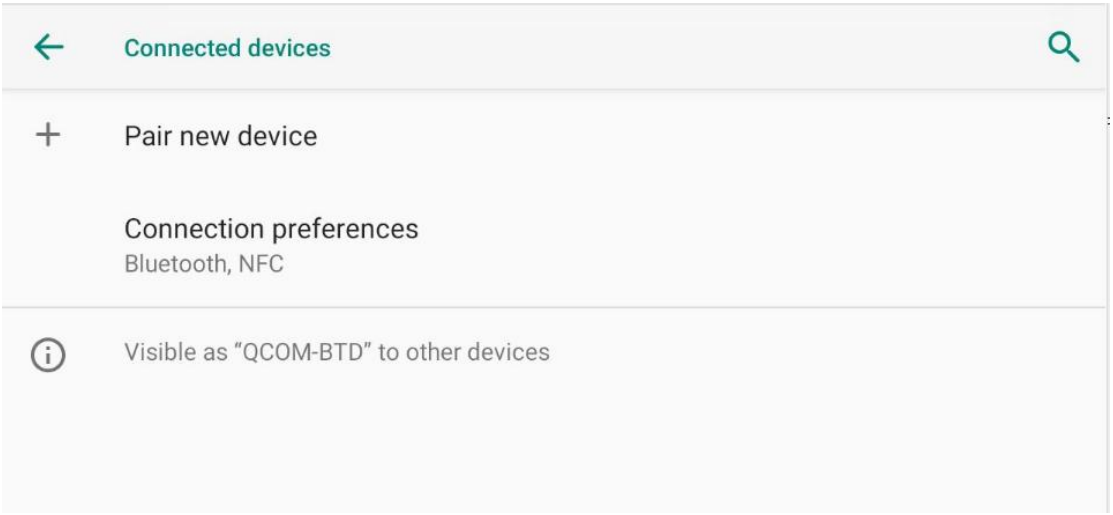
2.Try to ensure normal shutdown, otherwise it may lead to data loss.

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!

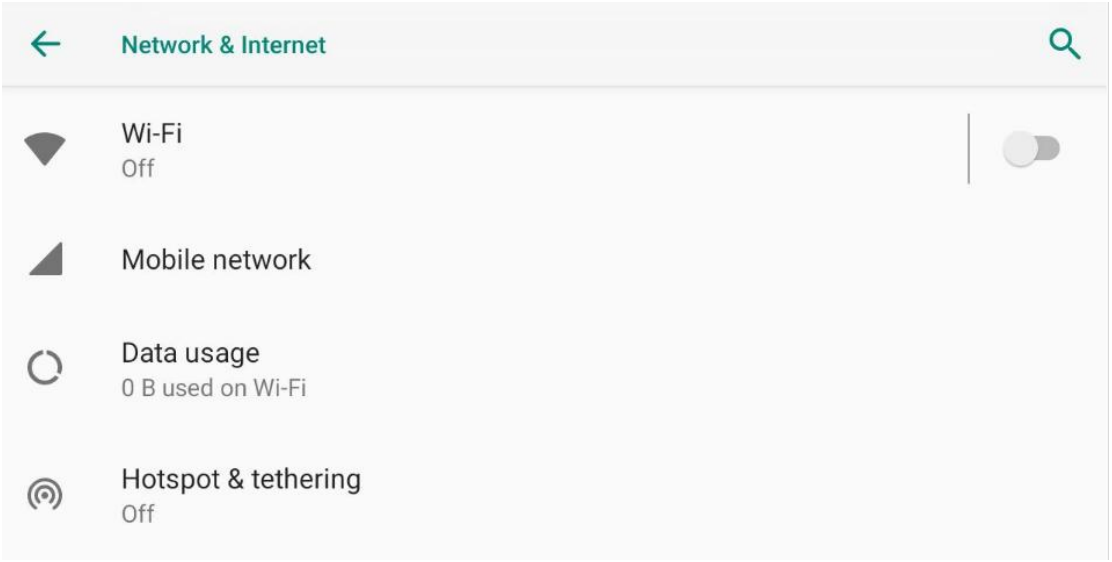
4.9 Bluetooth

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

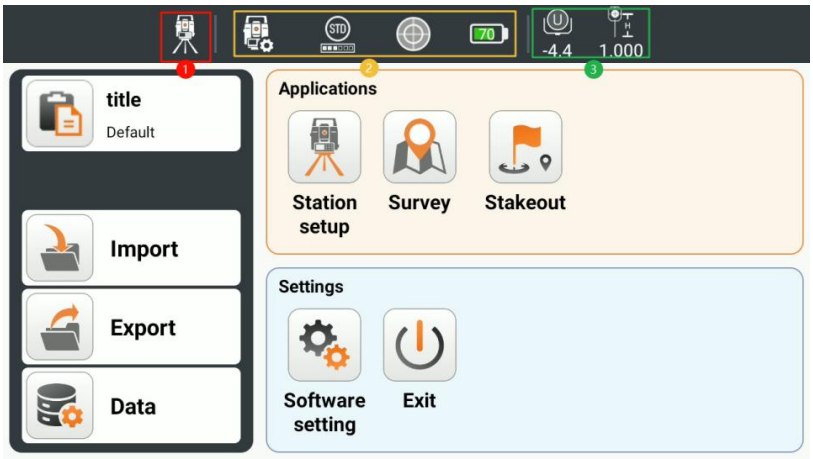
The main interface of LandStar On Board 1.0.0 software module is divided into four sections: [**Status bar**], [**Project and data**], [**Application**] and [**Setting**]. After opening the software, it will directly enter the main interface, and you can select the required section for operation.

-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

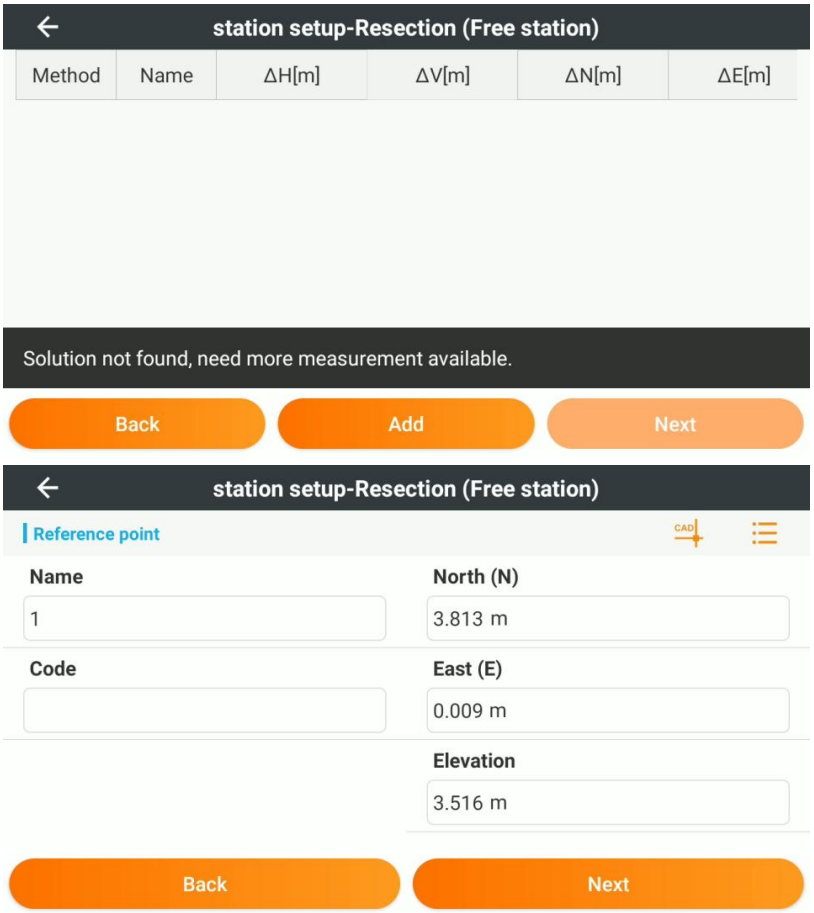
Clicking , you can enter the station setup interface, which corresponds to the same function as the station setup in the application, but the entrance is different.

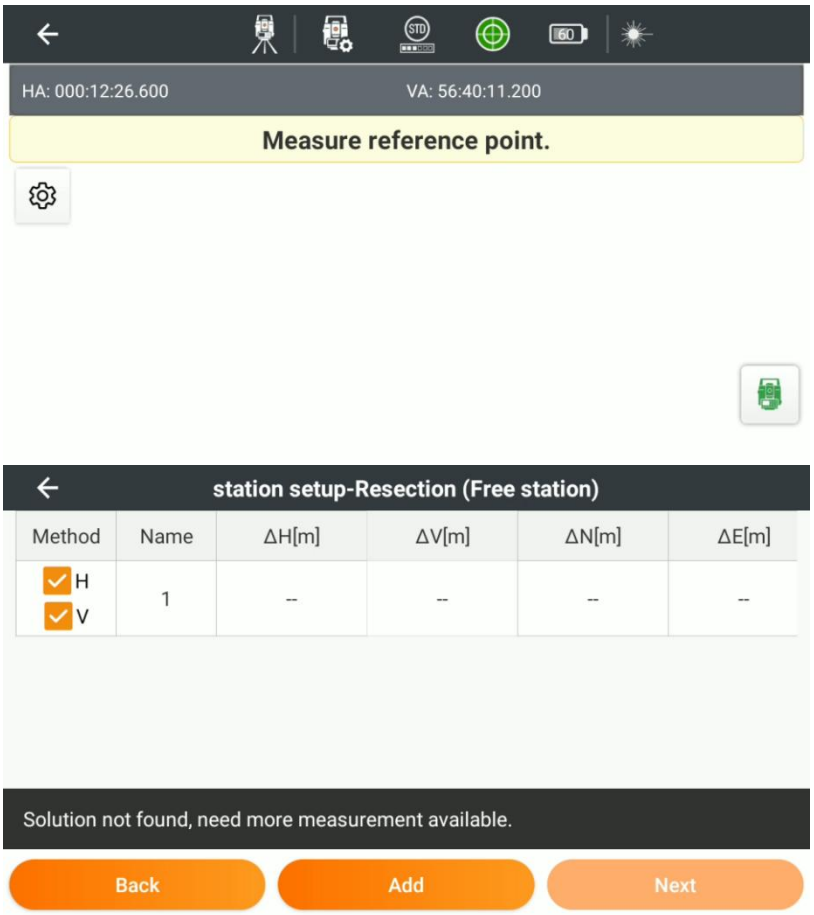
There are three kinds of station setup methods: Resection (Free station), Backsight to known point, Backsight by azimuth.

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)



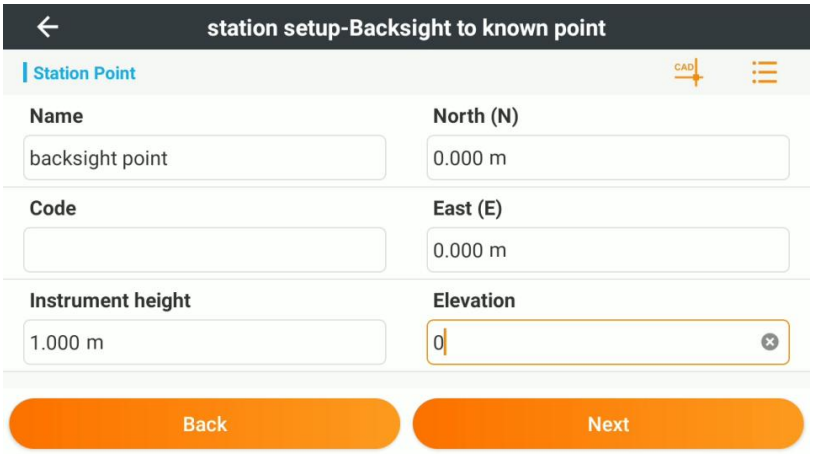


3.Repeat step 2, measure at least two known points

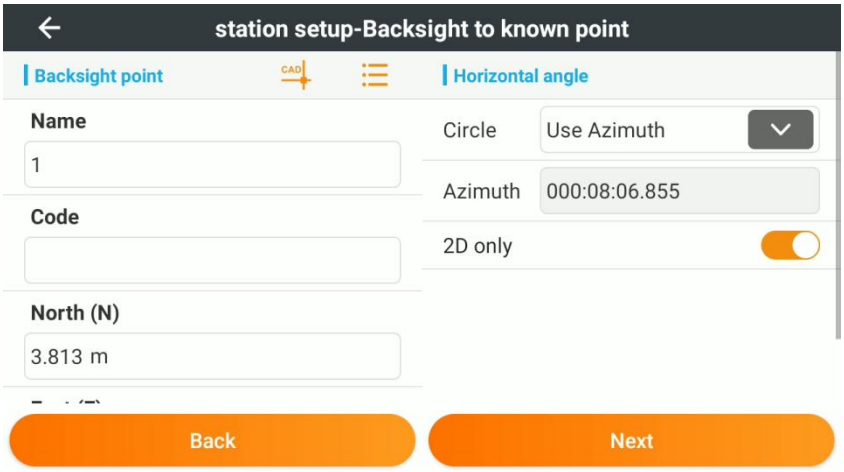
4.Complete station setup

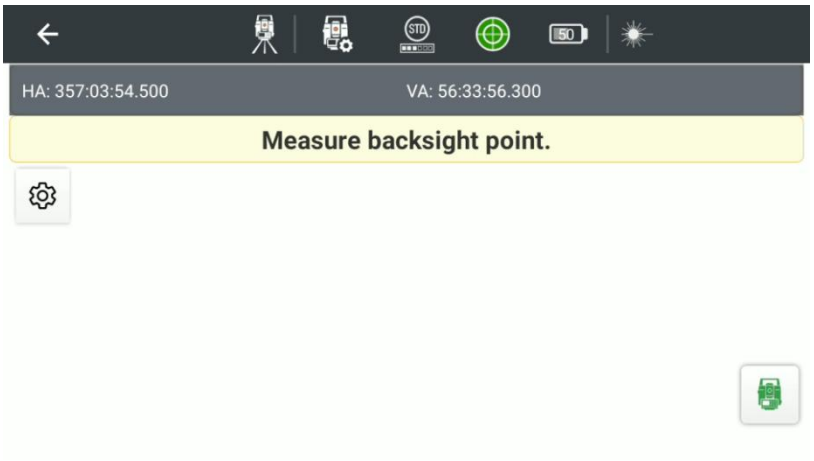
1.1.2 Backsight to known point

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

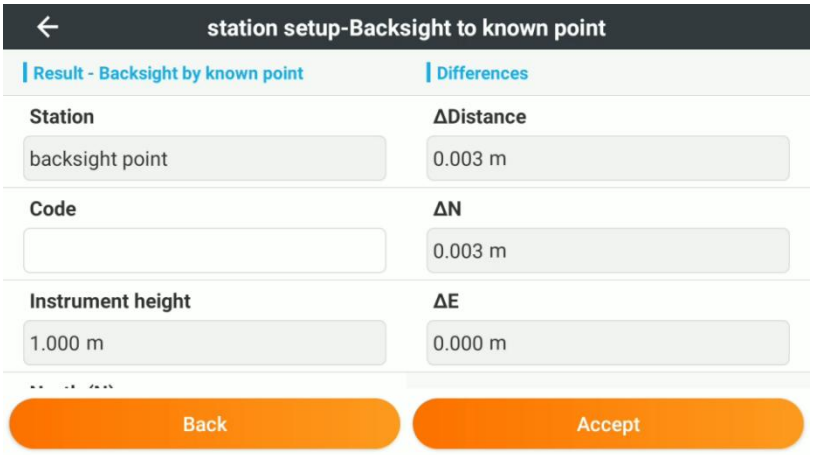


2.Select the known point for the backsight measurement





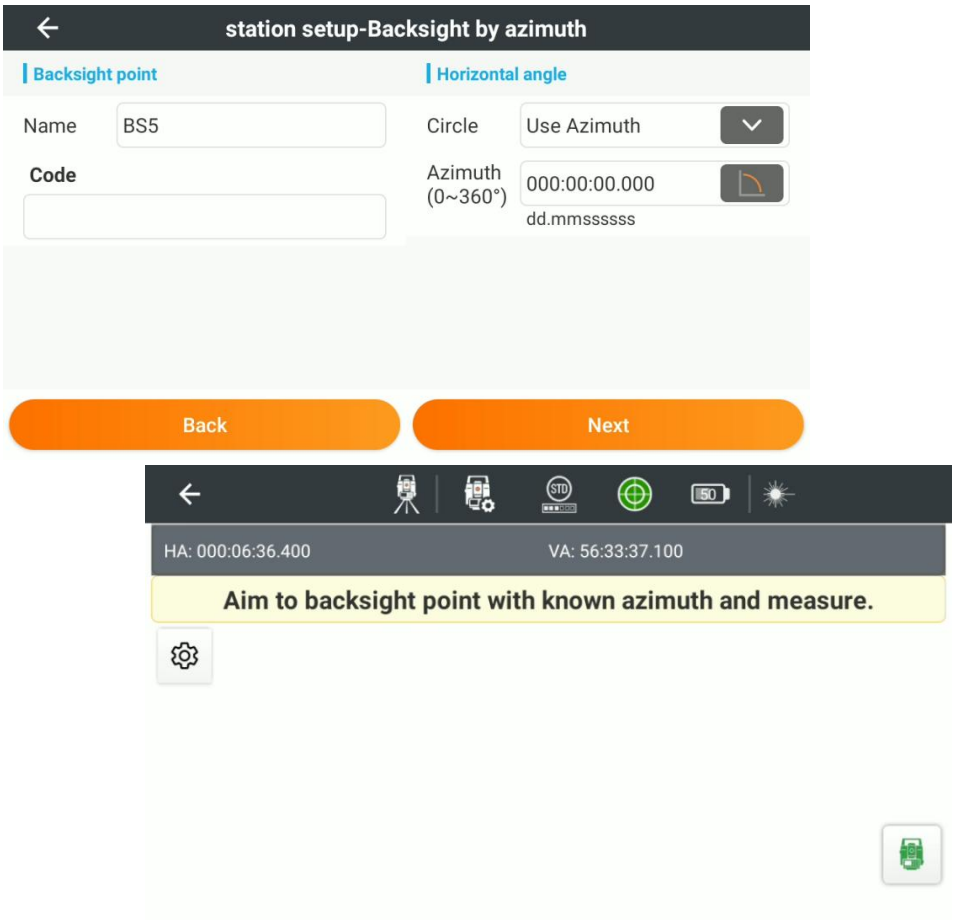
3.Complete station setup



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.

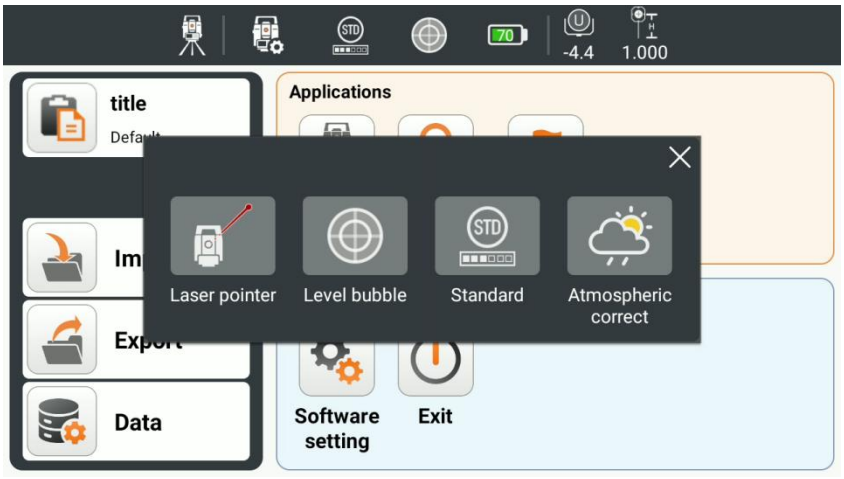
[Reset Z]: On the basis of the current station, the elevation of the station is set to 0, and a new station is obtained.

[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

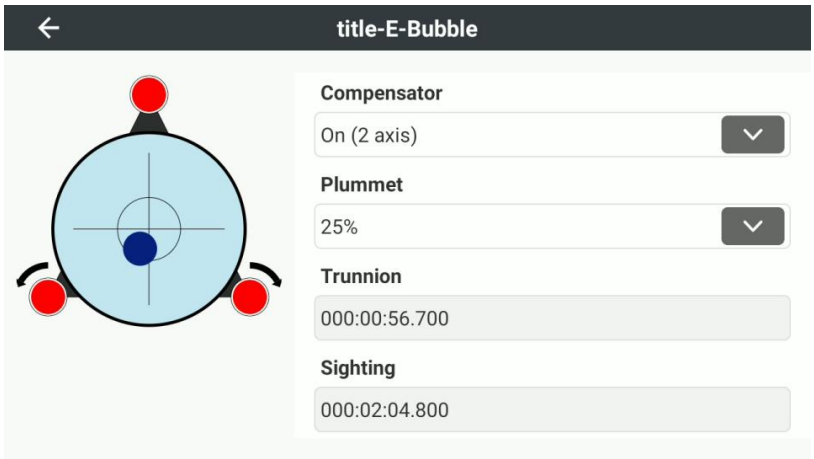
Instrument Settings display four icons by default, instrument Settings, measurement mode, level bubble and instrument power.

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

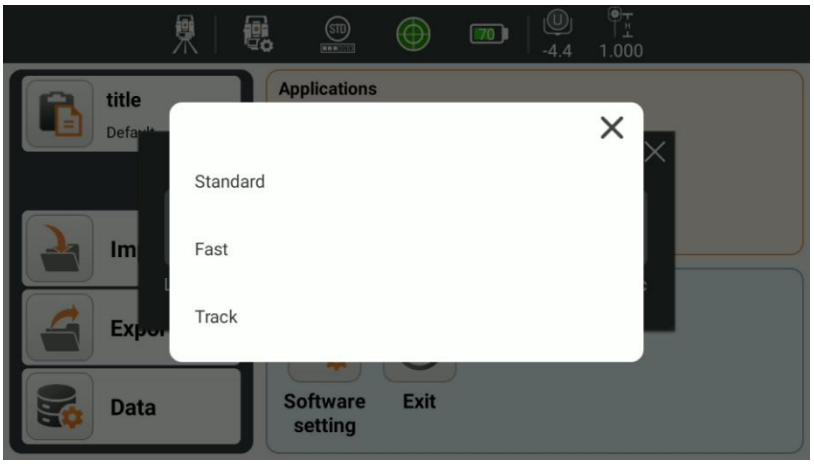


[Laser pointer] : Used to turn on or off the instrument laser indication.

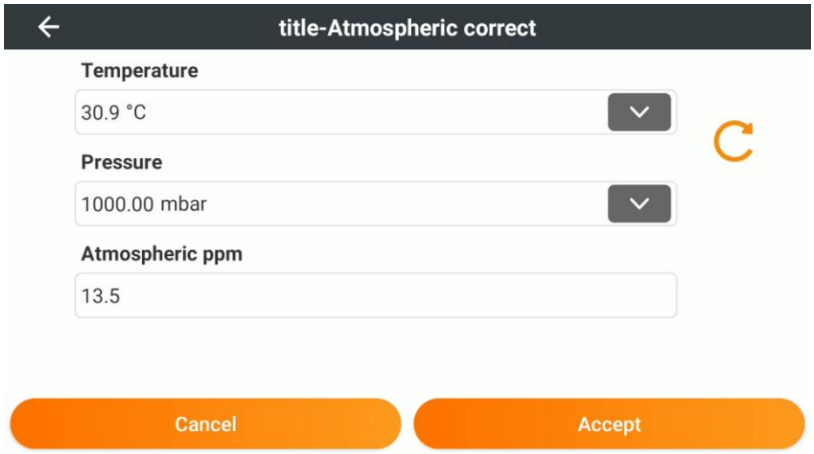
[Level bubble] : Used to turn the compensator on or off, control the laser intensity, view the electron bubble, horizontal axis and collimation axis. When the compensator is off, the icon of the horizontal bubble is gray ; When the compensator is turned on and the instrument is not adjusted, the horizontal 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.

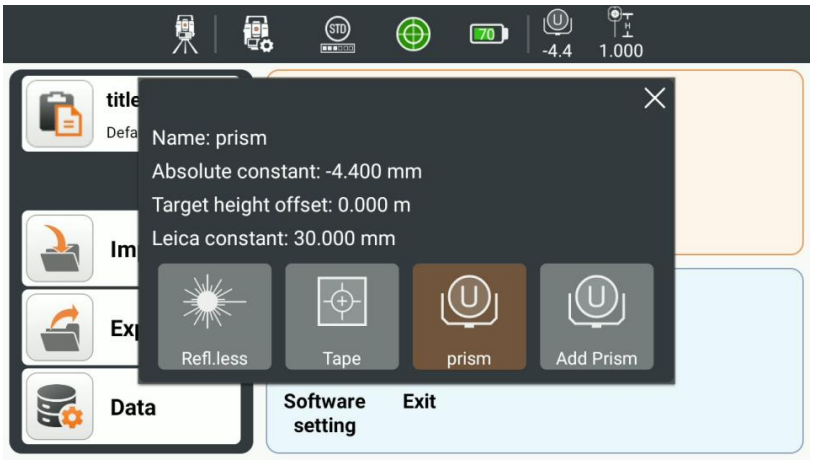


1.3 Prism setup

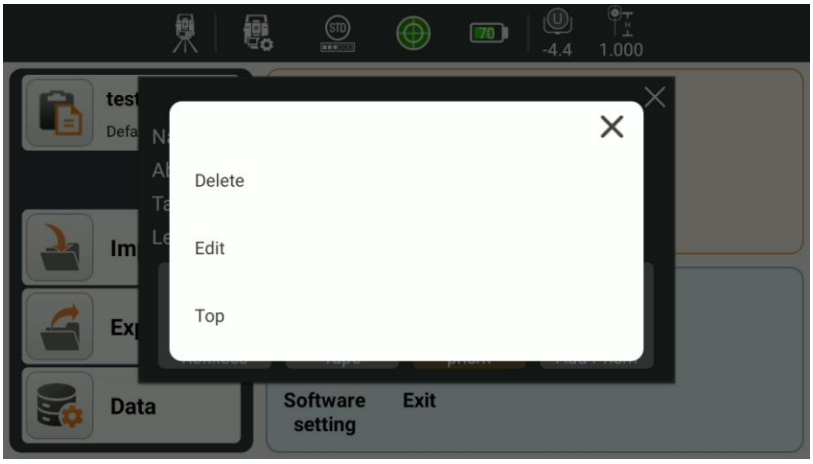
The prism setup consists of two parts: the left prism and the right prism height.

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.

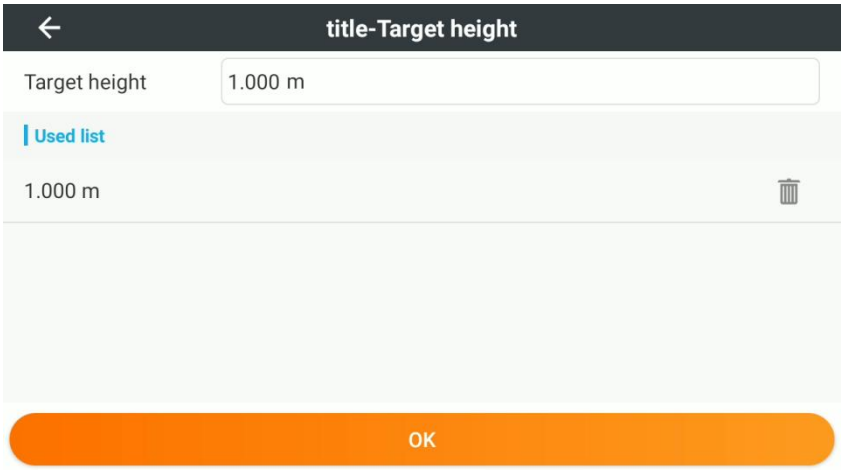
Click on the prism, the prism list will pop up, the top of the list shows the prism parameters being applied, and the bottom can add and select the prism you want to use.



Long press the non-default prism to delete, edit, and top.



Click the prism height , will jump to the prism height setting interface, the top can enter the prism height, the bottom record the prism height historical data.

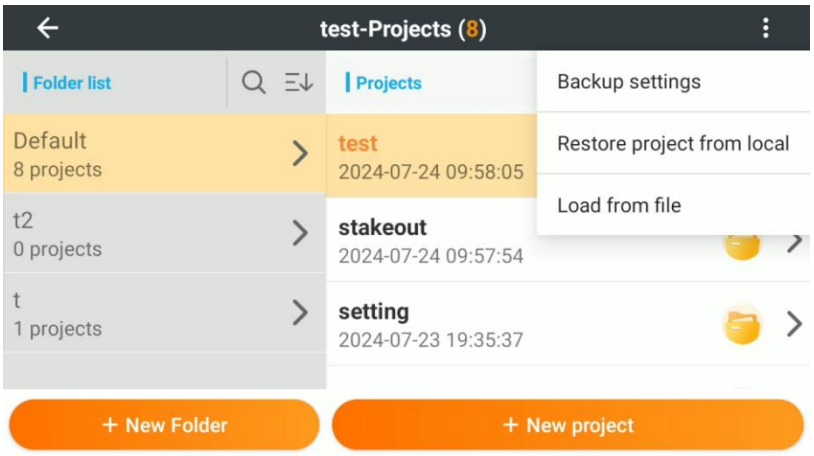


2.Project and data

This chapter introduces:

- Project
- Import
- Export
- Points
- Lines/Arcs
- Layers

2.1 Project



Operating instructions:

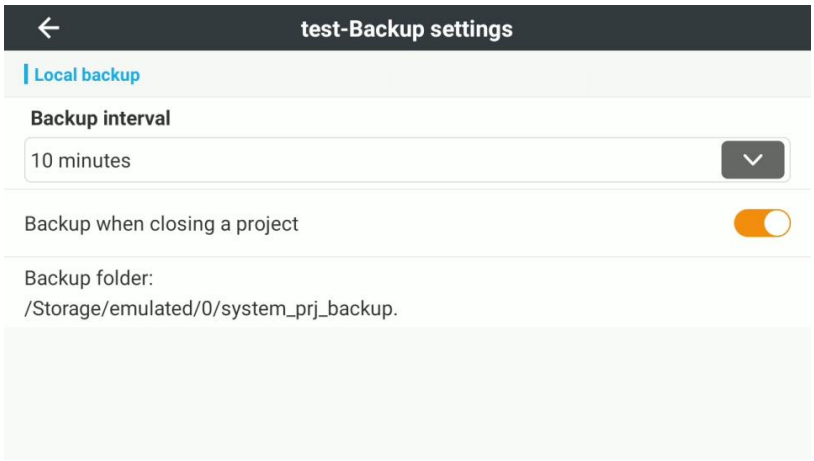
On the main interface, click [Project] to enter the project management interface, click New, enter the project name, enter the creator (optional);

Project Settings can choose to use the default parameters, or click to enter the corresponding modification Settings.

On the project page, you can **delete** and **open** projects by right-click the project.

There are three types of project source: **New project**, **Restore project from local**, **and Load from file**.

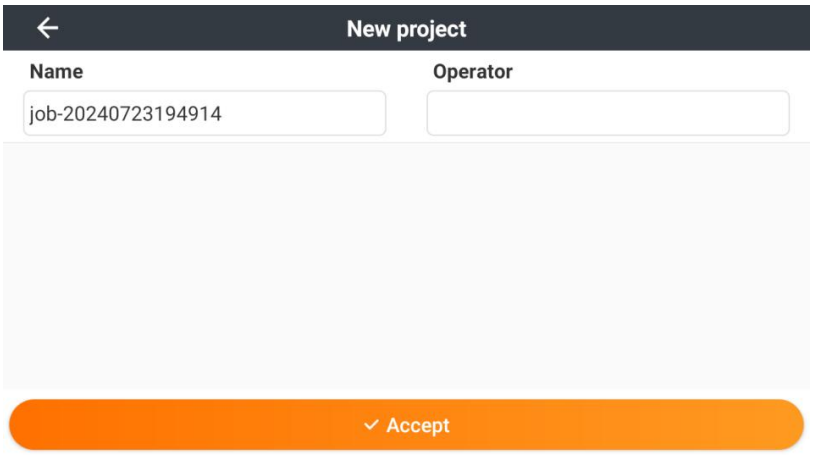
Project local backup: Click Backup Settings to set project backup parameters.



2.1.1 New

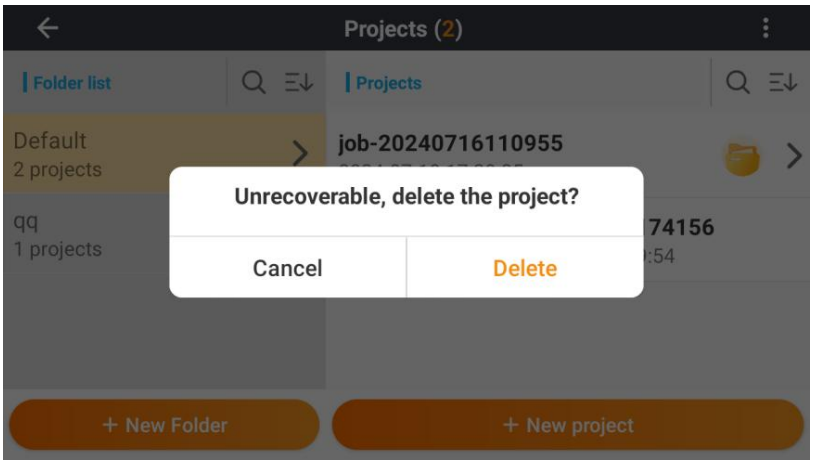
No matter what kind of operation mode, you must first create a project to manage the data, click "New", the new project dialog box will pop up, as shown below.

In Project Name, enter the project name. "Operator" means the founder of the project.



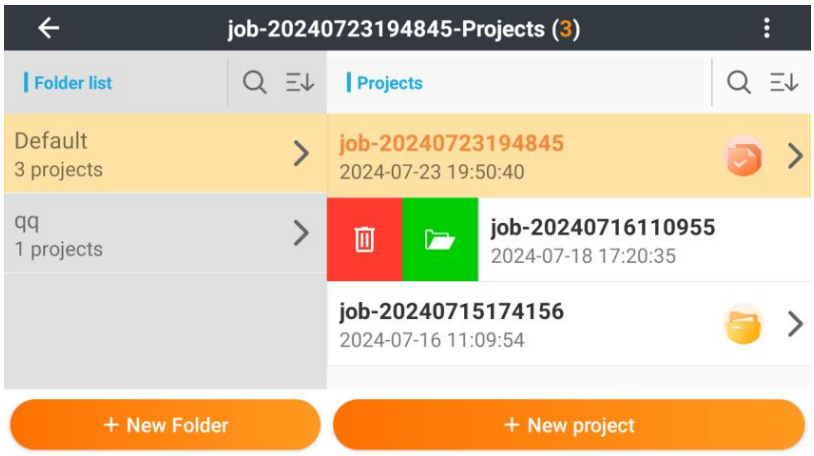
2.1.2 Delete

Select the project, drag to the right and click "Delete", delete the project file, will pop up a dialog box "Unrecoverable, delete the project?", select Delete to delete the project file. Choose cancel, do not delete the project file.

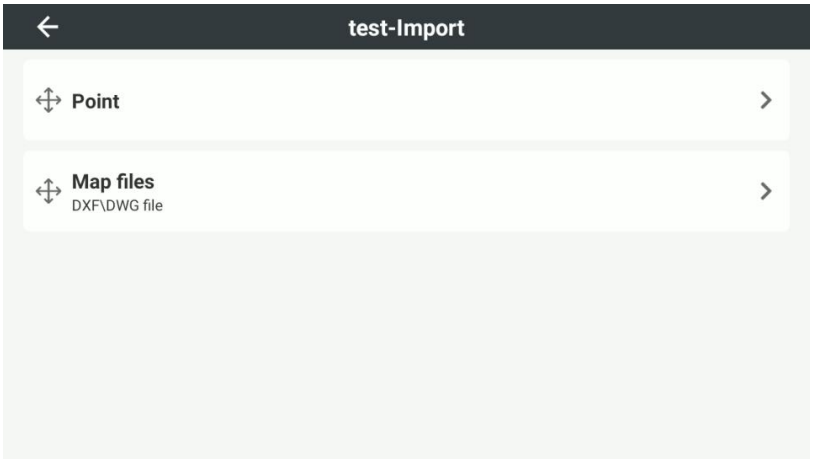


2.1.3 Open

If you want to continue a certain job, you can open the previous project, drag to the right and click "Open". When you want to open another project, select the project you want to open in the "Project" interface and click "Open".



2.2 Import



2.2.1 Text file Import

[Format]: Various types of file formats, including.txt \.csv \.dat \.xls \.xlsx, etc., can meet most customer needs;

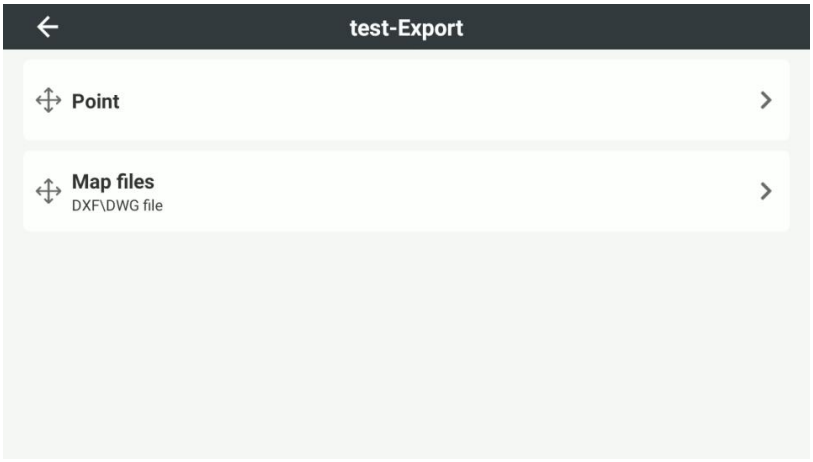
[Path]: Select the path where the data file is stored and select the data file to be imported.

[Parameter]: customize the style of the imported file.

2.2.2 Map files import

[Format]: AutoCAD DXF \ DWG Files (*dwg, *.dxF) format is currently supported.

2.3 Export



2.3.1 Text file Export

The function of the derived point is to export the point coordinates to the desired format.

[Format]: .txt \.csv \.dat \.xls \.xlsx type file format, a variety of fixed arrangement format optional, can meet most customer needs, users can also customize the file format. By default, the file is exported to the project directory. If there is a file with the same name, a message is displayed indicating that "**A file with the same name already exists, overwrite it?**" You can also quickly select the directory

After selecting the file format, you can also filter the exported data. The filtering fields include:

[Filter-Type]: Survey, Enter, Control, Station can be selected.

[Filter-Measurement time]: You can choose **today**, **1 Week**, **All**, or customize the **Start data** and **End data**.

[Filter-Keyword]: including **Name**, **Code** and **Description** keywords.

[Path]: Export file path, there is a default export folder.

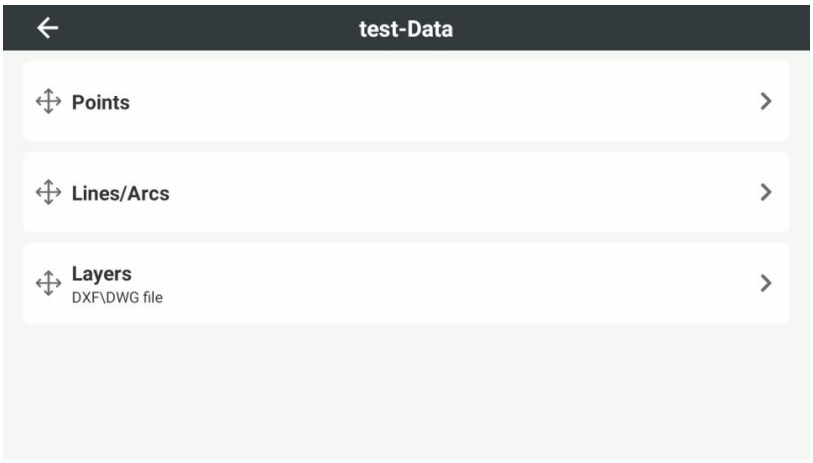
2.3.2 Map files Export

[Format]: Mainly export the required format, currently support AutoCAD DXF 2007 (.DXF), AutoCAD DWG 2007 (.DWG) files.

2.4 Data

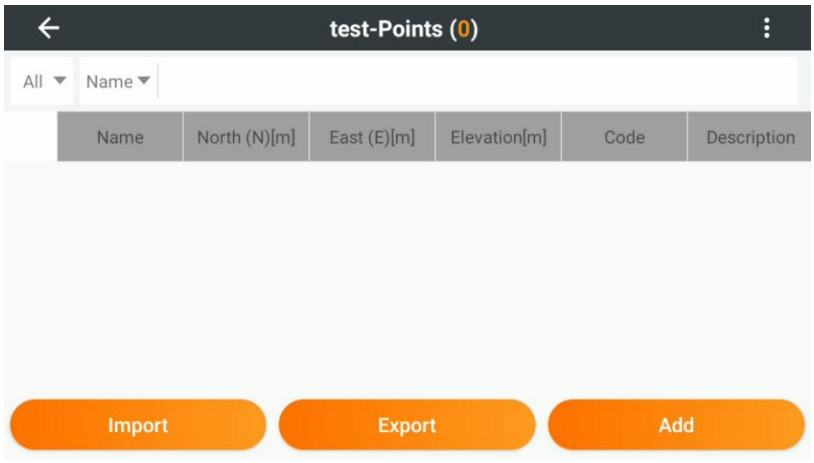
2.4.1 Points

Data includes points, line/Arcs and Layers.



Points is used to manage all types of coordinate points in a unified manner. In point management, the coordinates of enter points, survey points and control points can be viewed.

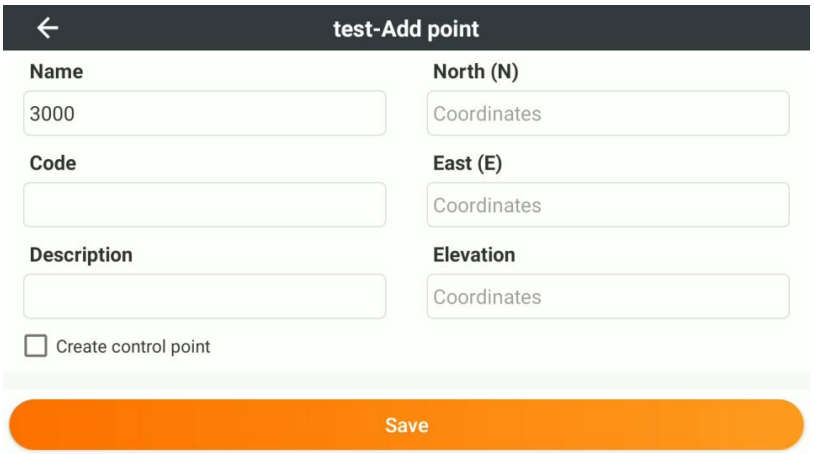
Points management includes delete, details, add, query, recycle bin and many other content.



2.4.1.1 Add point

Click **Add** to create the point. When creating a point, the following attributes are included: Name, code, Description, North coordinate, East coordinate, elevation coordinate, whether to save as a control point, enter the coordinates of the point to be created, the code and description are not required.

Set the above values, click **[Save]**, a point coordinate can be built.



2.4.1.2 Search point

The search criteria can be queried by any of the conditions such as the type, name, code, and description of the point.

Point type: It can be queried by survey point, enter point and control point

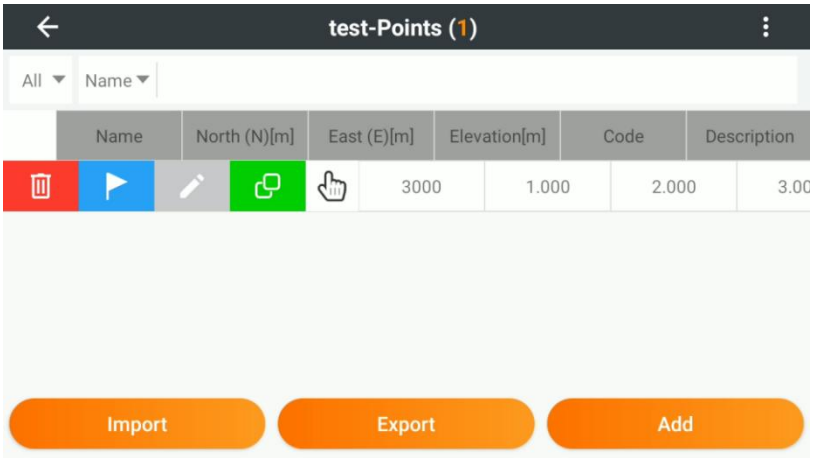
Name: Full match filtering can be done by name.

Code: Can be accurately filtered by code.

Description: Can accurately filter by remarks.

2.4.1.3 Delete point

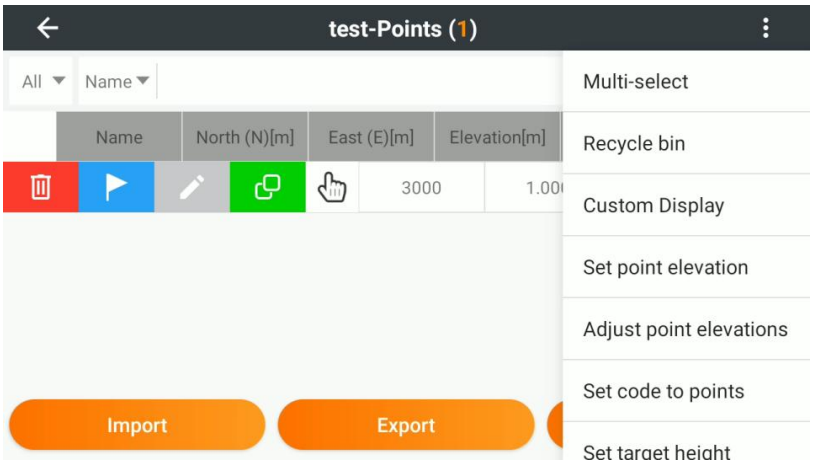
Select a point and swipe right to delete, stakeout, editing, copying the point, such as: delete point.



2.4.1.4 More operate

The three small dots ⋮ in the upper right corner have Select multiple, recycle bin,

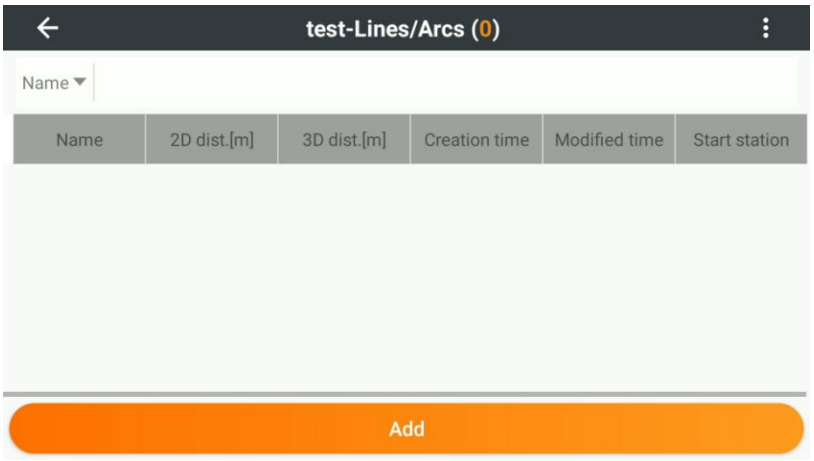
custom display,set point elevation, etc.



2.4.2 Lines/Arcs

Lines/Arcs management is used to manage line files of all kinds types in a unified manner. On the line management page, you can view the line name, line length(2D distance and 3D distance), creation time, modified time,and start station of all line files.

You can also delete, stakeout, and edit any line.



2.4.2.1 Add line

Click [Add] to create a line, you can create a line, polyline, arc, circle, as follows:

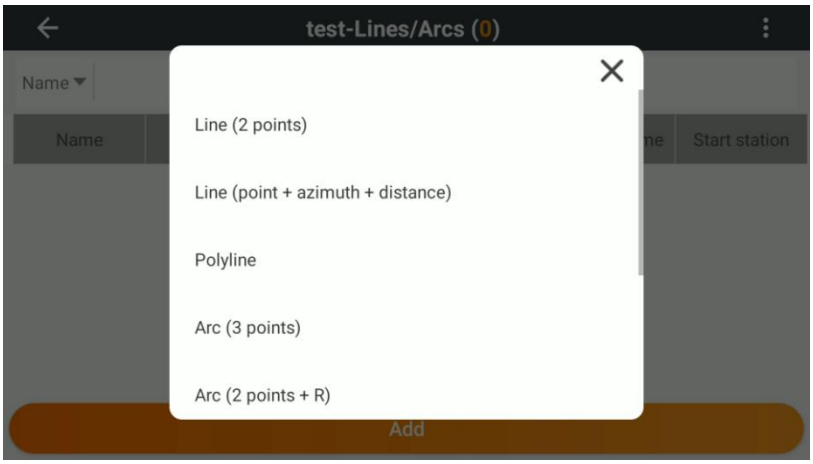
1.Create Line

Way one: Select two points to create a line.

Way two: Select a point + azimuth + distance to create a straight line.

2.Create Polyline

Way: Select two or more points to create a polyline.



3.Create Arc

Way one: Select three points that are not in the same line to create the arc.

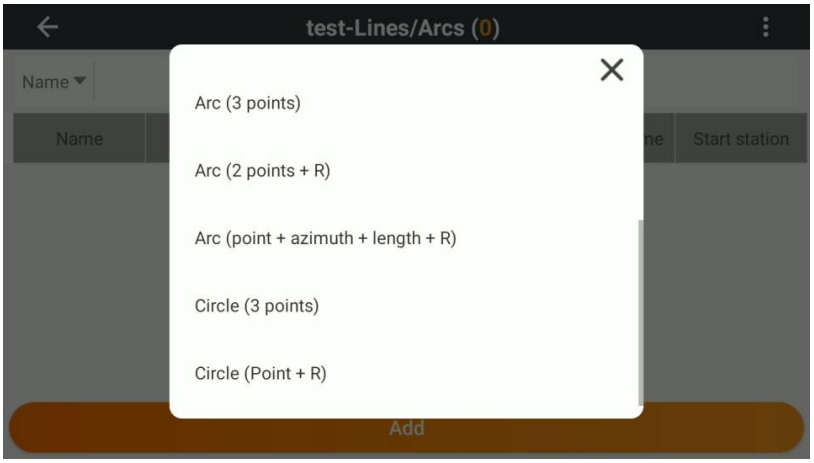
Way two: Select two points + circle radius to create an arc.

Way three: Select a point + azimuth + length + radius to create an arc.

4.Create Circle

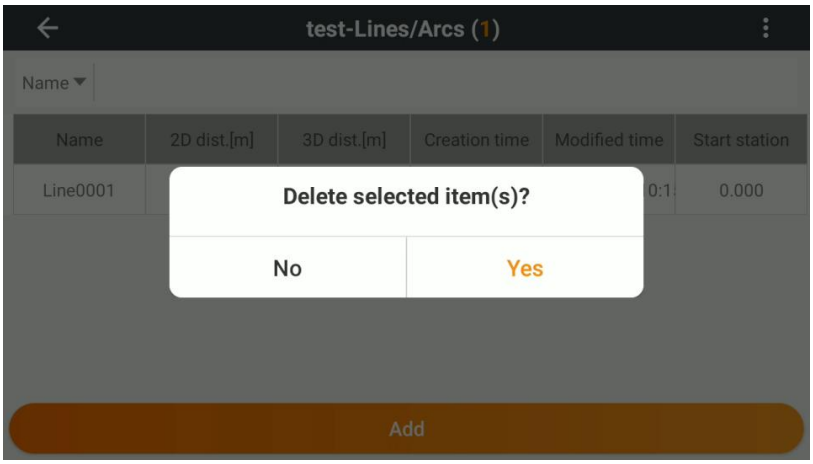
Way one: Select three points that are not in the same line to create the circle.

Way two: Select one point + circle radius to create an circle.



2.4.2.2 Delete line

When the line is selected, swipe right and select [Delete], the deletion confirmation dialog box "**Delete selected item(s)?**" will pop up. If the option is **Yes**, delete the record; If you select **No**, the record will not be deleted.

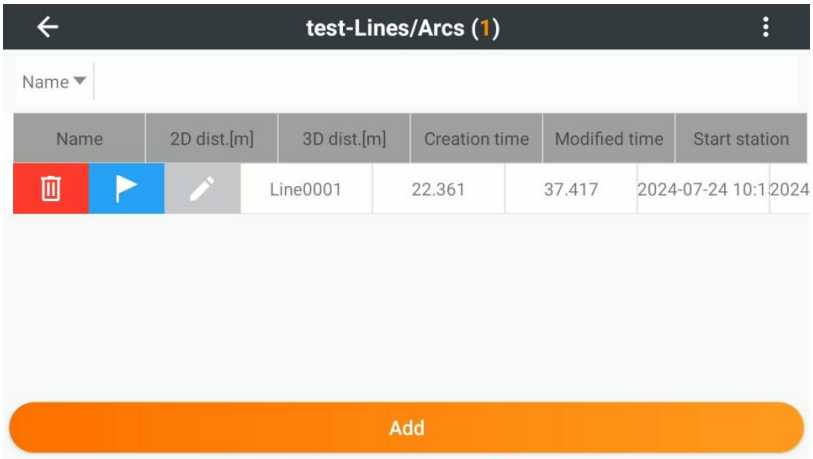


2.4.2.3 Stakeout line

Select the line and swipe right and click [Stakeout] to jump directly to the line stakeout.

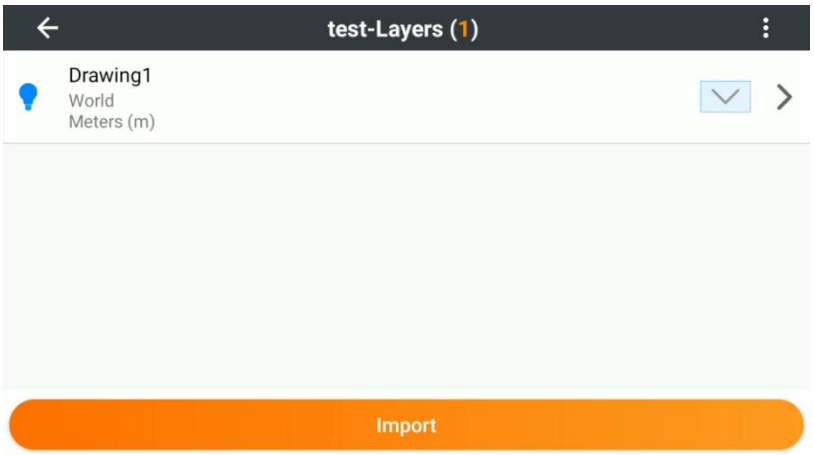
2.4.2.4 Line details

Select the line, swipe right and click [Edit] to view the detailed information of the selected line.



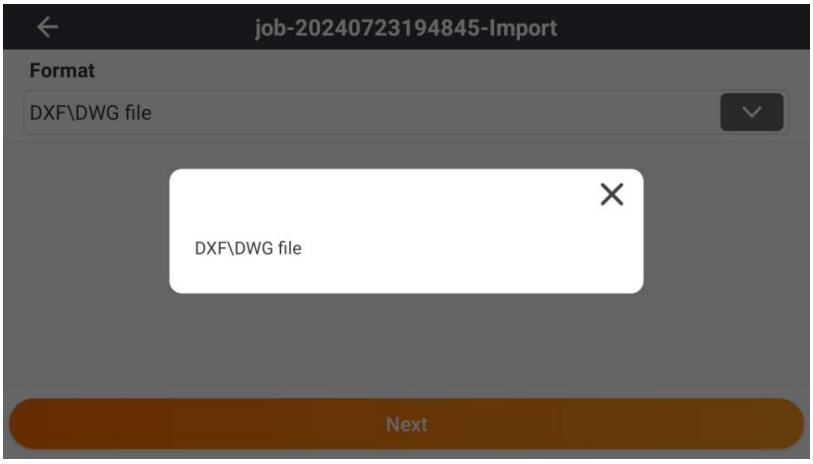
2.4.3 Layers

Layers management used to unified management of imported DXF\DWG file, layers management can view any imported base map layer information, you can delete, map adjustment, edit properties.



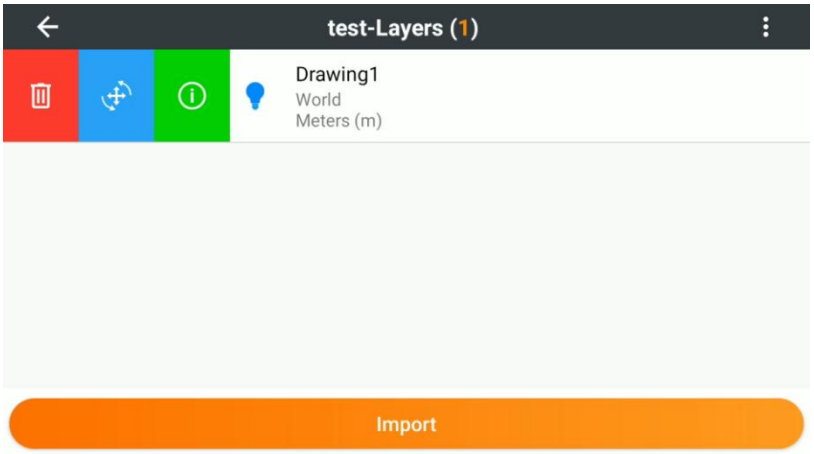
2.4.3.1 Import Map

Click **[Import]**, select the format to be imported, then select the path of the file to be imported, select the map file to be imported, and click Import.



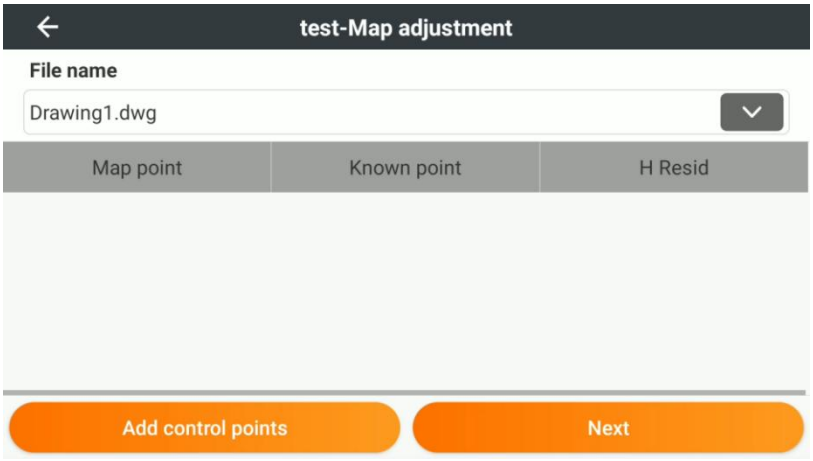
2.4.3.2 Delete Map

Select a base map, click **[Delete]**, the deletion confirmation dialog box will pop up "**Points and lines associated with the layers will be deleted, continue?**" If yes, delete the base map. If you select No, the base map will not be deleted.



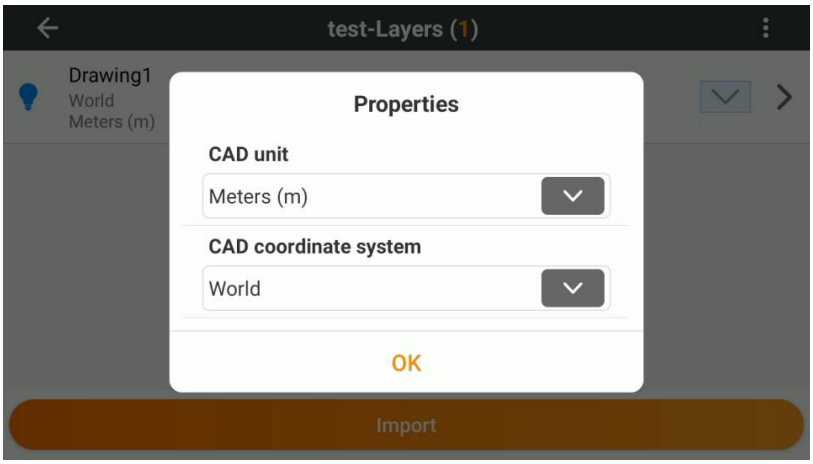
2.4.3.3 Map adjustment

Select a map and click [Map adjustment] to enter the calculation display interface. You can add point pairs to calculate adjustment parameters.



2.4.3.4 Map properties

Select a map, click [Properties], enter the map properties interface, you can modify the unit and the CAD coordinate system of the map, .



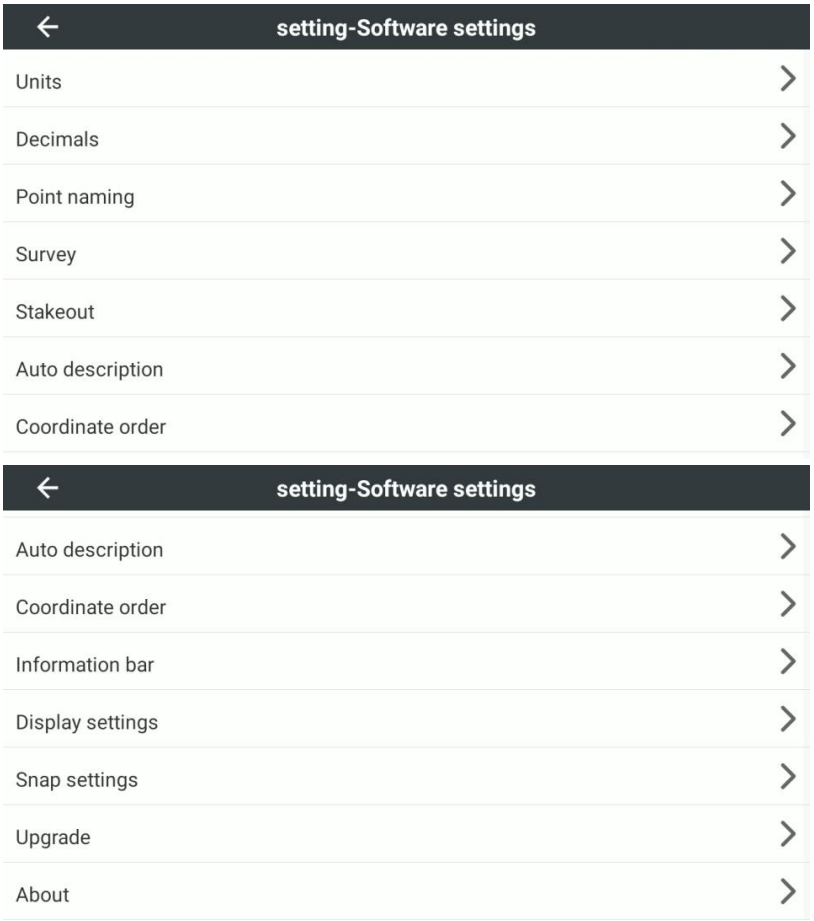
3.Settings

This chapter introduces:

- Software Setup
- Exit

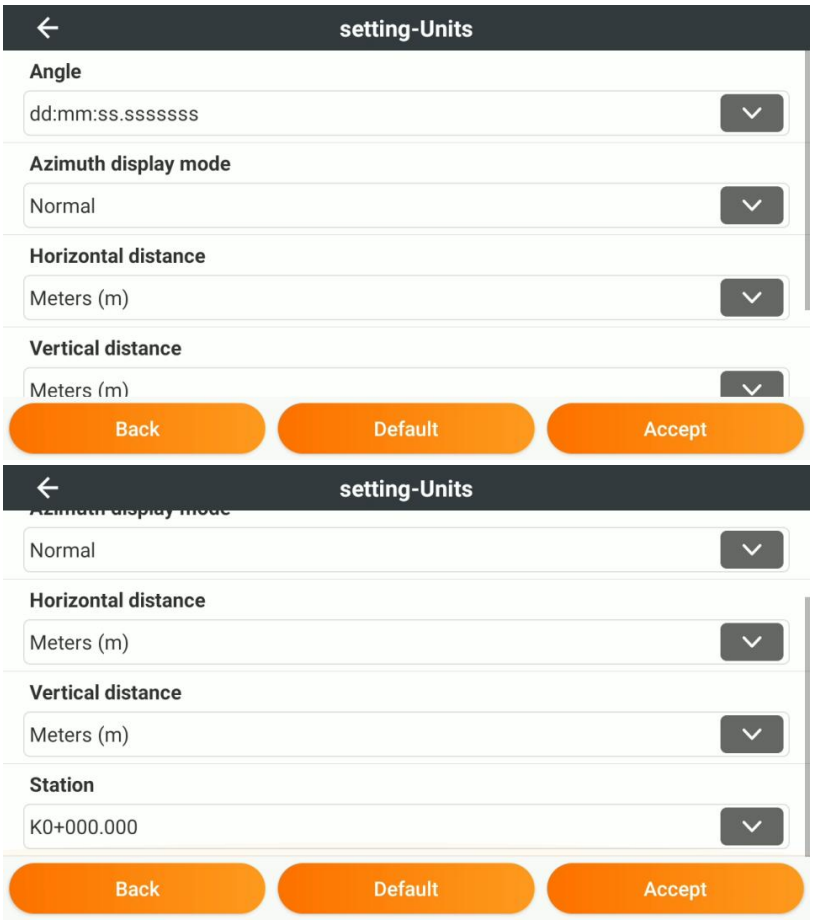
3.1 Software Setup

Software Settings include units, decimals, point naming,survey, stakeout, auto description, coordinate order, information bar, display Settings, Snap Settings, upgrade, and about.

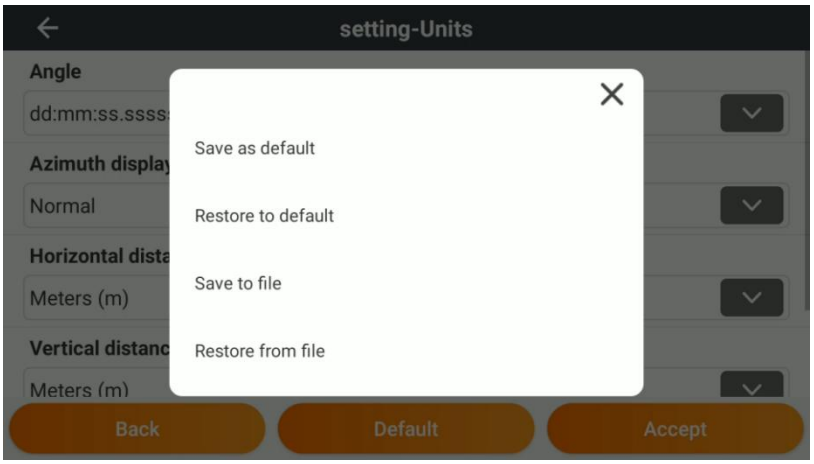


3.1.1 Units

Angle unit, azimuth display mode, horizontal distance unit, vertical distance unit, station display can be set.

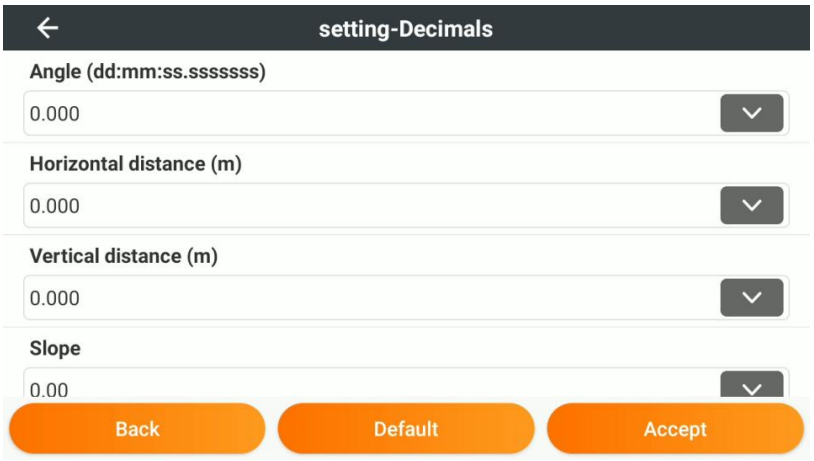


Click **Default**, and a dialog box will pop up. You can choose to **Save as default**, **Restore to default**, **Save to file**, or **Restore from file**. This option is available for other Settings.



3.1.2 Decimals

Angle, horizontal distance, vertical distance, slope decimal can be set.



3.1.3 Point naming

You can configure the **Auto increment name interval**, stakeout(point) naming method, and stakeout(line) naming method.

[**Auto increment name interval**] : can be a positive integer and a negative integer greater than or equal to -10. This rule is used for measurement point name, point name starts with 1 by default. This rule is also used when the point stakeout name and line stakeout name are selected for **Auto increment**. The point name starts from 1000 and 2000 by default. Input points also use this rule, and point name start at 3000 by default.

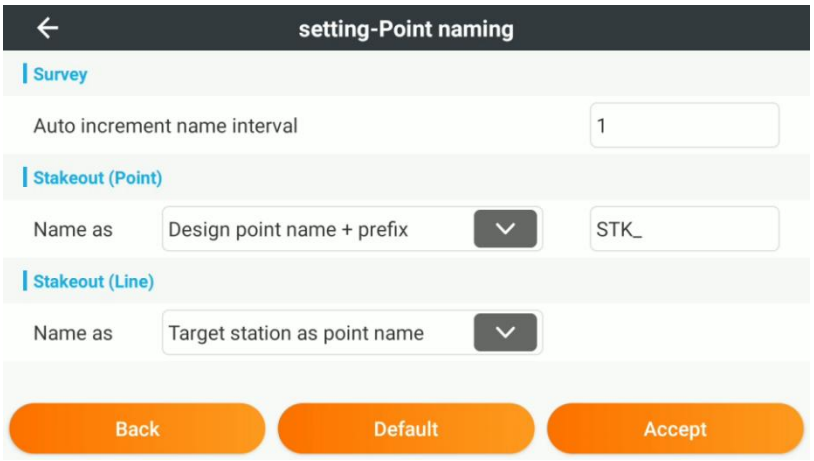
Examples of **Auto increment** rules:

When auto increment point name step is positive 1: When the end of point name is a number, such as a1, the next point name is a2. If the point name ends with a letter, such as 1a, the next point name is 1b. If the point name ends with another character, such as 1-, the next point name is 1-1.

When the auto increment point name step is negative -1: point name is a pure number, such as 1, and the next point name is 0. The point name is not a pure number, such as 1a, the next point name is 1a-1, and the next point name is 1a-2.

[Stakeout name (Point)] : point name rules have **prefix + design point name**, **design point name + suffix**, **design point name + constant**, **Auto increment**.

[Stakeout name (line)] : point name rules have **Target station as point name**, **Real time station as point name**, **Auto increment**.



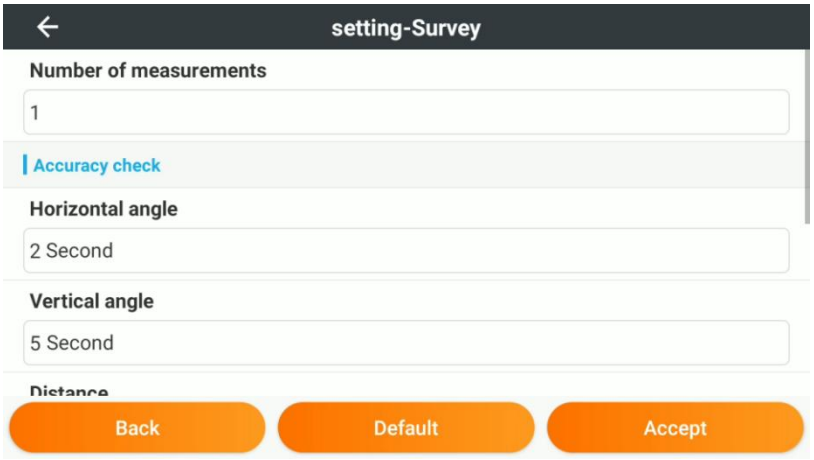
3.1.4 Survey

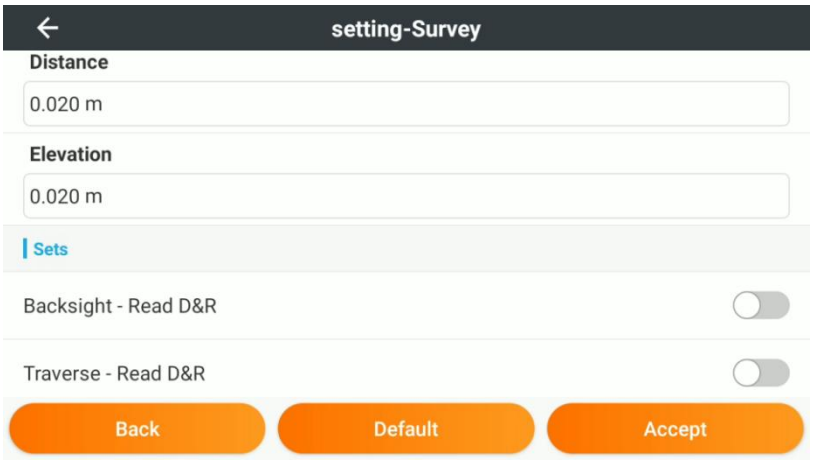
Survey settings can be configured with the **number of measurements**, **Accuracy check**, **Read Direct & Reverse** set.

[Number of measurements] : The number of measurements in a single measurement.

[Accuracy check] : including **Horizontal Angle**, **Vertical Angle**, **Distance**, **Elevation**, any data exceeding the limit difference will give a hint when measuring.

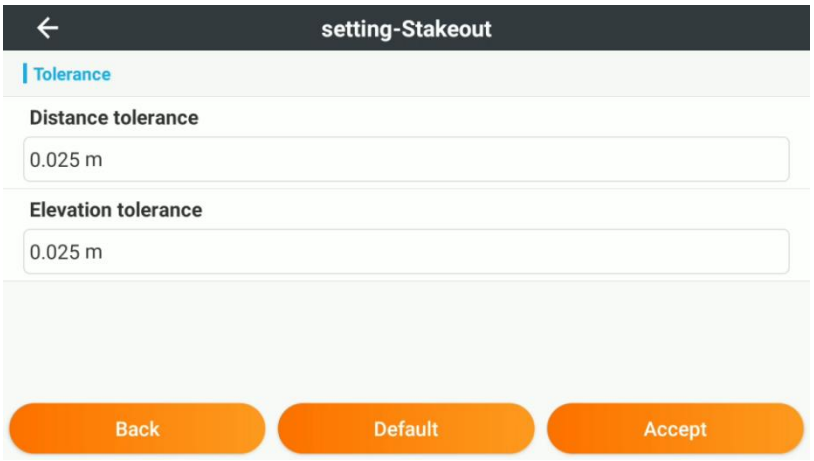
[**Read Direct & Reverse**] : including **Backsight - Read Direct & Reverse** set and **Traverse - Read Direct & Reverse** set. When the switch is turned on, the average value of each Direct & Reverse measurement should be taken as the result.





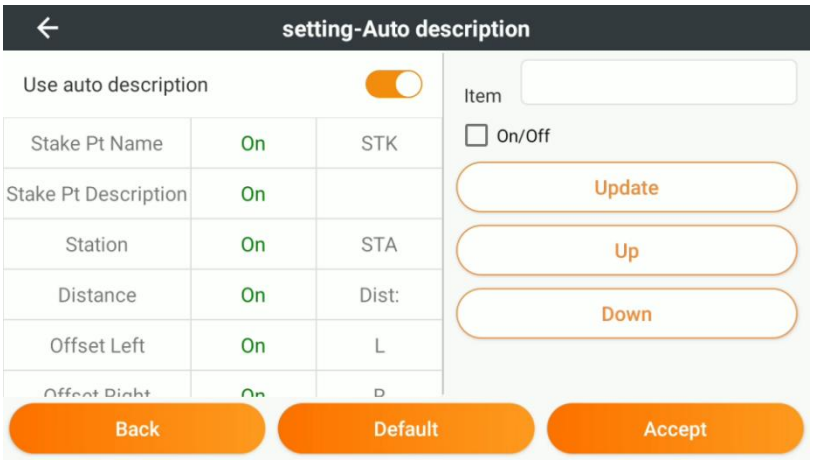
3.1.5 Stakeout

Stakeout is set with Distance tolerance and Elevation tolerance. When the distance or elevation difference between the measuring point and the stakeout target exceeds the limit tolerance, the software will give corresponding prompts.



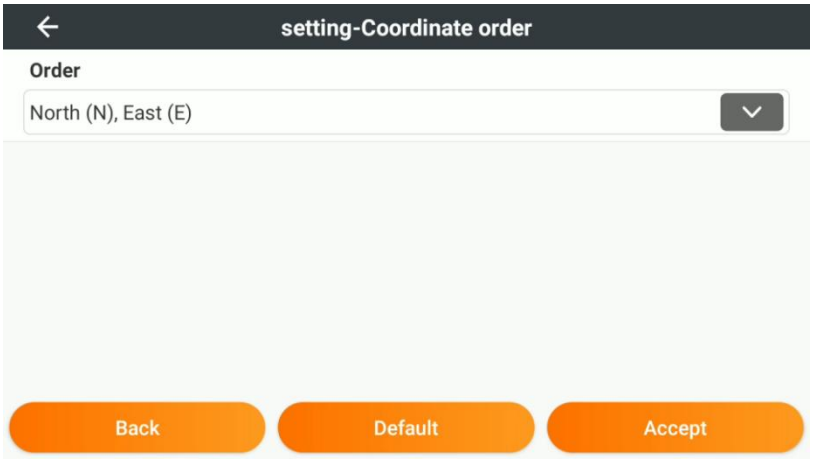
3.1.6 Auto description

After auto description are enabled, the stakeout points obtained during stakeout will automatically generate description according to the corresponding stakeout information. The information that can be configured includes stake Pt Name, Stake Pt Description, Station, Distance, Offset Left, Offset Right, Cut, Fill.



3.1.7 Coordinate order

You can set the coordinate order. The default value is North(N), East(E). You can select East(E) and North(N).



3.1.8 Information bar

The information bar setting can set the display information of Measure, stakeout point and stakeout line respectively.

1.Measure

By default, the information displayed in the information bar of the measurement interface includes [Horizontal angle - HA], [Vertical angle - VA], [North - N], [East - E], and [Elevation - Elev.]. The information not displayed by default includes [Horizontal distance - HD], [Slope distance - SD], and [Different in height - dH].

[Horizontal angle - HA] : instrument horizontal angle

[Vertical angle - VA] : instrument vertical angle

[North - N] : The north coordinate of the measurement position

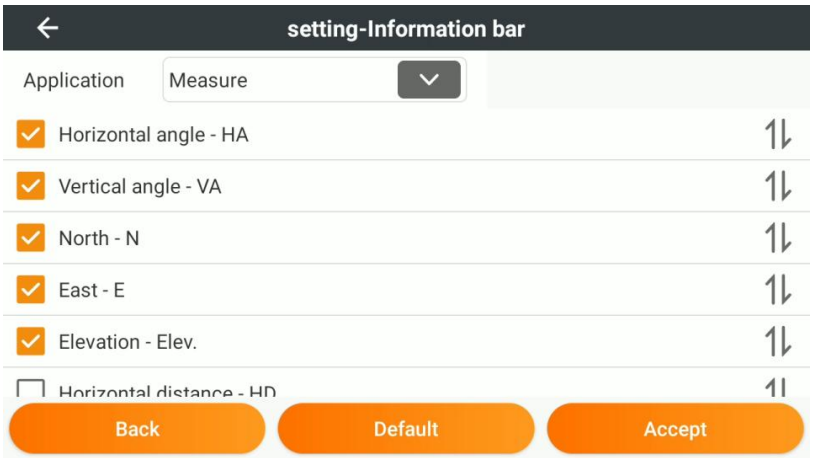
[East - E] : The east coordinate of the measurement position

[Elevation - Elev.] : Measuring position elevation

[Horizontal distance - HD] : The plane distance between the measuring position and the instrument

[Slope distance - SD]: The slope distance between the measuring position and the instrument

[Different in height - dH]: measuring position elevation minus instrument elevation



2.Stakeout point

In the stakeout interface, when the stakeout target is a point, the default information displayed is [Go], [Stake distance - Dist.], [Cut/Fill], Other optional information is [Design elevation - Dsn Elev.], [Elevation - Elev.], [dN], [dE], [dZ], [Horizontal angle - HA], [Vertical angle - VA], [Horizontal distance - HD], [Slope distance - SD], [Different in height - dH], [North - N], [East - E].

[Go]:Include Go Farther away /Come Near + Go Left /Go Right, the reference direction is the connection between the station and the measurement point.

[Stake distance - Dist.]: Distance between measuring point and stakeout target

[Cut/Fill]: Measuring point elevation minus stakeout target elevation, positive is cut, negative is fill, and the display value is taken as absolute value.

[Design elevation - Dsn Elev.]: Elevation of the stakeout target

[Elevation - Elev.]: The elevation of the measuring point

[dN]: Measuring position north coordinates minus stakeout target north coordinates

[dE]: Measuring position east coordinates minus stakeout target east coordinates

[dZ]: Measuring position elevation minus stakeout target elevation

[Horizontal angle - HA]: Instrument horizontal angle

[Vertical angle - VA]: Instrument vertical angle

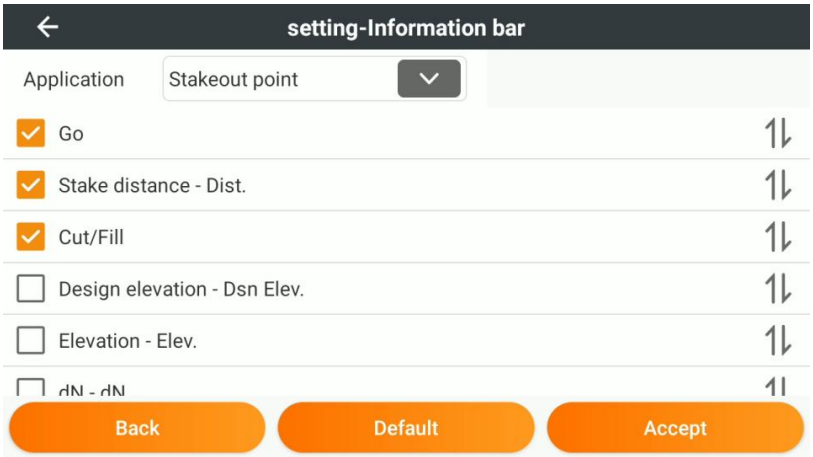
[Horizontal distance - HD]: The plane distance between the measuring position and the instrument

[Slope distance - SD]: The slope distance between the measuring position and the instrument

[Different in height - dH]: measuring position elevation minus instrument elevation

[North - N]: Measuring point north coordinates

[East - E]: Measuring point east coordinates



3.Stakeout line

In the stakeout interface, when the stakeout target is a line, the default information displayed is [Ahead/Back], [Inward /Outward], [Stake distance - Dist.], [Cut/Fill], [Station - Sta], [Offset - Off]. Other optional information is [Design elevation - Dsn Elev.], [dN], [dE], [dZ],, [Go], [Design station - Dsn Sta.], [Horizontal angle - HA], [Vertical angle - VA], [Horizontal distance - HD], [Slope distance - SD], [Different in height - dH], [North - N], [East - E], [Elevation - Elev.].

[Ahead/Back]: Target station minus real-time station, positive is forward, negative is backward, the display value takes absolute value.

[Inward /Outward]: The absolute value of the offset from the stakeout target, near the center line is inward, away from the center line is outward

[Stake distance - Dist.]: Distance between measuring point and stakeout target

[Cut/Fill]: Measuring point elevation minus stakeout target elevation, positive is cut, negative is fill, and the display value is taken as absolute value

[Station - Sta]: Real-time station

[Offset - Off]:the vertical distance from the current point to the line, is negative to the left

of the line and positive to the right of the line

[Design elevation - Dsn Elev.]: Elevation of the stakeout target

[dN]: Measuring position north coordinates minus stakeout target north coordinates

[dE]: Measuring position east coordinates minus stakeout target east coordinates

[dZ]: Measuring position elevation minus stakeout target elevation

[Go]:Include Go Farther away /Come Near + Go Left /Go Right, the reference direction is the connection between the station and the measurement point

[Design station - Dsn Sta.]: Stakeout target station

[Horizontal angle - HA]: Instrument horizontal angle

[Vertical angle - VA]: Instrument vertical angle

[Horizontal distance - HD]: The plane distance between the measuring position and the instrument

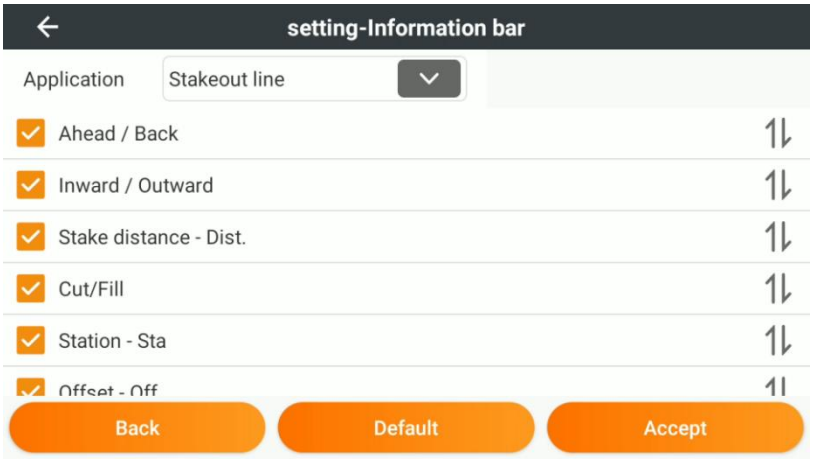
[Slope distance - SD]: The slope distance between the measuring position and the instrument

[Different in height - dH]: measuring position elevation minus instrument elevation

[North - N]: Measuring point north coordinates

[East - E]: Measuring point east coordinates

[Elevation - Elev.]: Measure the elevation of the position



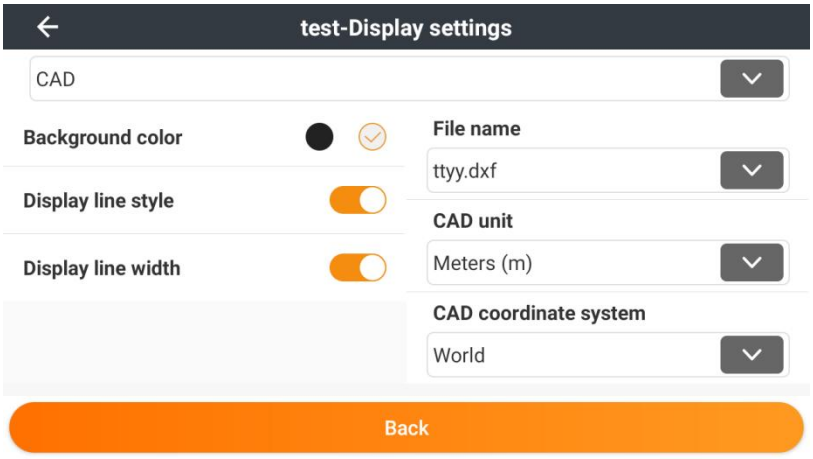
3.1.9 Display settings

Can configure CAD, point, line related display information.

1.CAD

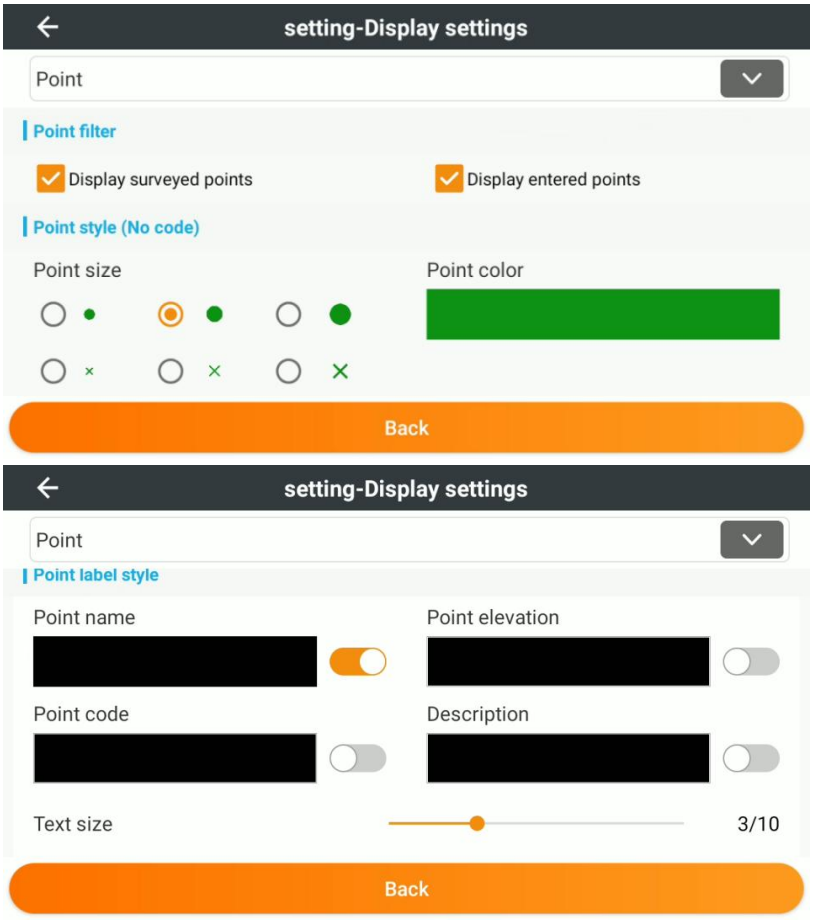
You can set the **Background color**, **Display line style**, **Display line width**, and whether **Display coordinates after point selection**.

You can also display the file name and set the CAD unit and CAD coordinate system.



2.point

You can set whether to Display surveyed points and Display entered points, point style, and point label style.

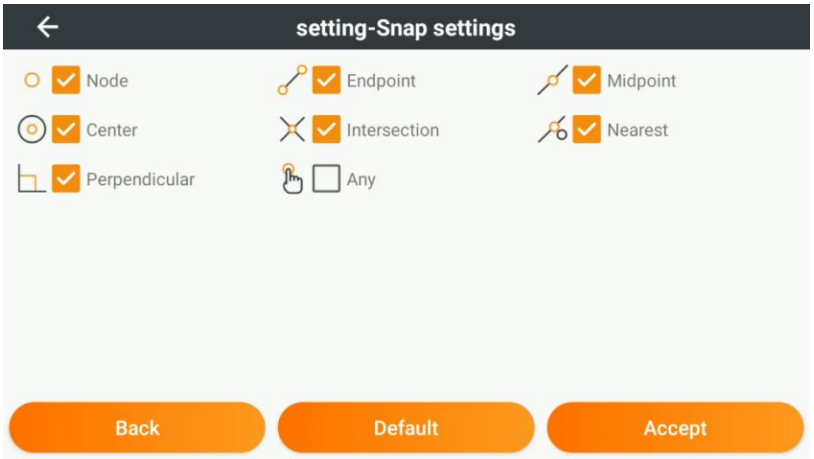


3.line

Line label style can be set.

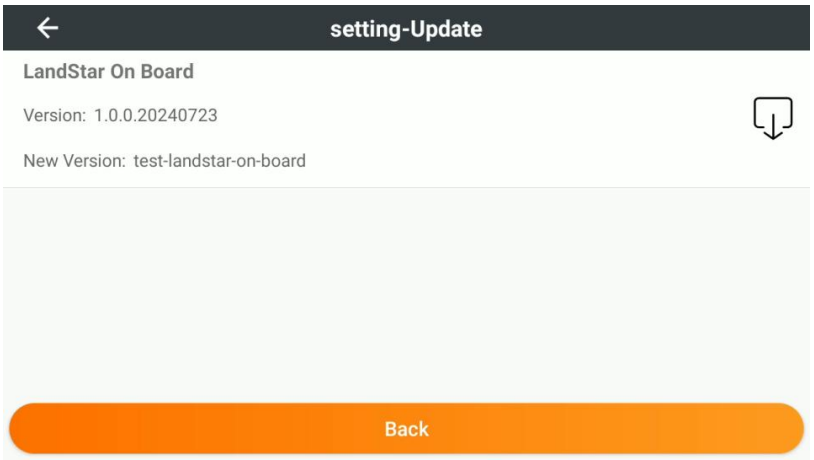
3.1.10 Snap settings

You can configure the points you can select when snapping.



3.1.11 Upgrade

You can receive the push of the new software version and upgrade the software.

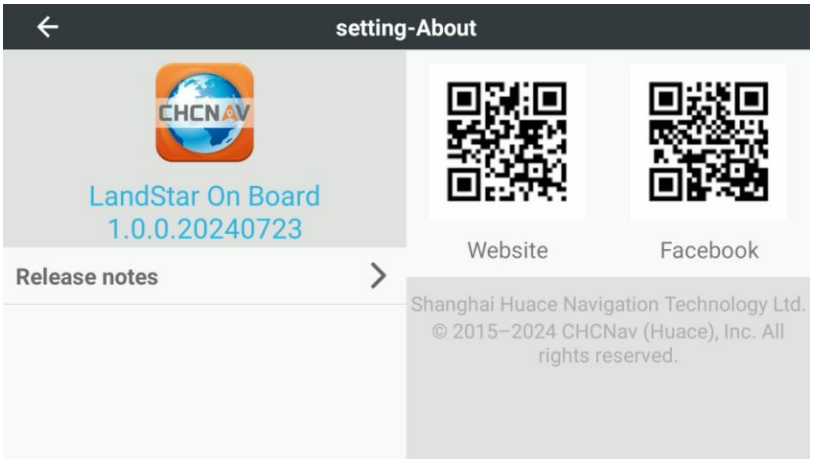


Make sure you have a network connection before checking for updates, see sections 4.10

and 4.11 for details

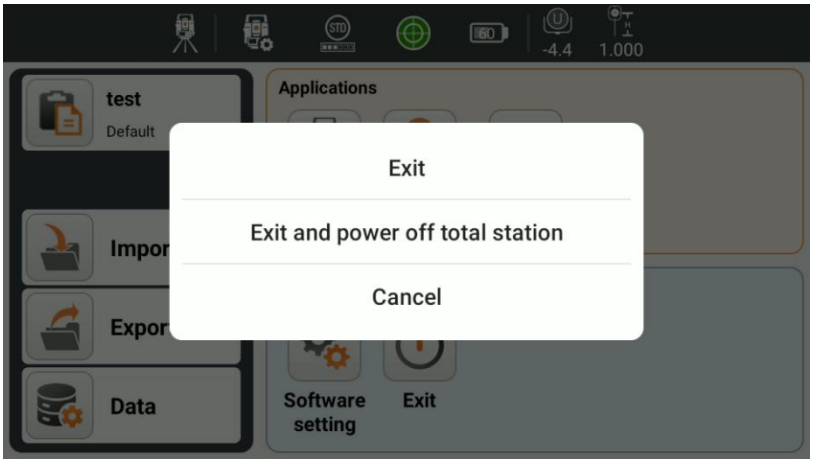
3.1.12 About

You can view the software version.



3.2 Exit

Click Exit will pop up a dialog box, you can choose to **Exit** the software, **Exit and shut power off the total station** and **Cancel**.



4.Applications

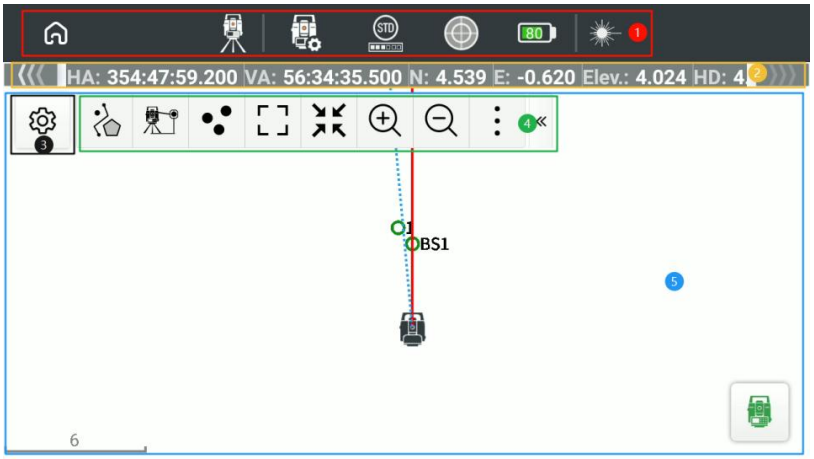
This chapter introduces:

- Station setup
- Survey
- Stakeout

4.1 Station setup

After clicking enter the station setup interface, which corresponds to the same function as the station setup in the status bar, but the entrance is different. For details, see 1.1.

4.2 Survey



After setup the station, you can enter the measurement interface for point measurement. The measurement interface is composed of five parts from top to bottom: **status bar**, **information bar**, **Settings**, **toolbar** and **view**.

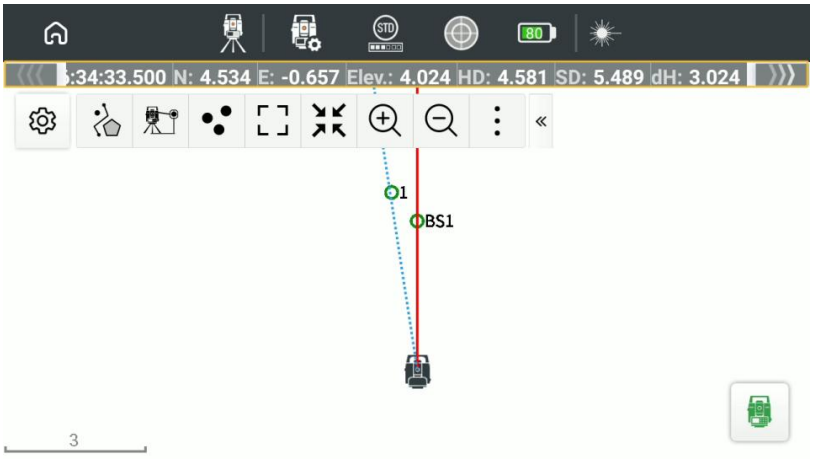
4.2.1 Status bar

The function of the status bar of the measurement interface is the same as that of the status bar of the main interface. Only a home button is added in the upper left corner for returning to the home page. For other functions, see the Chapter 1.status bar.

4.2.2 Information bar

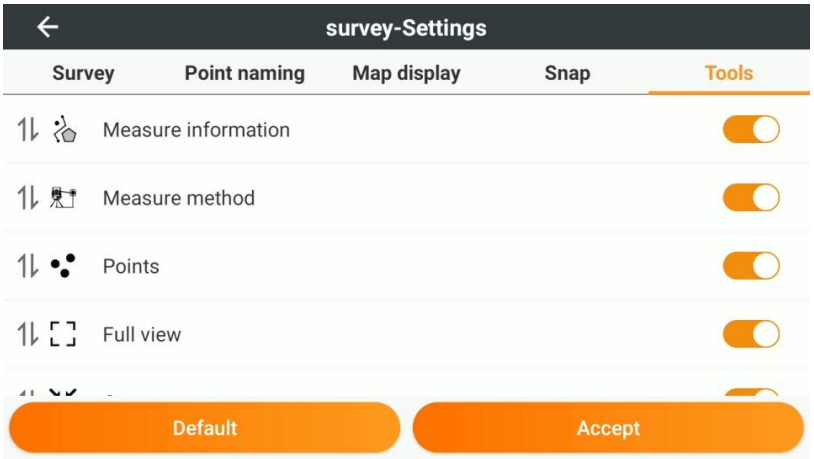
The display and order of the information in the information bar can be set in the software

Settings. The information will display the information related to the latest measurement. The information can be swipe left and right. And the position of the information bar will be recorded. The reentering page or the reentering software will display the previous position.

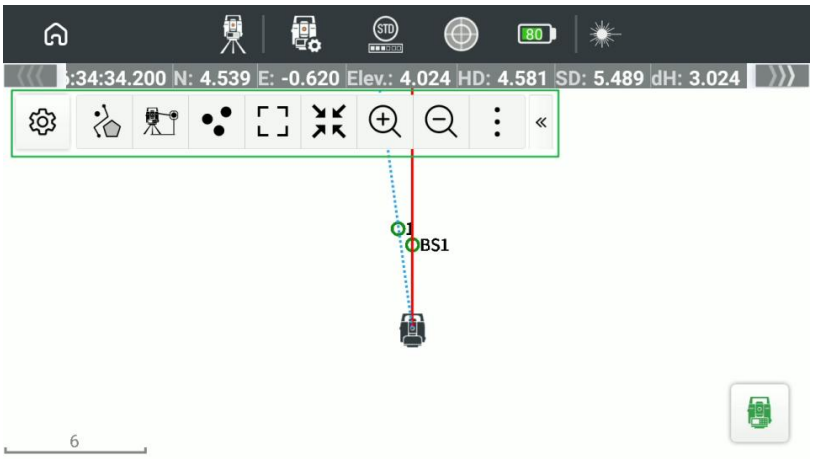


4.2.3 Settings

Settings can configure **Survey** Settings**, Point naming** Settings, **Map display** Settings, **Snap** Settings, and **Tools** Settings. Except tool Settings, other Settings can be configured in software Settings. For details, see 3.1 Software Setup. Tool settings can configure the toolbar of the measurement interface.



4.2.4 Tool bar



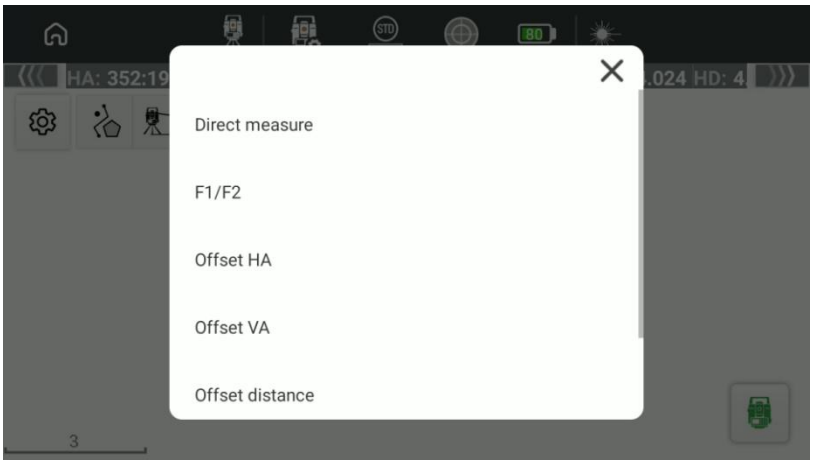
The display and order of the tools can be set in the measurement Settings. The default display tools include [Survey information], [Survey method], [Points], [Full], [Center], [Zoom in], and [Zoom out]. The default not display tools include [Redraw], [One-click Find], [Hide/show data], [Hide/show base map], [Delete previous point], and [Edit previous point]. The right side of the toolbar has [More functions] by default, and the far right side is the button to collapse and expand the toolbar.

[Survey information] : You can set the point name, code and description before survey.

When the "show every time" switch is turned on, the survey information page will pop up after measurement is completed. Otherwise, the point information will be automatically saved.

[Survey method] : The survey methods include **Direct measure**, **F1/F2**, **Offset HA**, **Offset VA**, **Offset distance**. When F1/F2 measurement is selected, the average value of each Direct & Reverse measurement should be taken as the result.When the **Offset HA** is selected, the offset coordinate is obtained by moving a horizontal Angle take the instrument as the center after measurement.When the **Offset VA** is selected, the offset coordinates are obtained by calculating the height difference with the moving vertical angle after measurement.When selecting **Offset distance**, the offset coordinates are calculated

according to the input values of front/back, left/right, up/down after measurement.



[Points] : For quick access to the point library.

[Full] : Zoom view to show all features.

[Center] : Position the instrument in the center of the view.

[Zoom in] : Enlarged view.

[Zoom out] : Reduced view.

[Redraw] : Redraws the data on the view.

[one-click Find] : Used to quickly find data on a view, such as a base map.

[Hide/show data] : Used to hide/show data, such as points and line.

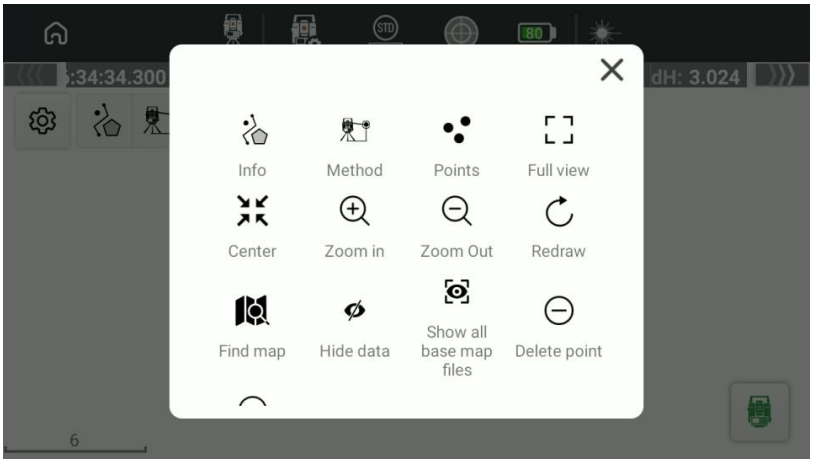
[Hide/show base map] : Used to hide or show the base map view。

[Delete previous point] : Delete the previous measurement point.

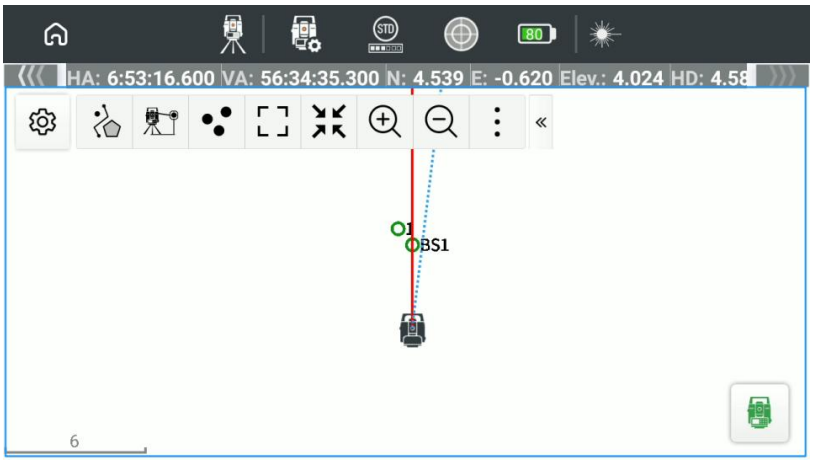
[Edit previous point] : Edit the previous measurement point.

More functions : Always in the last position of the toolbar, it is displayed by default and

cannot be edited. The multi-dialog box will disappear automatically if no operation is performed within five seconds, and all tools are displayed, which is consistent with the tool function in the toolbar.



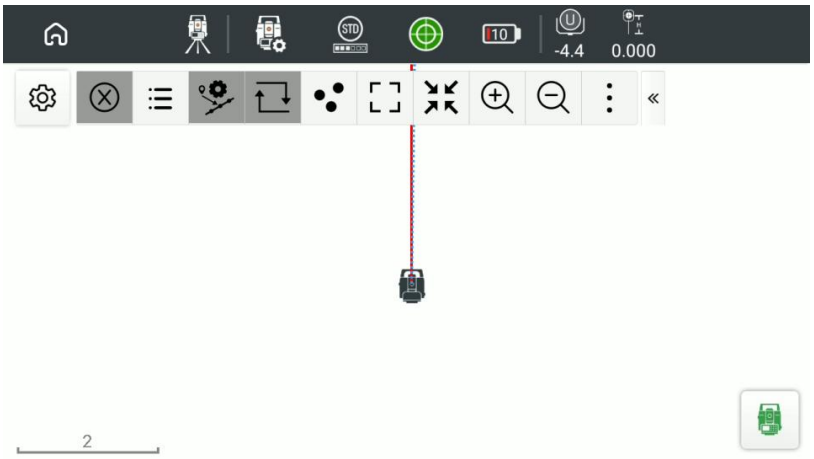
4.2.5 View and Operation



The icon of the total station is the position of the instrument, the red line is the direction of the station, and the blue line is the direction of the instrument. Point, line, and base map data can be displayed on the view. The scale is displayed in the lower left corner of the view, and the measurement button is displayed in the lower right corner. Click the measurement button to measure, and you can save the corresponding data after measuring.

4.3 Stakeout

After the station setup, you can enter the stakeout interface for point and line stakeout. Like the measurement interface, the stakeout interface is also composed of Status bar, Information bar, Settings, Tool bar and Views, but the information bar is hidden when there is no stakeout target.



4.3.1 Status bar

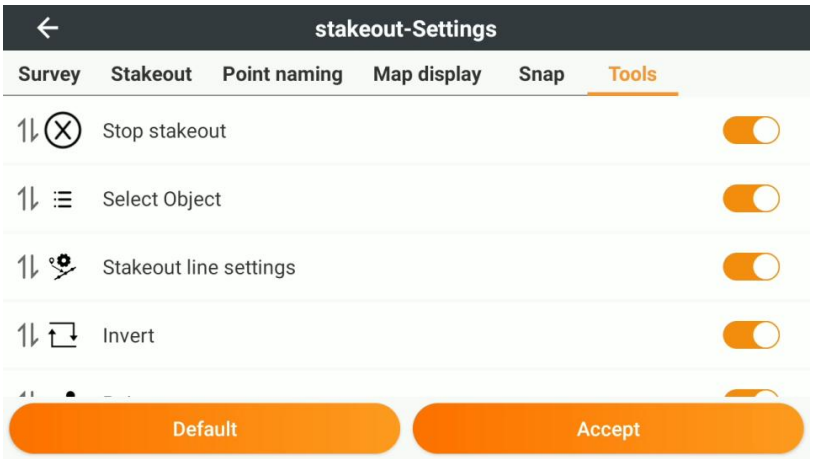
The status bar of the stakeout interface is exactly the same as that of the measurement interface, see 4.2.1 for details.

4.3.2 Information bar

In the stakeout interface, the information bar will display different contents according to the type of stakeout target, and the point and line stakeout display their respective information respectively. When there is no stakeout target, the information bar is hidden.

4.3.3 Settings

Settings can configure **Survey** Settings, **Stakeout** Settings, **Point naming** Settings, **Map display** Settings, **Snap** Settings, and **Tools** Settings. Except tool Settings, other Settings can be configured in software Settings. For details, see 3.1 Software Setup. Tool settings can configure the toolbar of the measurement interface.



4.3.4 Tool bar

The display and order of the tools can be set in the measurement Settings. The default display tools include [Stop stakeout], [Target selection], [Stakeout line setup], [Reversal], [Points], [Full], [Center], [Zoom in], and [Zoom out]. The default not display tools include

[Redraw], [one-click Find], [Hide/show data], [Hide/show base map], [Delete previous point], and [Edit previous point]. The right side of the toolbar has [More functions] by default, and the far right side is the button to collapse and expand the toolbar.

[Stop stakeout] ⊗ : Stop the current stakeout task, disable when there is no stakeout target.

[Target selection] ☰ : Select lofting target, you can select points, lines.

[Stakeout line settings] : Can set [line stakeout method], [Start station], [Stakeout elevation], [Stakeout interval], [Target station], [Horizontal offset], [Vertical offset] (not displayed when the elevation is ignored). Disabled when the stakeout target is not a line.

[Line stakeout method] : You can choose to stakeout to the line or Station & Offset

[Start station] : Set the start station of the line.

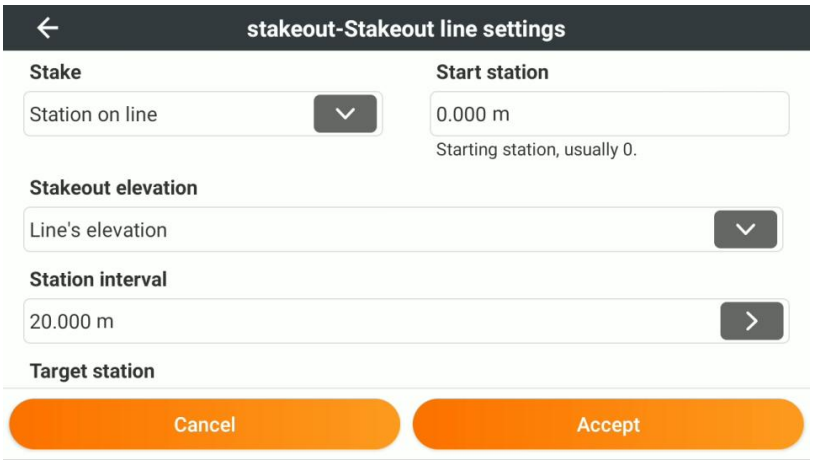
[Stakeout elevation] : can select line's elevation, Enter elevation, Ignore elevation.

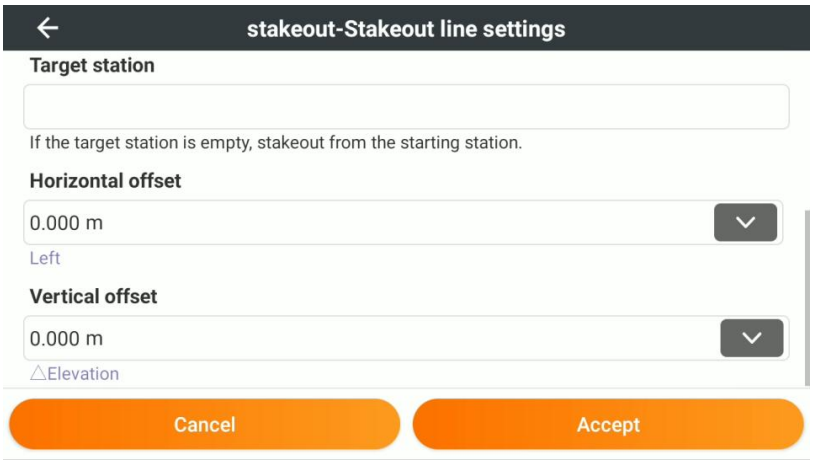
[Stakeout interval] : only display when stakeout the station, from the start station, the station is automatically generated according to the stakeout interval.

[Target station] : Set the station of the stakeout target.

[Horizontal offset] : the offset distance of the lofting target.

[Vertical offset] : The elevation deviation of the stakeout target, and the input methods are Elevation, ΔElevation, slope (Degrees), Zenith, Slope 1:N, Slope (%), Slope N:1.





[Reversal] : Change the direction of the selected line, disabled when the stakeout target is not a line.

[Points] : For quick access to the point library.

[Full] : Zoom view to show all features.

[Center] : Position the instrument in the center of the view.

[Zoom in] : Enlarged view.

[Zoom out] : Reduced view.

[Redraw] : Redraws the data on the view.

[one-click Find] : Used to quickly find data on a view, such as a base map.

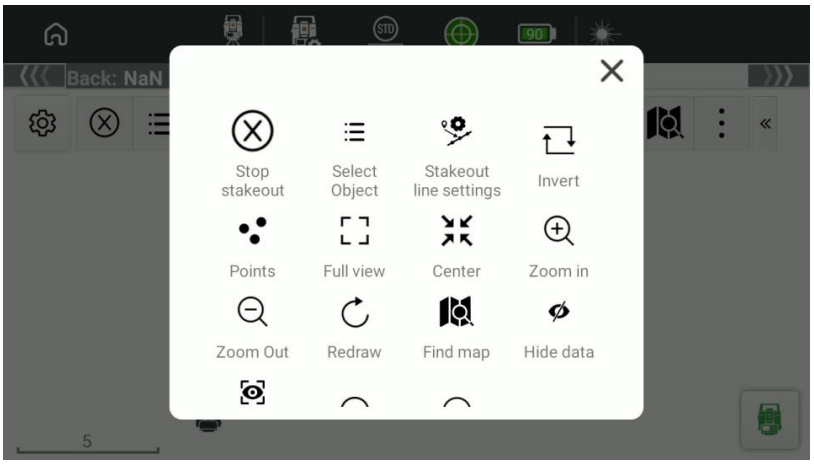
[Hide/show data] : Used to hide/show data, such as points and line.

[Hide/show base map] : Used to hide or show the base map view。

[Delete previous point] : Delete the previous measurement point.

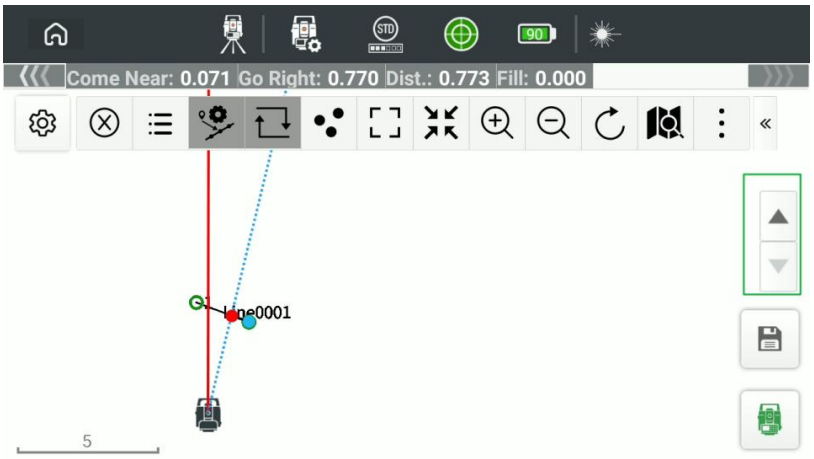
[Edit previous point] : Edit the previous measurement point.

More functions : Always in the last position of the toolbar, it is displayed by default and cannot be edited. The multi-dialog box will disappear automatically if no operation is performed within five seconds, and all tools are displayed, which is consistent with the tool function in the toolbar.



4.3.5 View and Operation

Point and line stakeout targets can be selected directly on the view, or through the [Target selection] , you can also be selected in the point management, line management right swipe stakeout.



Click the survey button , after the stakeout is completed, the Save button will appear, click save can jump to the point details page, save the results. When the stakeout target is a point, there is a button on the right side of the view, which will automatically switch the previous point/next point the point in the point library for stakeout.

CHC Navigation

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Make your work more efficient