Android Total Station ZTS-720 Series

Instruction manual

Preface

Instruction manual use

Welcome to use Zhongda Androidid total station ZTS-720 series instruction manual, this manual describes how to set up and use ZTS-720 series total station, in order for you to use the product better, please make sure to read this product instruction manual carefully, the sample pictures and icons in the manual are different from the actual product, please take the actual product as the standard. You can contact our local sales office.

Instruction Manual Introduction

This manual is to guide you how to work with the mainframe of ZTS-720 series of Total Station by taking Zhongda Androidid Total Station ZTS-720 as an example.

Experience Requirements

In order to use Zhongda Androidid Total Station ZTS-720 better, Zhongda recommends you to have some measurement knowledge and read this manual carefully. If you have any questions, please refer to the official website of Zhongda: www.hi-target.com.cn.

Safety technology tips

Note: Note that the contents of the tips are generally operating special places that require your special attention, so please read them carefully.

Warnings: The contents of the warnings are generally very important tips. Failure to follow the warnings will result in damage to the instrument, loss of data, and system crashes, and may even endanger personal safety.

Liability Waiver

Before using this product, please be sure to read the instruction manual

carefully, which will help you to use this product better. Zhong Haida is not responsible for any damage caused by your failure to operate the product in accordance with the requirements of the instruction manual, or your misuse of the product due to failure to properly understand the requirements of the instruction manual.

Hi Target is committed to continuously improving the functions and performance of its products and the quality of its services, and reserves the right to make changes to the contents of the instruction manual without prior notice.

We have checked the content of the printed materials and the consistency of the hardware and software, but do not exclude the possibility of deviation, the pictures in this manual are for reference only, if there is any discrepancy with the actual product, please take the actual product as the standard, the final interpretation right belongs to Suzhou Xunwei.

Technology & Services

If you have any technical problems, you can contact the technical center of each branch or the technical department of the headquarters by phone, and we will answer your questions promptly.

Related Information

You can find the manual by.

1、Login the official website of Zhongda, you can find it in "Service Center" → "Download" → "Manual".

Your suggestions

If you have any suggestions and comments on this manual, please contact us, your feedback will be a great improvement to the quality of our manual.

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CHAPTER

1

Instrument features and uses

This chapter introduces.

- Instrument Features
- Instrument use
- Precautions
- Security Guidelines

Instrument Features

Feature-rich - this series of total station based on Androidid hardware platform, support angle measurement, distance measurement, key light, serial port, Bluetooth, WiFi, USB, automatic tilt compensation, alignment height, key tone, support GNSS equipment installed at the same point, support total station command communication protocol (Xunwei L protocol and T protocol). With powerful industry application software, including project management, station setting, basic measurement, program measurement, road release, bridge, tunnel, map, configuration. At the same time, it can be installed to the handheld mobile use, WiFi connection total station remote control measurement, suitable for a variety of professional measurement.

1、Absolute digital dial

Equipped with an absolute digital dial, the instrument can measure directly when it is turned on. The azimuth information is not lost even if the power is reset in the middle of the process.

2、Powerful memory management

Large memory capacity and easy file system management for data addition, deletion, transfer, etc.

3、Prism-free distance measurement

This series of total stations all come with prism-free ranging function of laser ranging, which can directly measure objects of various materials and different colors (such as walls of buildings, poles, wires, cliff walls, mountains, mud, stakes, etc.) at a long distance, quickly and with high accuracy. For those targets that are not easy to reach or simply inaccessible, the application of prism-free ranging function can complete the measurement task very well.

4、Special measurement procedures

In addition to the common basic measurement functions, this series of total station also has special measurement programs for overhang height measurement, eccentric measurement, edge-to-edge measurement, release sampling, rear rendezvous, area calculation, road design and release, etc., which can meet the needs of professional measurement.

5、Interchangeable eyepieces

The eyepiece of this instrument is interchangeable eyepiece, which can be conveniently equipped with bent tube eyepiece, so that it is easy for users to observe the zenith direction and the measurement of high-rise buildings.

6、Laser down to point optional

Convenient station indication function for easy station setting.

7、Image assisted release

The instrument is equipped with image assisted release function, which can display the point mark of release point in the software interface to facilitate the alignment of the release point.

Instrument Use

Total station is a measuring instrument that measures azimuth, target distance, and can automatically calculate the coordinates of target points. It has an important role in economic construction and national defense construction. Mineral census, exploration and extraction, construction of railroads, highways, bridges, agricultural water conservancy, urban planning and construction, etc. are inseparable from the electronic total station measurement. In national defense construction, such as battlefield preparation, harbor, fortress, airport, base and military engineering construction, etc., all must be based on detailed and correct geodesy . In recent years, the electronic total station has become an effective tool for precision positioning and installation in large precision engineering measurements, shipbuilding and aviation industries.

The angle measuring part of this series total station adopts absolute coding digital angle measuring system, and the distance measuring system adopts integrated circuit control board distance measuring head, using Androidid system, with measuring software, it can display the measurement results of horizontal angle, vertical angle, slope distance and flat distance, height difference, coordinates, etc. at the same time, and it can measure angle and slope in many modes.

Prism-free rangefinding is even designed for users of engineering projects, especially suitable for various construction fields. It can be widely used for three-dimensional coordinates of buildings, position determination, overhang height measurement, plumbness determination, pipeline positioning, section measurement, etc. It is also suitable for triangulation control measurement, topographic measurement, cadastral and property measurement, etc.

Cautions

1, daylight measurement should be avoided when the objective lens is aimed directly at the sun. It is recommended to use a solar filter to diminish this effect.

2、Avoid storing the instrument at high and low temperatures and using the

instrument when there is a sudden change in temperature.

3、When the instrument is not in use, it should be put into a box, placed in a ventilated and dry place, and pay attention to shock-proof, dust-proof and moisture-proof.

4、If the temperature at the working place of the instrument is too different from the temperature at the storage place, the instrument should be left in the box first until it adapts to the ambient temperature and then take out the instrument for use to obtain good accuracy.

5、If the instrument is not used for a long time, the battery should be removed and stored separately. And the battery should be charged once a month to extend the life of the battery.

6、The instrument should be packed in a box when transporting, and be careful during transportation to avoid extrusion, collision and violent vibration. It is better to use soft cushion around the box for long-distance transportation.

7、When setting up the instrument, use high-quality wooden stand as far as possible to ensure the stability of the measurement to improve the accuracy of the measurement.

8, in order to improve the accuracy of prism-free measurement, please be sure to keep the object lens clean. Exposed optics need to be cleaned, the application of degreasing cotton or lens paper gently wipe clean, do not use other items to wipe.

9、After using the instrument, use a lint cloth or brush to remove the dust on the surface of the instrument. After the instrument is wet by the rain, do not power on, should be clean and soft cloth dry and put in a ventilated place for a period of time, so that the instrument fully dry before use or box.

10, before the operation should be carefully and thoroughly check the instrument, to determine the instrument indicators, functions, power, initial settings and correction parameters are in line with the requirements before the operation.

11、If the instrument function is found to be abnormal, non-professional maintenance personnel should not disassemble the instrument without permission to avoid unnecessary damage.

12、The prism-free total station emits laser light, which cannot be directed at the eyes when used.

Note: This instrument is subject to strict inspection and calibration at the factory, and the quality meets the standard requirements. But the instrument after long-distance transport or environmental changes, the instrument's optical and mechanical structure parameters of trace changes are inevitable. Therefore, the new purchase of this instrument and to the measurement area before the operation of the instrument should be carried out in this section of the inspection and calibration to ensure the accuracy of the results of the operation.

Security Guide

When using prism-free laser distance measurement, it is important to pay attention to the following safety matters.

Warning.

The total station is equipped with laser class 3R/IIIa rangefinder.

This product is a Class 3R laser product, according to the following standards.

IEC 60825-1:2001 "Radiation safety of laser products".

For Class 3R/IIIa laser products, the emission limit at wavelengths of 400nm-700nm can be achieved within five times that of Class 2/II.

Warning.

Continuous direct vision of the laser beam is hazardous.

Prevention.

Do not stare at the laser beam with your eyes or point the laser beam at others. The reflected beam is a necessary measurement signal for the instrument.

Warning.

When a laser beam is directed at, for example, a prism, a flat mirror, a metal surface, or a window, direct viewing of the reflected light with the eye can be dangerous.

Prevention.

Do not stare at the laser reflection. Do not look next to the laser light path or prism when the laser switch is on (ranging mode). Only look through the telescope of the

total station to illuminate the prism.

Warning.

Improper use of Class 3R laser equipment can be dangerous.

Prevention.

To avoid causing injury and to allow each user to take practical safety precautions, control must be done within the distance of possible hazards (according to the standard IEC60825-1:2001).

The following is an explanation of the main parts of the criteria.

Class 3R laser products for outdoor and construction site use (prism-free measurement)

a Only persons who have received the relevant training and certification may install, commission and operate such laser equipment.

b Set up the corresponding laser warning signs within the use area.

c To prevent anyone from looking directly into the laser beam with their eyes or using optical instruments to view the laser beam.

d To prevent laser damage to people, the laser beam should be blocked at the end of the working route. The laser beam must be terminated when there is human activity within the restricted area (***harmful distance******) through which the laser beam passes.

e The path of the laser beam must be set above or below the human line of sight.

f laser products when not in use, properly stored for safekeeping, not certified people should not use.

g To prevent the laser beam from unintentionally irradiating such as flat mirrors, metal surfaces, windows, etc. Be especially careful of surfaces such as flat mirrors and concave mirrors.

*__***The harmful distance is*** the maximum distance from the start of the laser beam to the point where the laser beam weakens to the point where it will not cause harm to a person. For built-in rangefinder products with Class 3R/IIIa lasers, the harmful distance is 1000m (3300ft), beyond which the laser intensity is reduced to Class 1 (no harm to the eye from visualizing the beam).

CHAPTER

2

Name and function of each part of the instrument

This chapter introduces.

- Name of each part
- Keyboard functions and information display

Name of each part

The names of the product components are as follows.

1 - coarse sight; 2 - objective lens focusing screw; 3 - vertical fine adjustment screw; 4 - display; 5 - eyepiece; 6 - battery compartment cover.

7 - Base; 8 - Vertical brake screw.

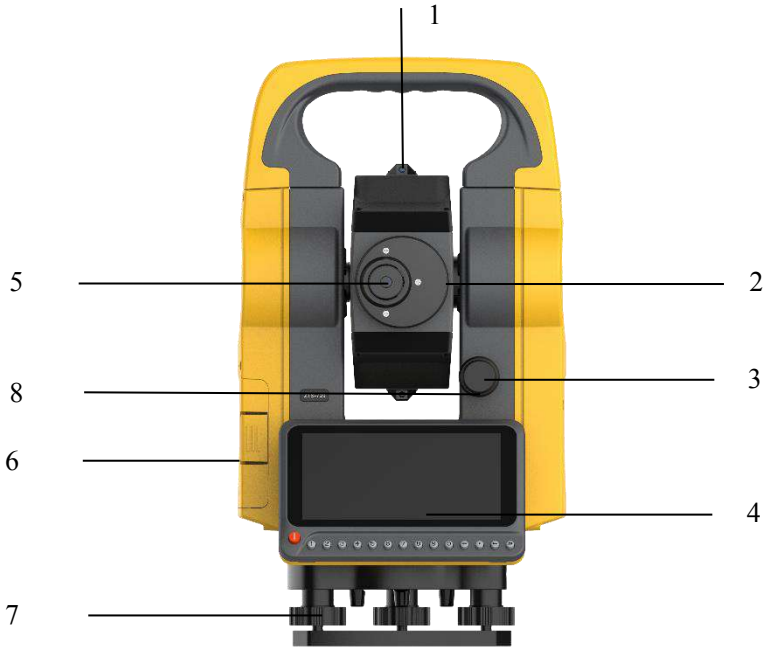


Figure 2-1

9-Type C USB port/SD card slot/external SIM card slot; 10-Quick measurement button; 11-objective lens; 12-camera

13 - Horizontal trim screw; 14 - Horizontal brake screw.

Figure 2-2

Keyboard functions and information display

Figure 2-3

Table 2.1 Key functions.

Button	Name	Function
	Quick measurement keys	Configurable measurement/deposit mode, triggers a measurement/deposit when clicked.
	Power Switch	Controls the switch of the power supply.
0 to 9	Number keys	Enter the number 0~9.
-~ -	Symbol Keys	Input symbols: decimal point, negative sign.
←	Delete key	Delete the previous character of the insertion character.
	Return button	Return to the previous level.

Table 2.2 Display symbol definitions.

Symbols	Content
Vz	Zenith distance mode
V0	Vertical angle display mode of 0 when the telescope is horizontal at the positive mirror
Vh	Vertical angle mode (0 when horizontal, positive elevation angle, negative pitch angle)
V%	Slope mode
HR	Horizontal corner (right corner)
HL	Horizontal corner (left corner)
HD	Horizontal distance
VD	height difference
SD	Slant Distance
N	North directional coordinates, dN denotes the difference of release N coordinates
E	Eastern coordinates, dE denotes the difference of the release E coordinates
Z	Elevation coordinates, dZ denotes the difference of release Z

	coordinates
m	In meters
ft	In feet
fi	In feet and inches, feet before the decimal point and hundredths of an inch after the decimal point
X	The value along the baseline direction in point projection measurement, the direction from the starting point to the end point is positive
Y	Point projection measurement of values in the direction of vertical deviation from the baseline
Z	Elevation of the target in point projection measurement

CHAPTER

3

Preparation before measurement

This chapter introduces.

- Instrument unpacking and storage
- Placement of instruments
- Battery loading and unloading, information and charging
- Reflective prisms
- Loading and unloading of bases
- Telescope eyepiece adjustment and target illumination

Alphanumeric input method

- Notes on USB flash drives
- Instrument registration
- Notes on instrument data storage size prompt messages

Instrument unpacking and storage

-Unboxing

Gently lower the case, let its lid face up, open the locking bolt of the case, open the lid and remove the instrument.

-Storage

Cover the telescope mirror cover, make the vertical hand wheel of the illumination department and the level of the base face up, put the instrument lying flat (telescope objective end facing down) into the box, gently screw the vertical hand wheel, cover the box cover and close the lock bolt.

Placement of instruments

-Operation reference.

Mount the instrument on a tripod, level and center it precisely to ensure the accuracy of the measurement results. (A special tripod with a central connecting screw should be used).

Centering and leveling with the pendant ball

1）Establish the tripod

① First open the tripod, so that the tripod's three legs are approximately equidistant, and make the top surface is approximately horizontal, tighten the three fixed screws.

②Make the center of the tripod and the measurement point lie approximately on the same lead line.

③Step firmly on the tripod so that it is firmly supported on the ground.

2) Place the instrument on the tripod head

Carefully place the instrument on the top surface of the tripod, hold the instrument with one hand, loosen the center connecting screw with the other hand, gently move the instrument on the head of the rack until the hammer ball is aligned with the center of the site mark, and then gently tighten the connecting screw.

3）Use the circular level to roughly level the instrument

① Rotate the two foot spirals A and B, so that the circular leveler bubble moves to a straight line perpendicular to the line connecting the centers of the two foot spirals mentioned above.

② Rotate the foot spiral C to center the round level bubble.

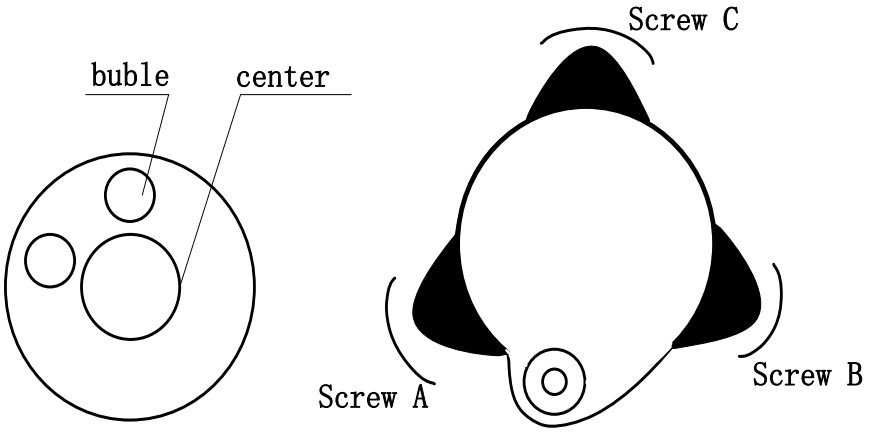


Figure 3-1

4）Use the tube level to fine level the instrument

① Loosen the horizontal brake screw, turn the instrument so that the tube level is parallel to the line of a pair of foot spiral A and B, and then rotate the foot spiral A and B in opposite directions to center the bubble of the tube level.

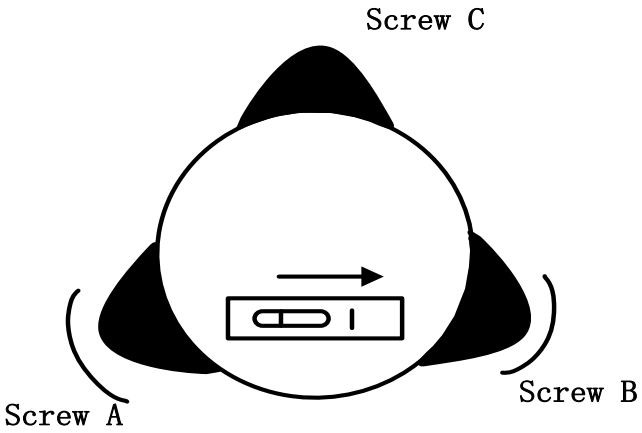


Figure 3-2

② Rotate the instrument 90° around the vertical axis and then rotate the other foot helix C to center the tube level bubble.

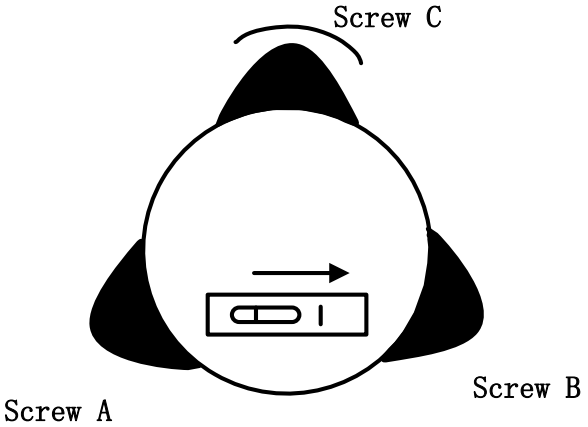


Figure 3-3

③ Rotate the apparatus 90° again, and repeat steps ① and ② until the bubbles are centered in the four positions.

Centering with aligner

1）Establish the tripod

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

2) Placement of instruments and alignment points

Carefully place the instrument on the tripod, tighten the center connecting screw, and enter the compensator interface to turn on the laser down to the point. Hold the other two unfixed legs of the frame with both hands and adjust the position of these two legs by looking at the optical pointing device. When the aligner is roughly aligned with the survey site, make all three legs of the tripod fixed on the ground. Adjust the three leg screws of the total station to align the pointing device precisely with the survey site.

3）Use the circular level to roughly level the instrument

Adjust the length of the three legs of the tripod so that the total station round level bubble is centered.

4）Use the tube level to fine level the instrument

① Loosen the horizontal brake spiral and turn the instrument so that the tube level is parallel to the line of a pair of foot spirals A and B. Make the bubble of the tube level centered by rotating the foot spiral A and B.

② Rotate the instrument 90℃ so that it is perpendicular to the line of foot helix A and B. Rotate foot helix C to center the tube level bubble.

5）Accurate alignment and leveling

By observing the spotter, slightly loosen the center connecting screw and level the instrument (do not rotate the instrument) so that the instrument is precisely aligned with the measurement site. Tighten the center connecting screw again to accurately level the instrument again.

This operation is repeated until the instrument is precisely aligned with the measurement site.

Battery loading and unloading, information and charging

Battery Information

-- Sufficient power to operate and use.

-- When this message first appears, the battery is still good for about 4 hours.

--The power is already low, end the operation as soon as possible, replace the battery and charge it; if you cannot grasp the time that has been consumed, prepare a spare battery or charge it before use.

--From the appearance to the lack of power shutdown can last about a few minutes, the battery has no power, you should immediately replace the battery and charge.

Notes.

①The length of battery working time depends on the environmental conditions, such as: the surrounding temperature, charging time and the number of times of charging, etc. For safety reasons, it is recommended to charge in advance or prepare some charged spare batteries.

②The remaining battery capacity display level is related to the current measurement mode. The fact that the remaining battery capacity is sufficient in the angle measurement mode does not guarantee that the battery will also work 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 battery capacity is insufficient and sometimes the range measurement will be aborted.

Precautions when removing the on-board battery compartment.

▲ Every time you remove the battery compartment, you must first turn off the instrument power.

▲ To install the battery, press the top button of the battery compartment to snap it into the instrument to fix it into place.

Precautions when charging.

▲ Despite the charger's overcharge protection circuit, the plug should still be

pulled out of the socket when charging is finished.

▲To be charged within the temperature range of 0°~ ±45°C, beyond this range may charge abnormally.

▲Rechargeable batteries can be recharged 300-500 times, and complete discharge of the battery will shorten its service life.

▲ To get the maximum life of the battery, please make sure to charge the battery once a month even when the instrument is not used for a long time.

Reflective Prism

When a total station is used in prism mode for distance measurement and other operations, a reflecting prism must be placed at the target. The reflecting prisms are available in single (triple) prism sets, which can be attached to the base on a tripod via the base connector or directly on the centering rod. The prism set can be configured by the user according to the operational needs.

Loading and unloading of bases

●Disassembly

If necessary, the triangular base can be removed from the instrument (including the reflecting prism base connector with the same base) by loosening the base locking knob fixing screw with a screwdriver and then turning the locking knob about 180° counterclockwise to separate the instrument from the base.

●Installation

Put the three fixed feet on the instrument into the holes of the base, so that the instrument is mounted on the triangular base, turn the locking knob 180° clockwise to lock the instrument with the base, and then use a screwdriver to turn the locking knob fixing screw leftward to fix the locking knob.

Telescope eyepiece adjustment and target illumination

Method of targeting (for reference)

① Aim the telescope at the bright sky, rotate the eyepiece barrel and focus to see the crosshairs (first rotate the eyepiece barrel in your direction and then slowly rotate it in to focus clearly on the crosshairs).

② Use the cross center in the coarse sight to aim at the target point, and keep a proper distance between the eye and the sight when illuminating (about 200mm).

③ Use the telescope focusing screw to make the target image clear.

When the eye moves up and down or left and right at the end of the eyepiece, parallax is found, indicating that the focus or eyepiece diopter is not well adjusted, which will affect the accuracy of angle measurement, should be carefully focused and adjust the eyepiece tube to eliminate parallax.

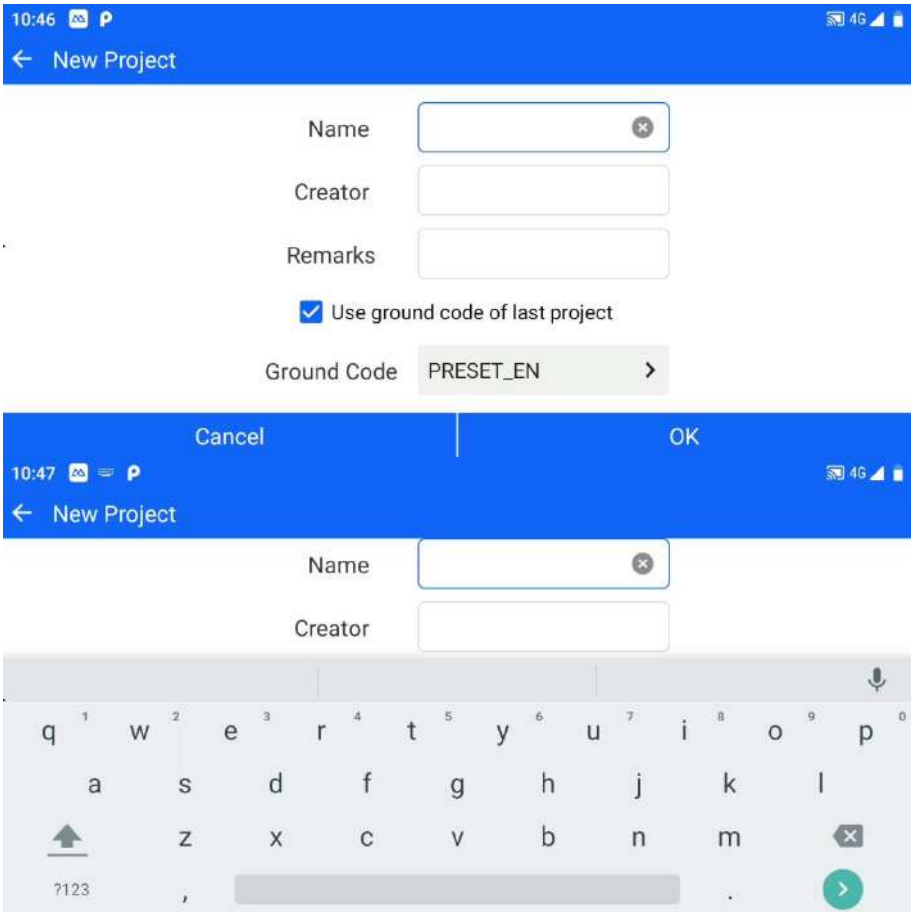
Alphanumeric input method

This series of total station keyboard comes with numeric keys and soft keyboard, so users can input numbers directly and use soft keyboard to input characters.

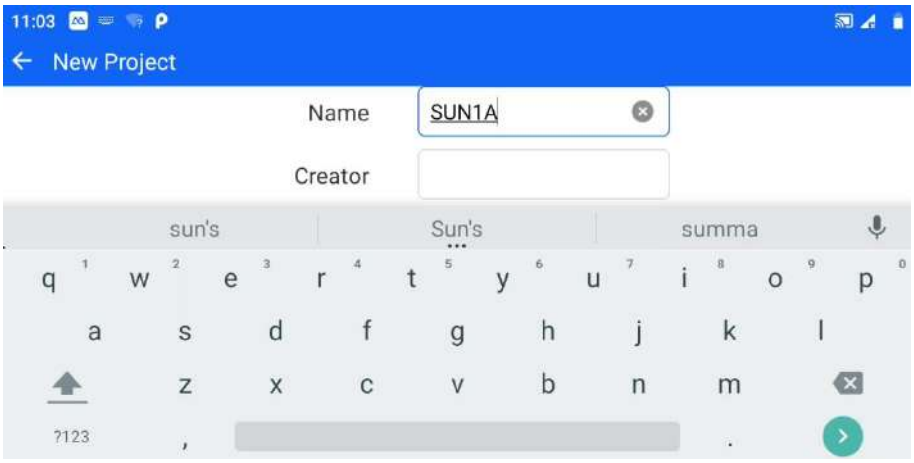
***Input characters**

[Example 1] Select the project name in the new project and ask to enter in the edit box of the file name: SUN1A

Click on the software [Project Management] > [New Project] and click on the project name input box.

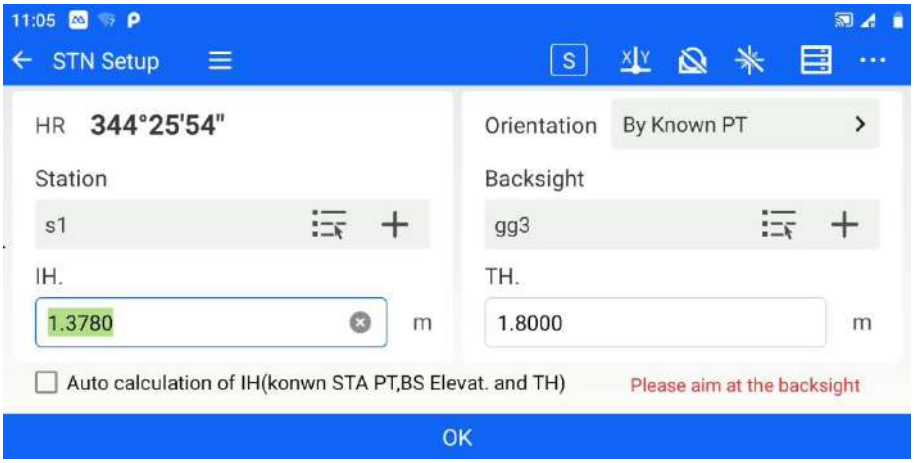


Simply type SUN1A in the soft keyboard that pops up.



***Enter the number**

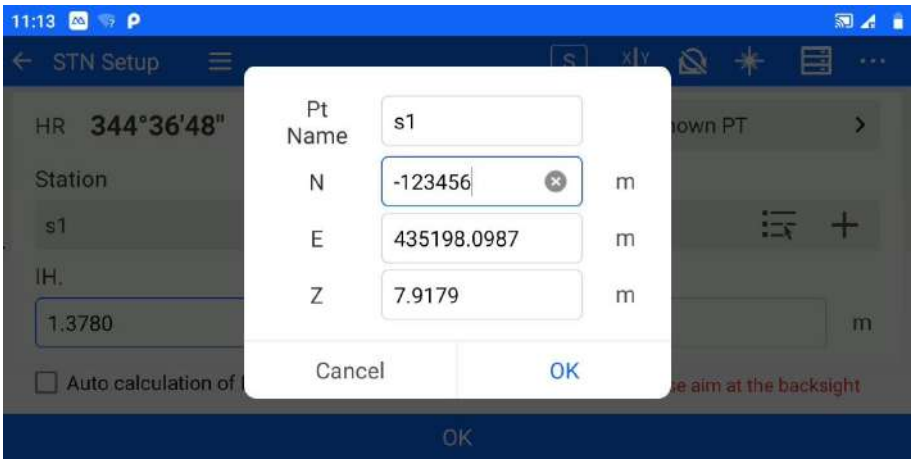
[Example 2] Select the station setting mode, click on the "+" sign in the station interface, enter the coordinates of the station, click on the [N] direction input box, enter: -123.456



Method 1

Key sequence at the bottom of the screen: [-]→[1]→[2]→[3]→[.]→[4]→[5]→[6]

The results are shown in the following figure.



Method 2

In the pop-up soft keyboard key sequence: [-]→[1]→[2]→[3]→[.]→[4]→[5]→[6]

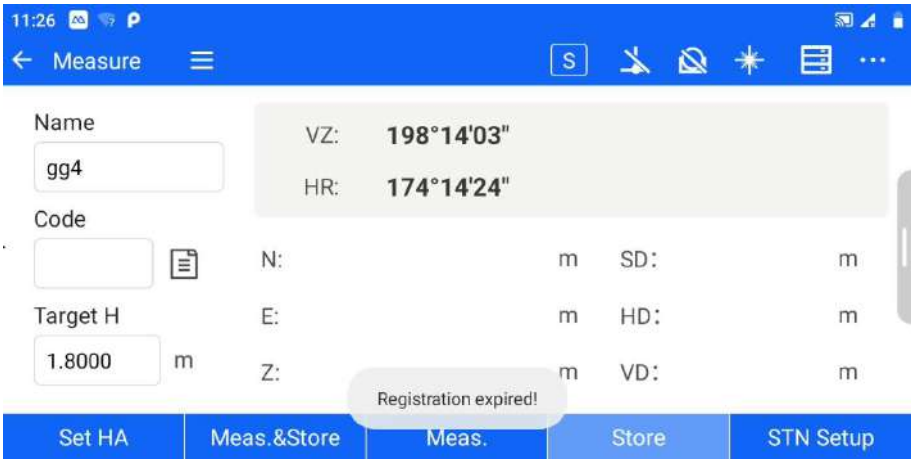
The results are shown in the following figure.

Notes on USB flash drives

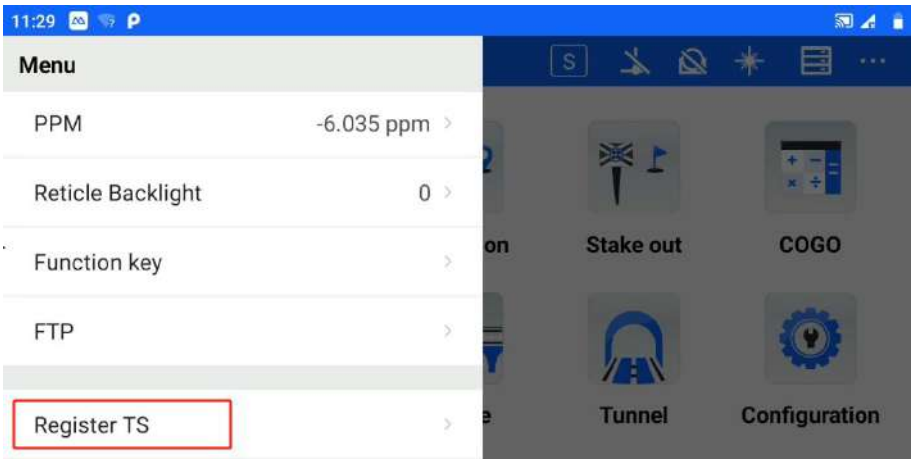
This machine supports a maximum of USB2.0/2.1/3.0/3.1 128G USB flash drive reading and writing, in the software running process, do not randomly plug into the U disk, if you unplug the U disk after the end of the detection U disk steps, then the subsequent operation may cause errors!

Instrument Registration

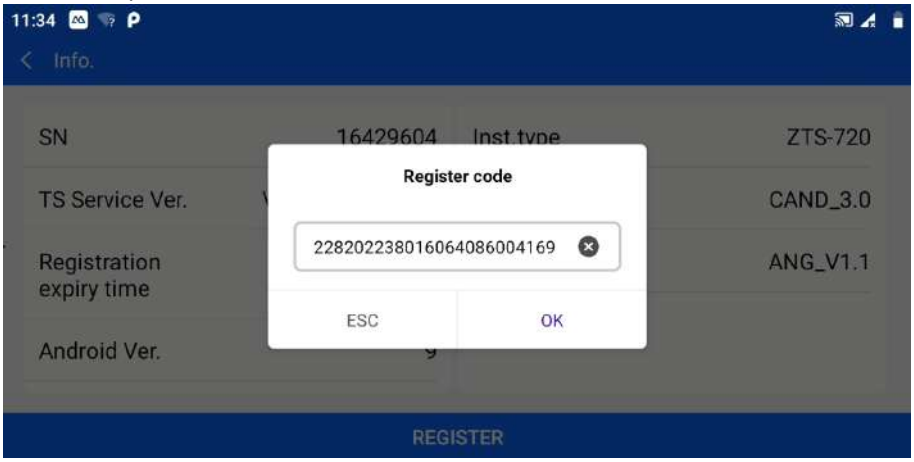
No ranging operation can be performed before the instrument has been registered.



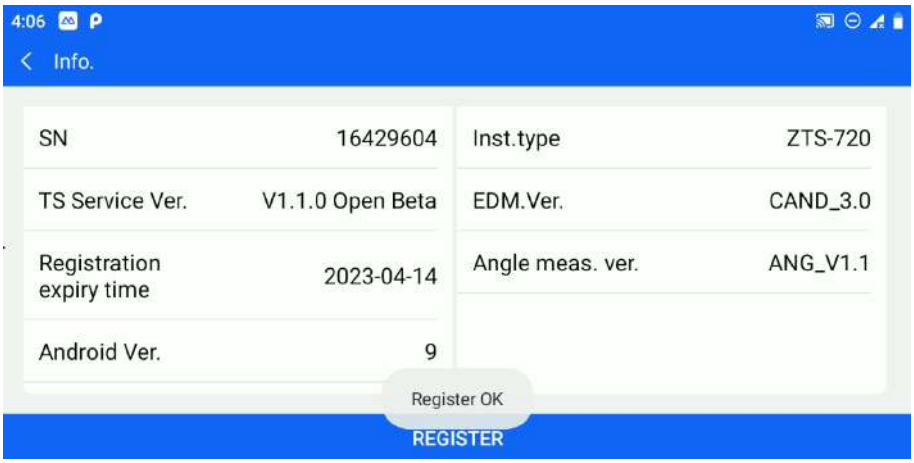
1)Instrument registration, you can click [Total Station Information] in the main interface configuration options or click [Total Station Registration] in the main interface shortcut menu to enter the instrument registration interface.



2)Enter the Total Station information interface, click [Register], and enter the correct registration code in the pop-up input box (please contact your dealer to obtain it).



3)After entering the correct registration code, press the [Confirm] key to indicate that the registration is successful and the displayed registration expiration time is shown correctly.



Notes on instrument data storage size prompt messages

1, in the instrument memory is less than 100k, after the boot will be prompted "the disk is less than 100K, please organize data or delete data words".

Note: When deleting the disk data, please export your measurement data to the U disk first to prevent unnecessary troubles.

CHAPTER

4

Software Introduction and Easy Operation Procedure

This chapter introduces.

- Software Introduction
- Software installation
- Quick start

Software Introduction

T-Survey software is a total station software developed by Zhongda. In addition to the basic station setting and acquisition functions, it also supports a variety of release procedures, including CAD release and image-assisted release. The software also supports road, bridge and tunnel related design and release operations. The software has the following features.

Image Assist

1、Image-aided release, the software interface shows the point mark of the release point, which is easy to align the release point.

Software Installation

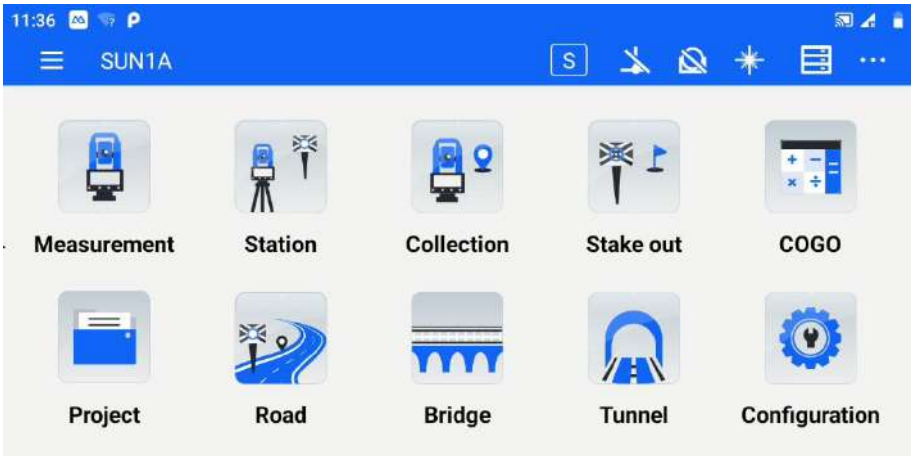
T-Survey software needs to run on Androidid OS with Androidid 9 or above. It can run on Androidid devices such as Zhongda professional Androidid total station, professional survey handbook, and ordinary cell phones. Copy the APK file (APK is the abbreviation of Androidid Package, i.e. Androidid installation package) of this program directly to the Androidid control terminal device for execution or install it on the computer with a third-party cell phone assistant.

Quick Start

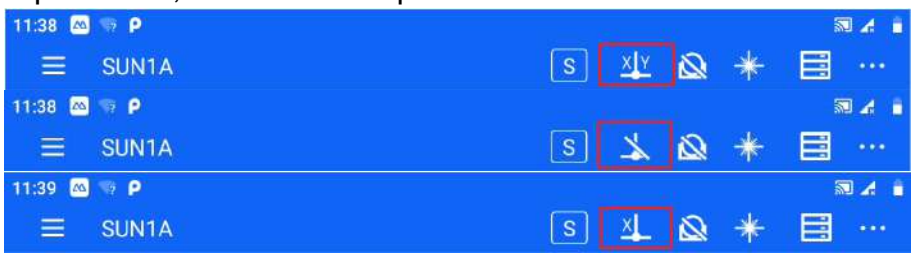
The following is only a quick start procedure, please refer to the detailed instructions in each chapter for detailed usage steps. This procedure is only a solution that we provide to you, and you may not follow this procedure after you have become proficient in using the software. During the operation, the usual procedure is.

I. Initial settings

1、 Open T-Survey software, the main interface of the software is as follows.



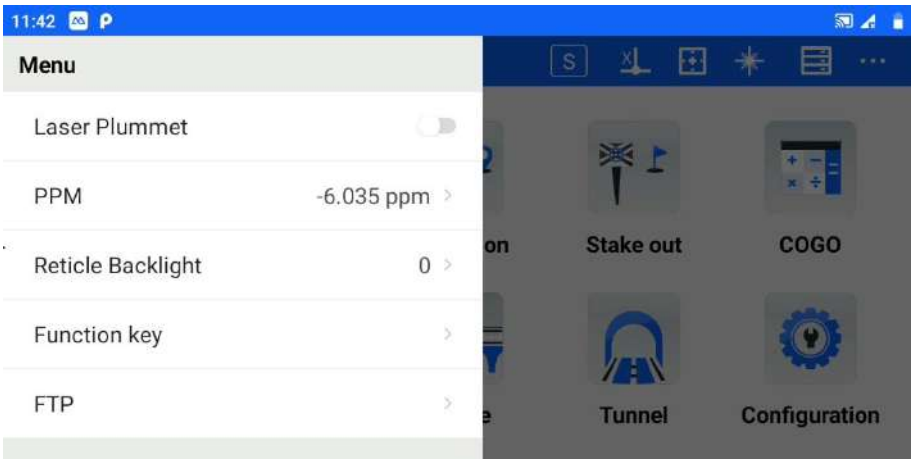
2、Set the tilt to change the compensation total station can be tilted in the X, Y direction of the instrument vertical axis caused by the angular reading error compensation correction. The compensation settings supported by the software are: open XY dual-axis compensation, open X single-axis compensation, and close compensation.

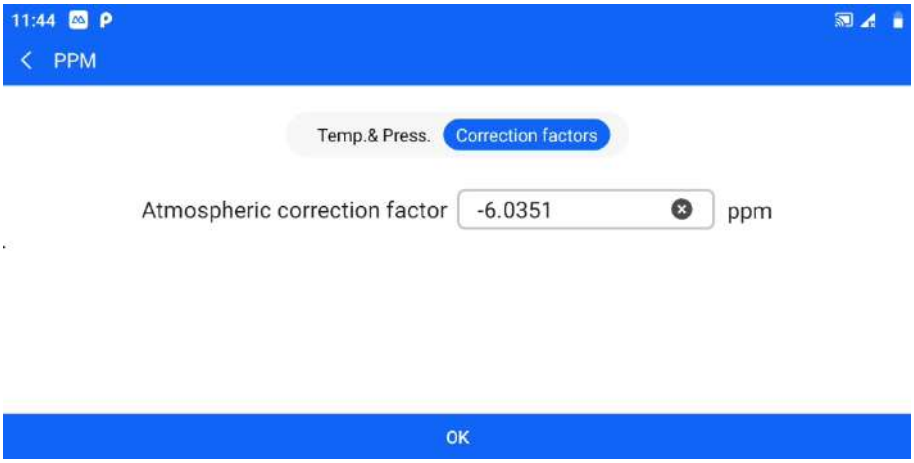


Users can choose whether to turn on the tilt compensation or not according to the actual usage scenario. To ensure the accuracy of the angle measurement, it is recommended not to turn off the tilt compensation, whose display can also be used to better level the instrument. If the "compensation overrun" appears, it indicates that the instrument is out of the range of automatic compensation, and the foot spiral must be adjusted for leveling.

3、Set the type of ranging target. The optional reflection modes of the total station are prism, reflector and prismless. Users can set them according to their operational needs.

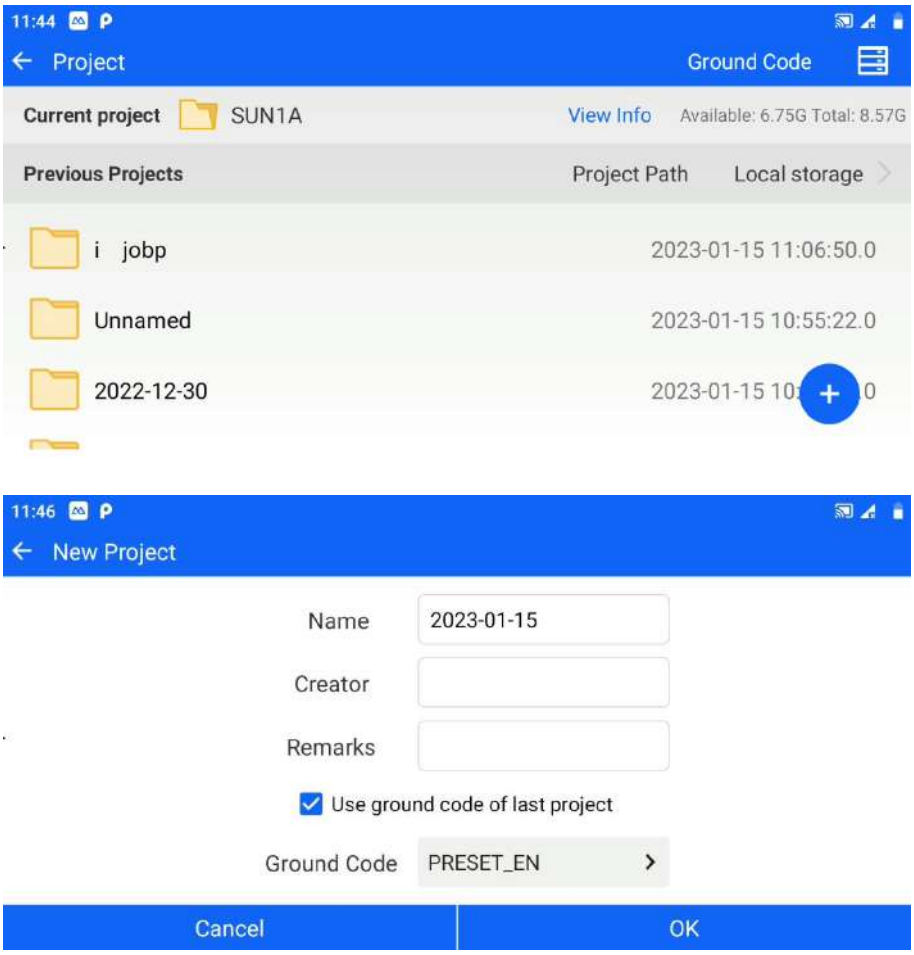
4、Set atmospheric correction. When measuring distance, the distance value is affected by the atmospheric conditions at the time of measurement. In order to reduce the influence of atmospheric conditions, the distance measurement must be corrected using the weather correction parameter. Click the upper left button to open the [Quick Menu Bar] and click [Atmospheric Correction] to set it.





II. Establishment of projects

1、 To create a new project, click [Project Management], click the blue hover [New] button on the interface (New button can be dragged), enter the project name (required), operator, notes and other information, select the required legend template, confirm that there are no errors and click OK to complete the new project.



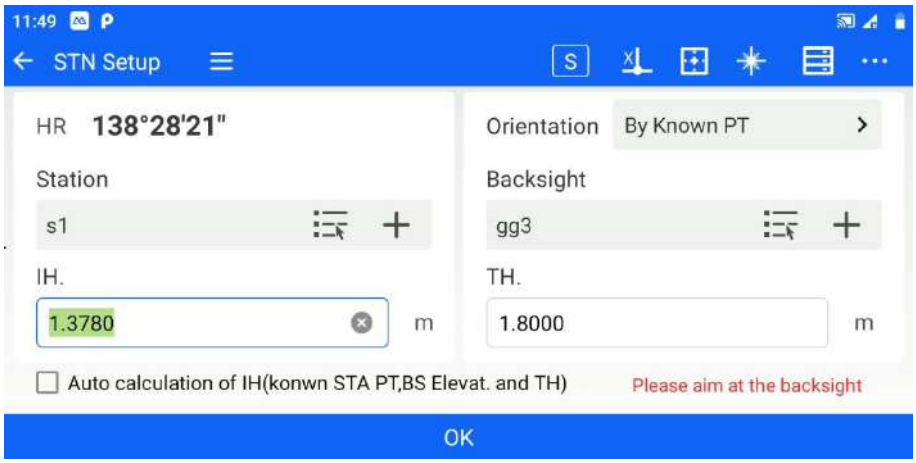
Three, set up stations

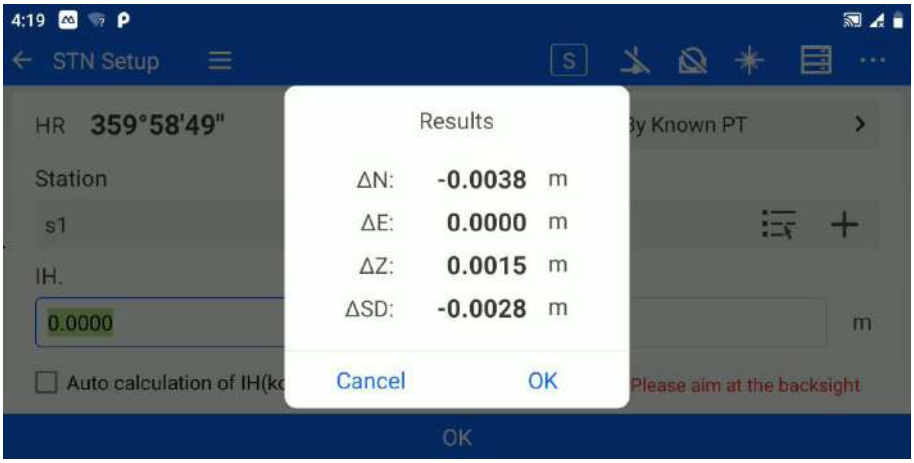
The software supports users to set up stations using station hind sight, elevation transfer, rear rendezvous and point to line setting. This is illustrated here as an example of coordinate oriented station back view.

1. The total station is set up on the known point A and illuminated on the known point B.

2. Click [Set Station] - [Station Hind View], choose "Coordinate Orientation" as the orientation method. Set the coordinates of known point A for the station, set the coordinates of known point B for the hind sight, and input the instrument height and target height correctly.

3. Click "OK" to align the rear view point. At this time, the measurement difference check box will pop up. If the user judges that the difference value is within the acceptable range, click "OK", that is to complete the station hind sight; if the difference value exceeds the limit, click "Cancel", you can re-direct the coordinates.

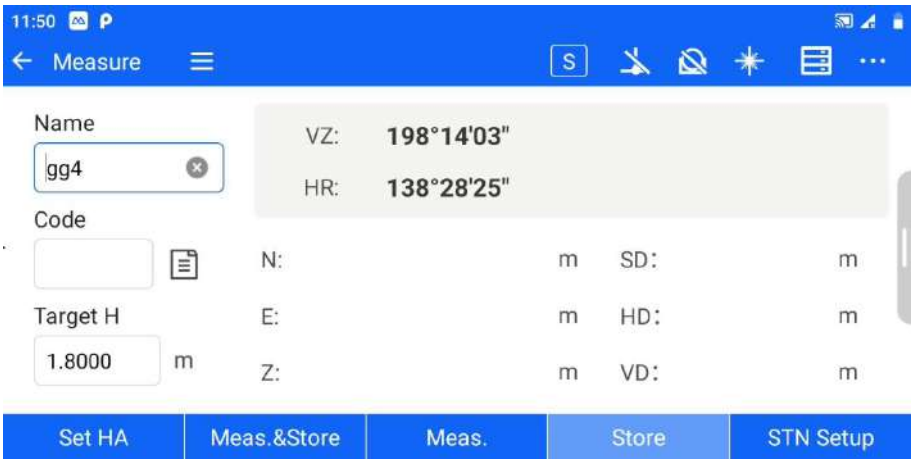




IV. Acquisition

The software supports various acquisition procedures such as coordinate measurement, eccentric measurement, edge-to-edge measurement, overhang height measurement, line and extension point measurement, and line and angle point measurement. The most basic coordinate measurement is explained here as an example.

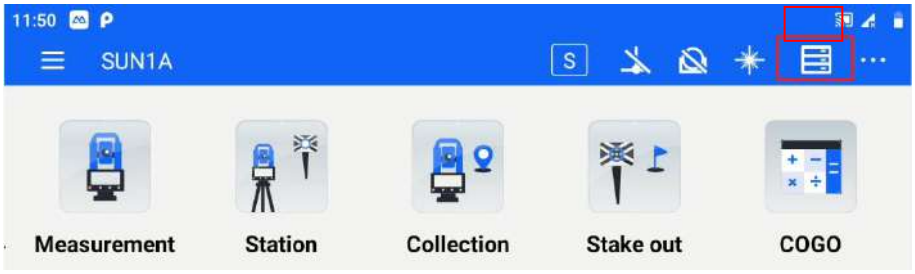
1. Click [Basic Measurement] - [Coordinate Measurement] or [Acquisition Program] - [Coordinate Measurement] to enter the coordinate measurement interface.

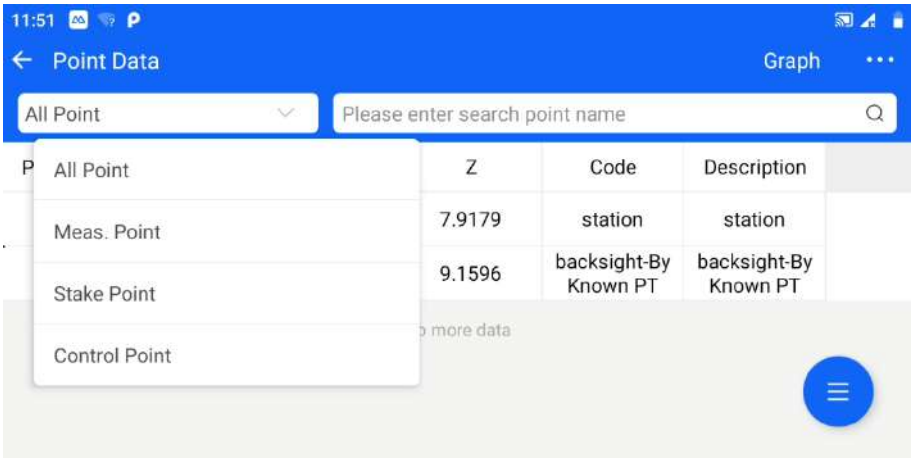


2. Aim at the target point, enter the point name, legend code, target height, click [Measure] - [Record] or directly click [Measure and Save] to measure and save the prism points to the total station point library.

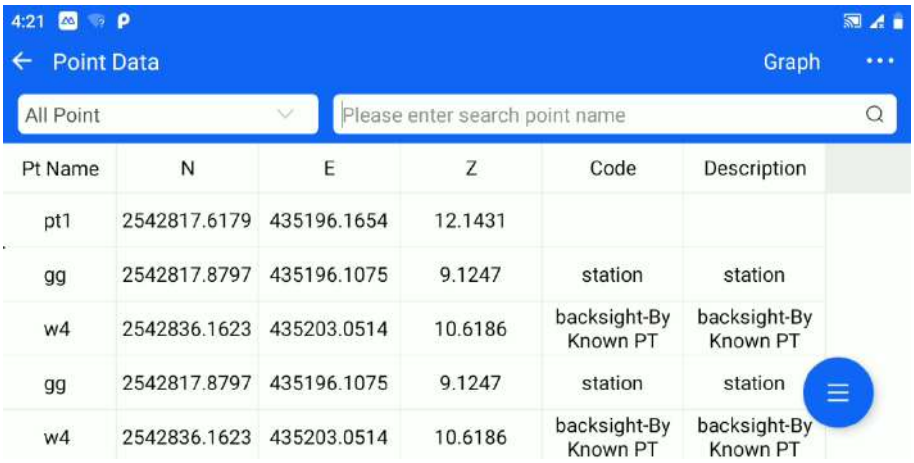
V. Data export

1. Click the top bar, go to [Point Data] - [Measurement Points], you can view the survey site, rear view point, prism point and other kinds of total station points.

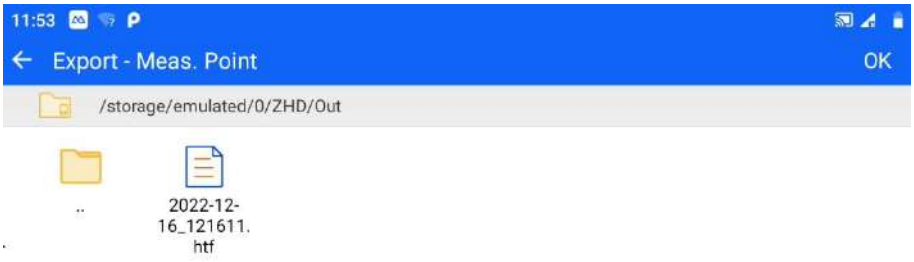


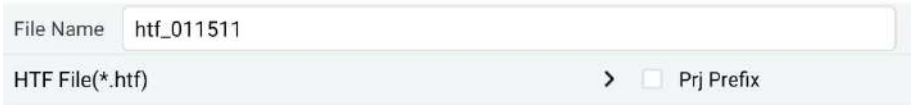


2. Click the hover button-[Export] to enter the export interface.



3. Select the desired export format, enter the file name, and click "OK" to export the total station points to the internal storage of the total station (default path: ********). Export format supports *. htf, *.txt, *.csv, *. dat, *. GSI, *. dxf and *. gt7.





CHAPTER

5

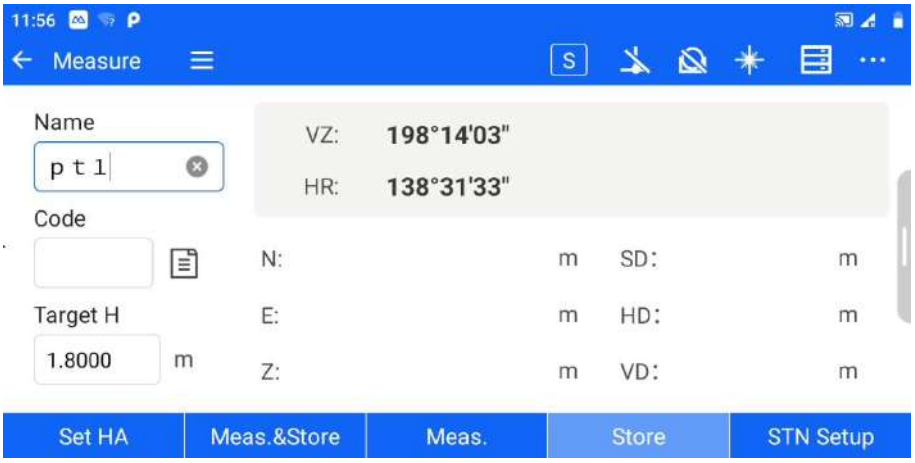
Basic measurements

This chapter introduces.

- Coordinate measurement
- Coordinate placement

Coordinate measurement

Access through [Basic Measurement] - [Coordinate Measurement] or [Acquisition Program] - [Coordinate Measurement].



"Roll call": measurement roll call, automatic accumulation by default.

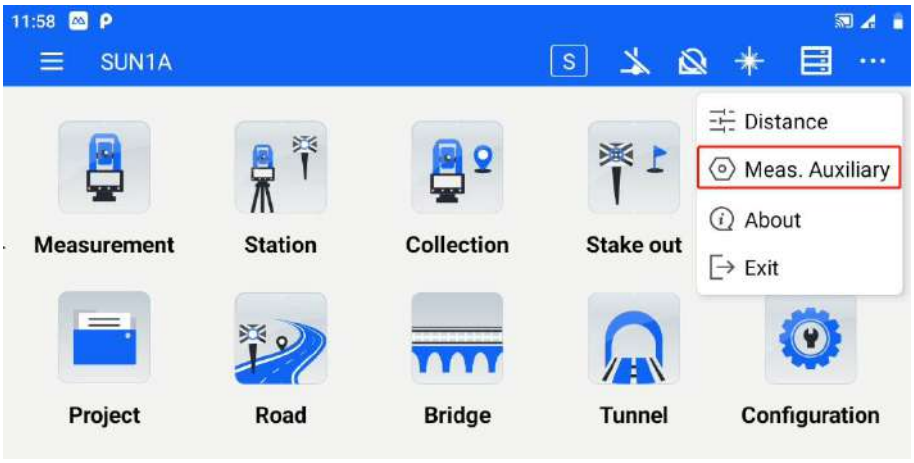
"Legend code": description of the measurement point, which can be entered manually or selected by clicking the button after the input box.

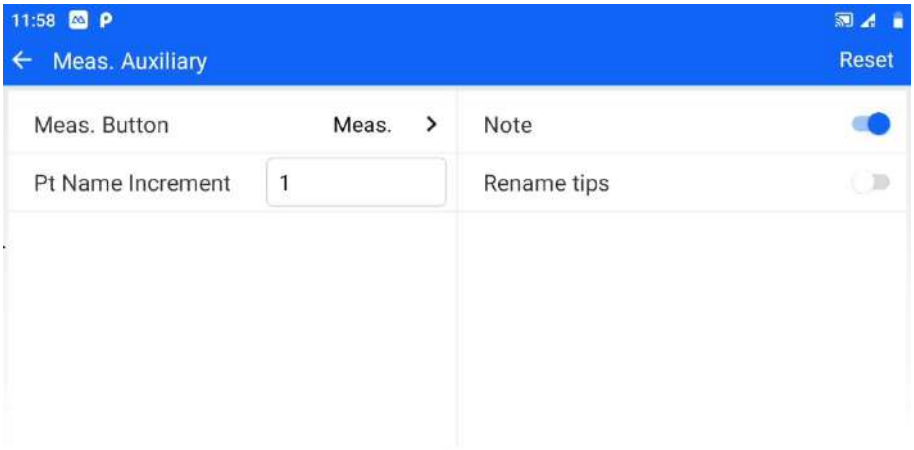
"Target height": the measurement point prism height.

[**Set Plate**]**:** [Basic Measurement] - [Coordinate Measurement] This button is displayed when you enter. The horizontal angle can be set to the desired angle.

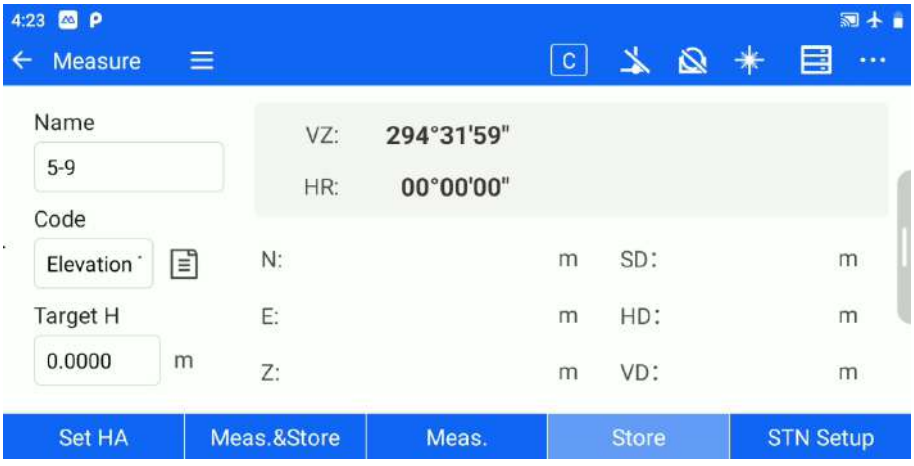
When measuring coordinates, you can also choose to record the points at the same time. The operation is as follows.

1. Go to [Configuration] - [Measurement Aids Configuration] and select Open Point of Memory.





2. Enter [Coordinate Measurement], and the interface will display the point record image at the same time. When you measure and record the points, the points will be recorded at the same time. It should be noted that the image function is not available when the usb is inserted.



The following buttons are common to all acquisition/release screens and will not be repeated after the explanation here.

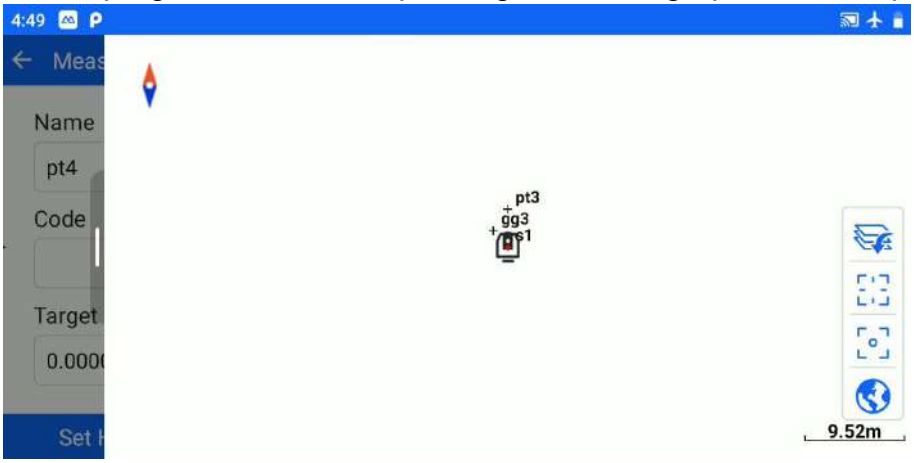
[Measurement and storage]: While measuring the target point, save the target point information to the total station point database.

[Measurement]: Measure the coordinates of the target point.

Record]: When the target point coordinates have been measured, click Record to save the target point information to the measurement point library.

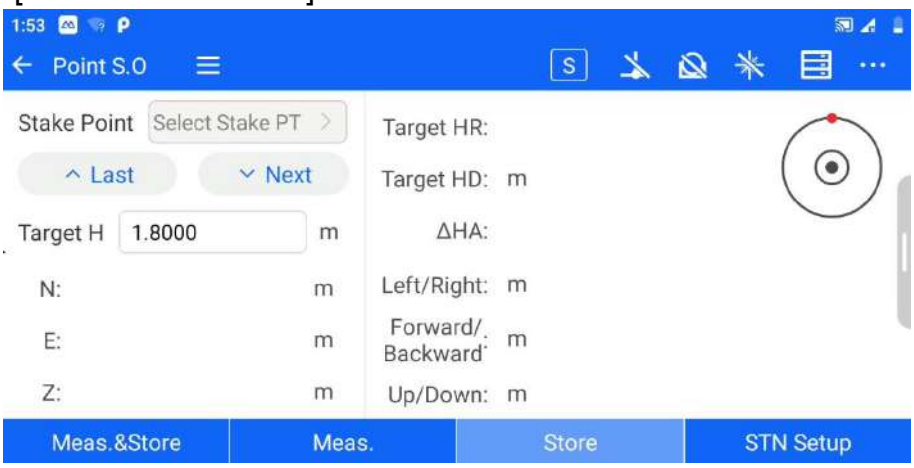
[Set Station]: Jump to the station rear view screen to reset the station.

Each acquisition interface/release interface can be expanded by clicking the pull box on the right side, and the graphical interface will display measurement points, release points and control points by default. At the same time, for different acquisition/release programs, the corresponding indication graphics are displayed.



Coordinate Placement

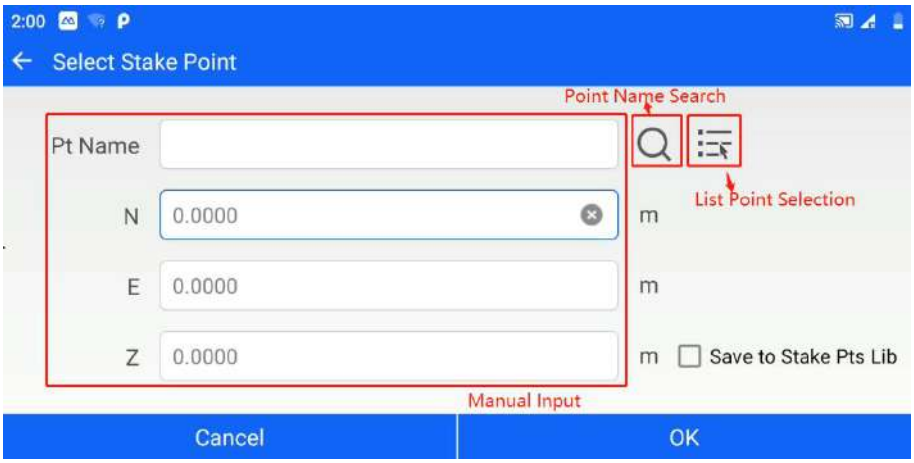
Access through [Basic Measurement] - [Coordinate Release] or [Release Procedure] - [Coordinate Release].



Previous point]/[Next point]: Switch to select the release point in the release point library.

"Select release point": enter the release point setting interface.

You can select the release points by manual input, point name search, and list selection.

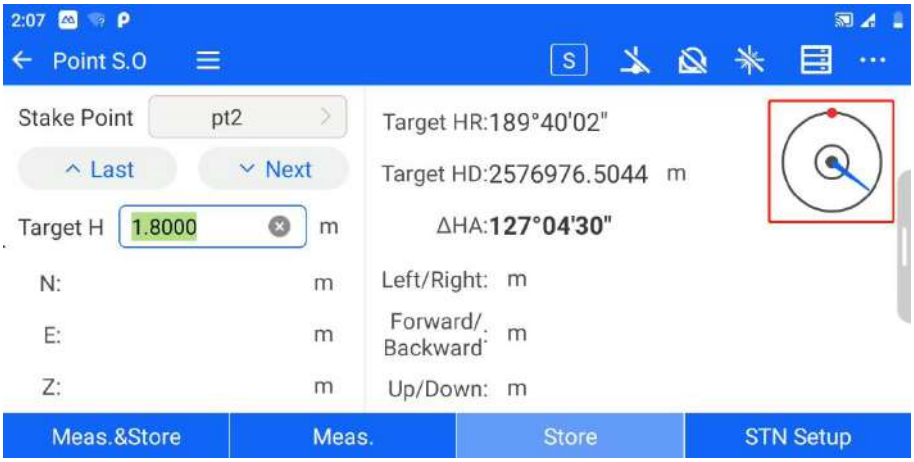


"Point Name Search": Perform a precise search based on the entered point name.

"List Point Selection": Jump to the point library and you can select points from each point library.

"Save to release point library": If checked, the currently set release points will be saved to the release point library.

In the upper right corner of the release program interface, the orientation of the release point is shown as a radar map. The red dot is the direction of the release point, and the arrow points to the direction of illumination. Users can judge the orientation of the release point by the radar map.



CHAPTER

6

Set up a station

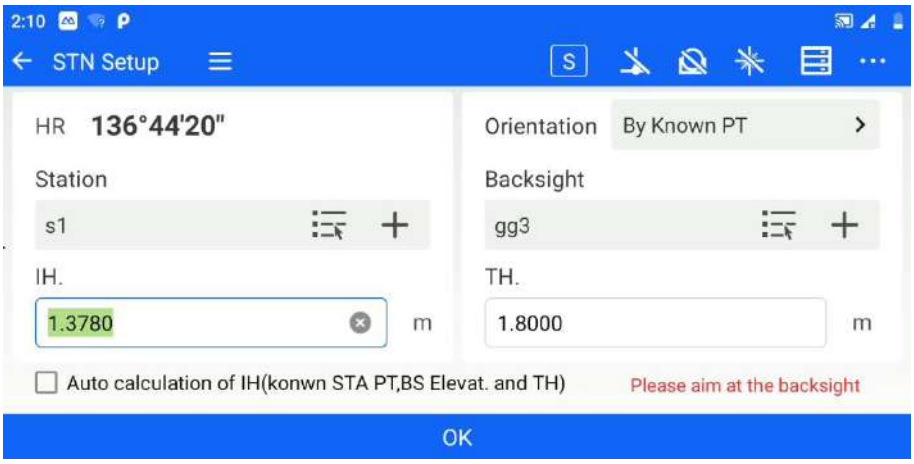
This chapter introduces.

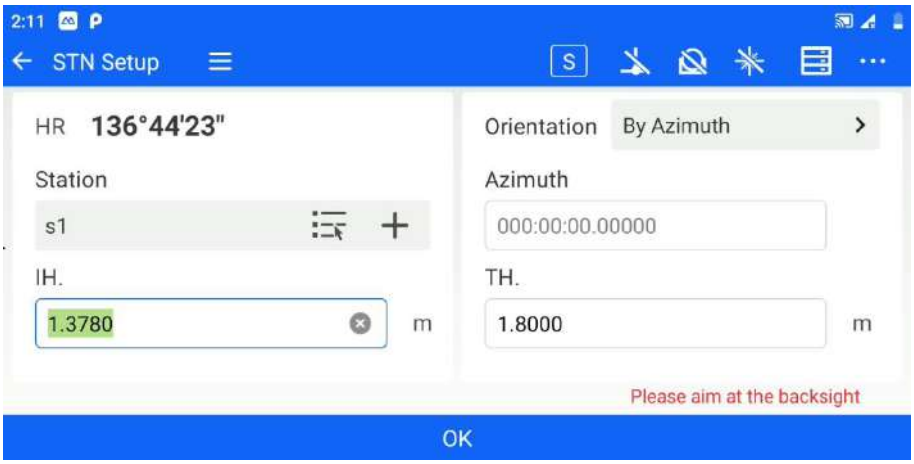
- Station rear view
- Rear view inspection
- Rear rendezvous
- Elevation transfer
- Point to linear station set-up

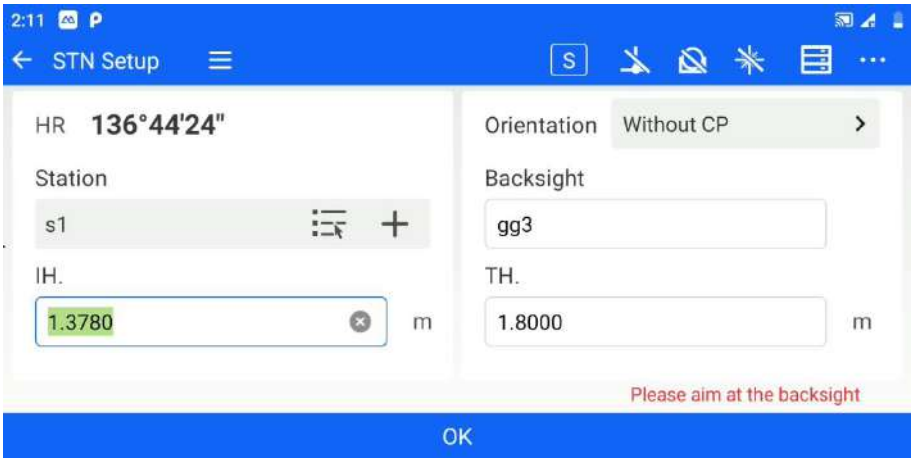
Station Rear View

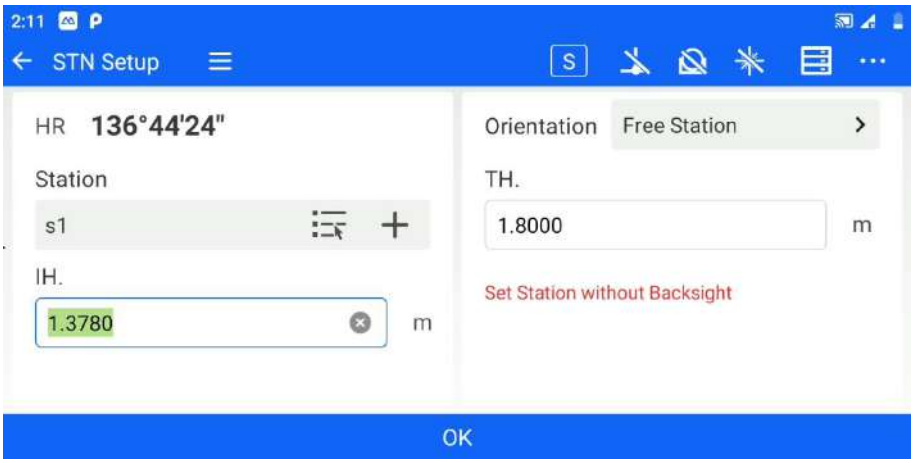
Through [Set Station] - [Station Rear View] or "each measurement interface" - "Set Station" button to enter the station rear view interface.

The station hind sight currently supports four types of orientation: coordinate orientation, azimuth orientation, unknown orientation and no orientation.





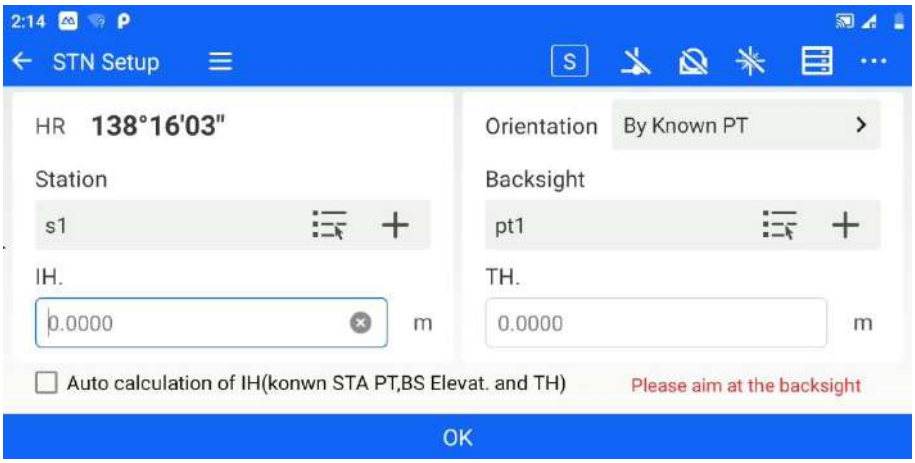




Coordinate orientation

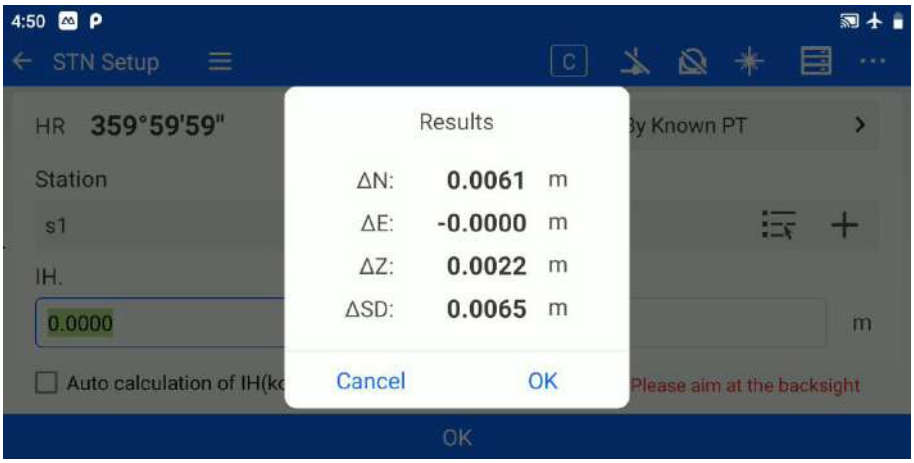
Coordinate orientation is applicable to the case where the coordinates of the survey site and the coordinates of the back view point are known. The operation steps are as follows.

1. After the user sets up the total station at the survey site, enter the [station back view] and select the coordinate orientation for the orientation mode.



2. Set the coordinates of the survey site, the coordinates of the back view point, the instrument height and the target height. Coordinates can be set by "list point selection" or "input".

3. Click "OK" to align the rear view point. At this time, the measurement difference check box will pop up. If the user judges that the difference value is within the acceptable range, click "OK", that is to complete the station hind sight; if the difference value exceeds the limit, click "Cancel", you can re-direct the coordinates.

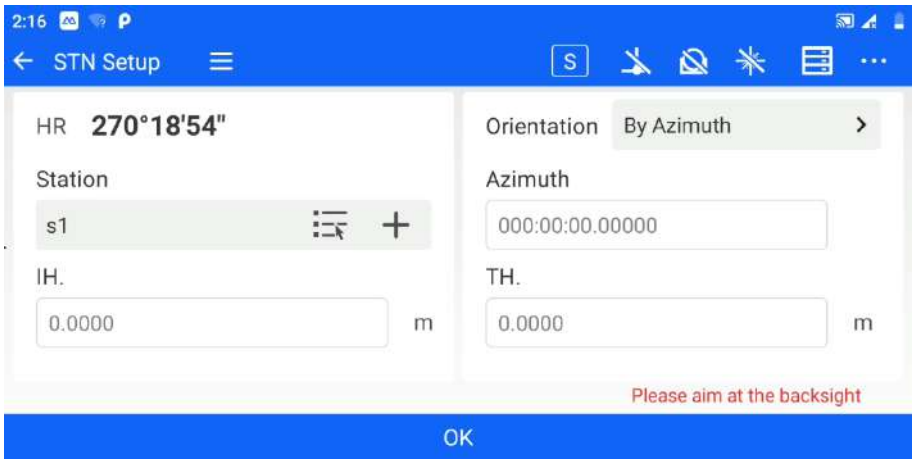


"Automatic calculation of instrument height": when the survey site, hind sight elevation and target height are known, you can check "Automatic calculation of instrument height", the software will automatically calculate the instrument height based on the known information.

Azimuthal orientation

Azimuth orientation is applicable to the case where the coordinates and azimuth of the survey site are known. The operation steps are as follows.

1. After the user sets up the total station at the survey site, enter the [station hind sight] and select azimuth orientation for the orientation mode.

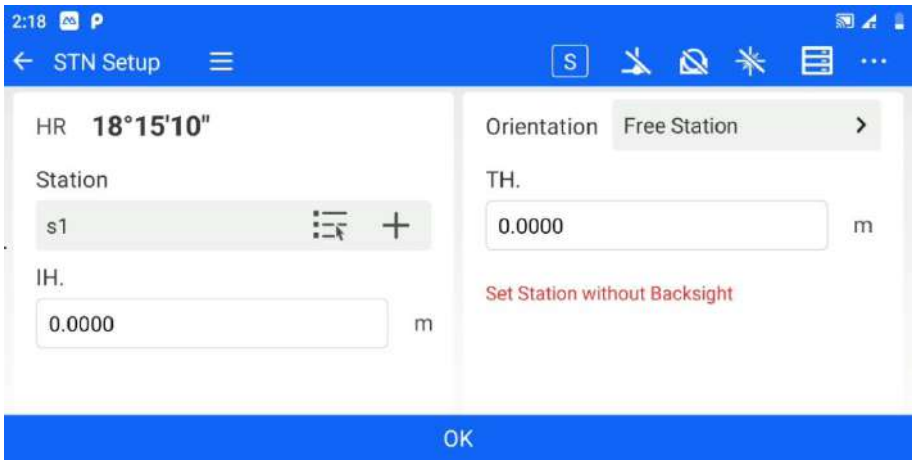


2. Set the coordinates of the survey site, the azimuth of the rear view point, the instrument height and the target height. Coordinates can be set by "list point selection" or "input".

3. Click on "OK" to complete the station hind sight.

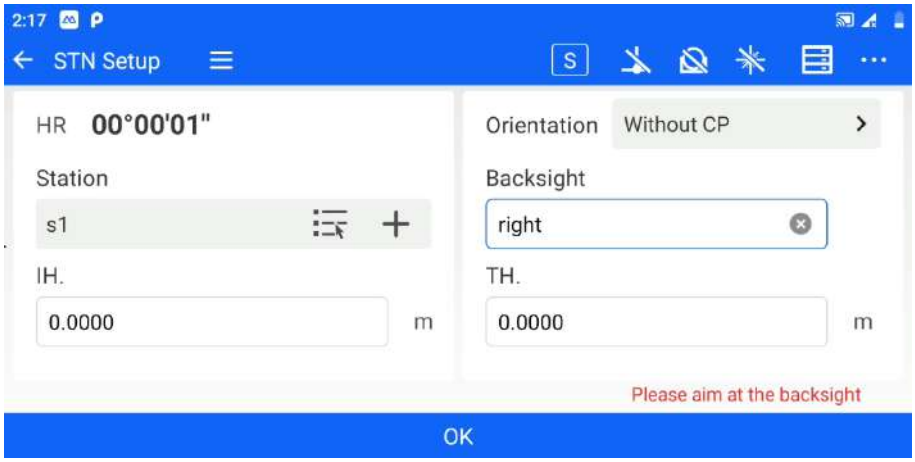
Unknown point orientation

Unknown point orientation is applicable to the case where the coordinates of the survey site are known, and the point location of the back view point is known but the



coordinates are unknown. Usually used in conjunction with [Unknown Point Orientation Correction] (see Chapter 6). The operation steps are as follows.

1. After the user sets up the total station at the survey site, enter the [station hind sight] and select the unknown point orientation for the orientation mode.



2. Set the coordinates of the survey site, the point name of the back view point, the instrument height and the target height. Coordinates can be set by "list point selection" or "input".

3. Click on "OK" to complete the station hind sight.

Orientation-free

Orientation-free is usually used in conjunction with [Orientation-free calibration] (see Chapter 6). The operation steps are as follows.

1. After the user sets up the total station at the survey site, enter the [Station Rear View] and select the orientation method without orientation.

2. Set the coordinates of the survey site, instrument height and target height. Coordinates can be set by "list point selection" or "input".

3. Click on "OK" to complete the station hind sight.

Rear view inspection

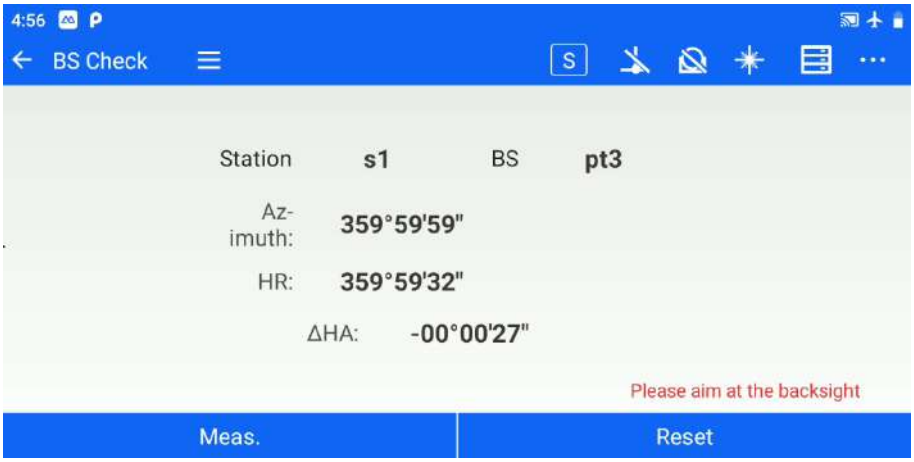
After the user set the station, if you want to check whether the current rear view direction horizontal angle and the recorded rear view point direction horizontal angle are consistent, you can use the rear view check function, which can be accessed through [Set Station] - [Rear View Check].

If the current station setting method is "Coordinate Orientation", the "Measure" and "Reset" buttons are displayed on the rear view inspection screen.

【**Measurement**】:Click measurement when illuminate the rear view point, and get the coordinate difference between the measurement coordinates and the rear view point, and the distance difference to the measuring station.

[Reset]:Reset the horizontal angle to the rear viewpoint azimuth.

If the current station setting method is "Azimuth Orientation"/"Unknown Point Orientation"/"No Orientation", the rear view check screen will only display the "Reset " button.

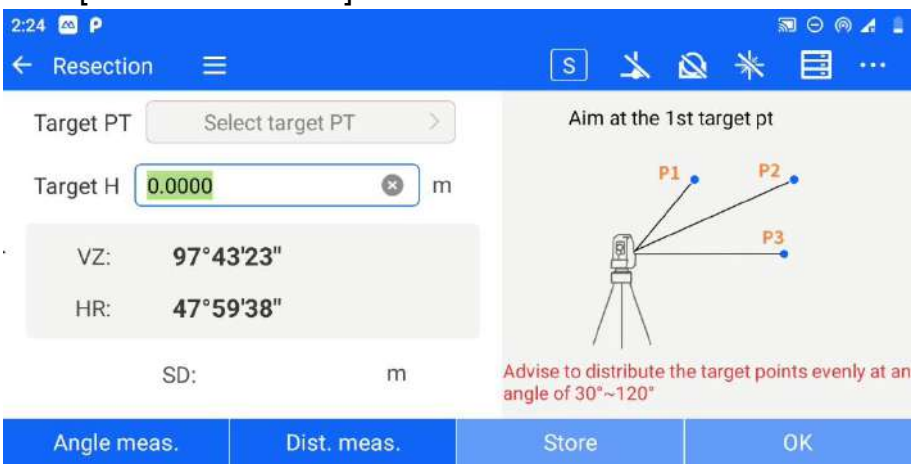


Rear rendezvous

When the coordinates of the survey site are unknown, but there are 2~5 known points within the visual range, you can use the rear rendezvous function to obtain the

coordinates of the survey site through the edge rendezvous calculation. Through [Set Station] - [Rear Rendezvous] to enter the rear rendezvous interface. The operation steps are as follows.

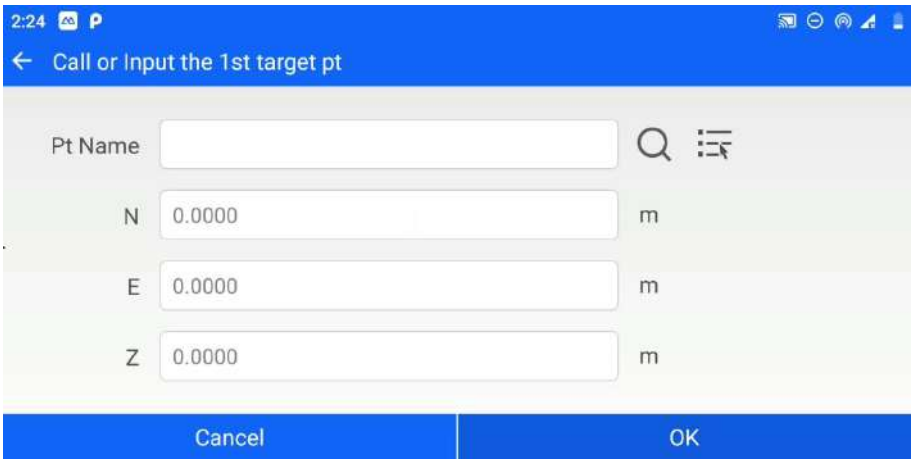
1. Click [Rear Rendezvous] to enter the measurement interface.



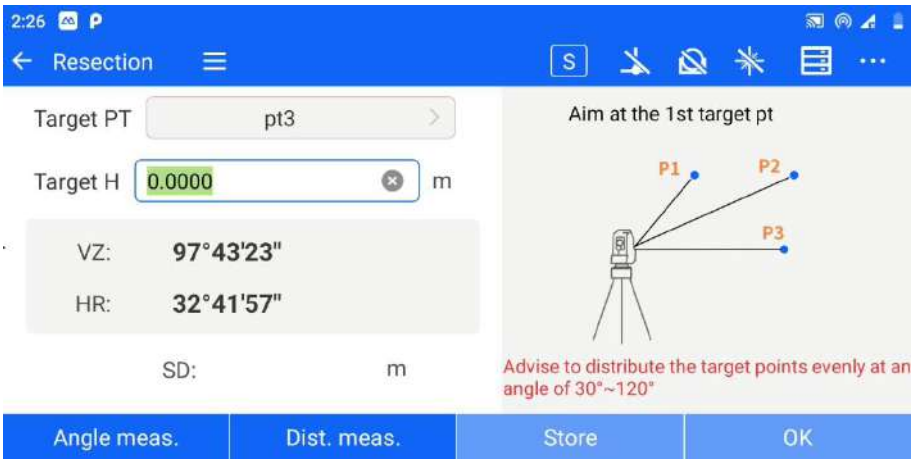
2. Click "Select target point", the target point is a known point. Users can set it by "manual input", "list point selection" or "search point library".

OK]: After setting the coordinates of the target point, click "OK" to finish the setting and return to the measurement interface.

【Cancel】: Cancel to set the target point coordinates and return to the measurement interface.



3. After completing the selection of the target point, shine the light on the target point and measure (distance) or angle.



Angle measurement】: Click on the angle measurement when shining on the target point, and get the angle data from the measurement station to the target point.

【Measure】: Click measure when shining on the target point to get the slant distance from the measuring station to the target point.

Record]: After measuring the target point, click "Record" to return to the point list and record the distance point/angle point to the measurement point library.

[OK]: After you have measured the target points, click "OK" to return to the point list.

Note: 1. Distance measurement requires at least 2 points, and he angle of 30°~120° for each two points is preferred.

2. At least 3 points are required for angle measurement, and the point to be determined needs to be inside the triangle formed by the 3 observation points.

---

4. The rear rendezvous point list interface shows all the points that have been measured currently. At the bottom, you can set "Instrument height". Click on the corresponding data to "delete" the operation.

[Add points]: You can continue to add known points for measurement and repeat steps 2~3.

【Calculation】: Based on the current existing measurement points and the set instrument height, calculate the coordinates of the measurement site.

[Return]: Return to the back rendezvous point list interface, you can continue to add points to calculate.

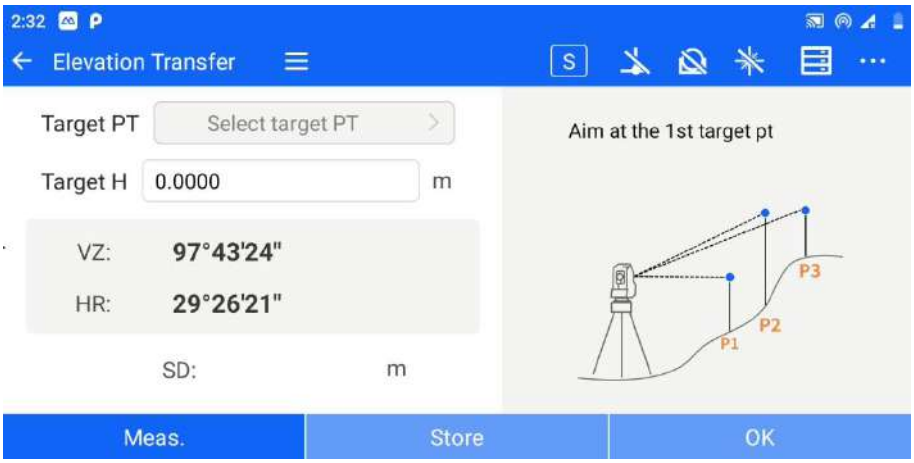
【Application】: Apply the calculated rear rendezvous results to the current measurement site, the calculated measurement site and the last known point for the rear view point to complete the set-up, the new measurement site and rear rendezvous rear view point in the point database.

Elevation Transfer

When the elevation of the survey site is unknown, but there are known elevation points within the visual range, you can use the elevation transfer function to calculate and obtain the coordinates of the survey site after the station is set up in the station hind sight. You can enter the elevation transfer interface through [Set Station] - [Elevation Transfer]. The operation steps are as follows.

1. After the user sets up the station, click [Elevation Transfer] to enter the

measurement interface.

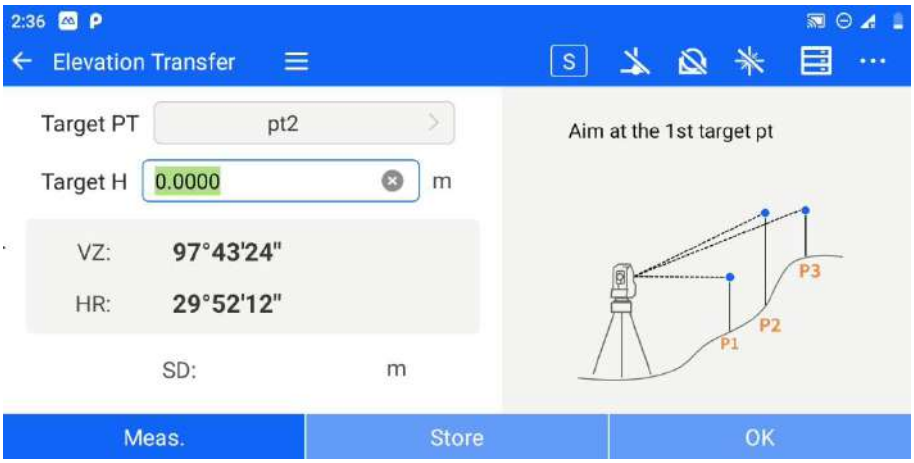


2. Click "Select target point", the target point is the known point of elevation. The user can set it by "manually input elevation", "list selection" or "search point library".

[OK]: After setting the elevation of the target point, click "OK" to finish the setting and return to the measurement interface.

Cancel]: Cancel to set the elevation of target point and return to the measurement interface.

3. After completing the selection of the target point, shine the light on the target point and make the measurement.

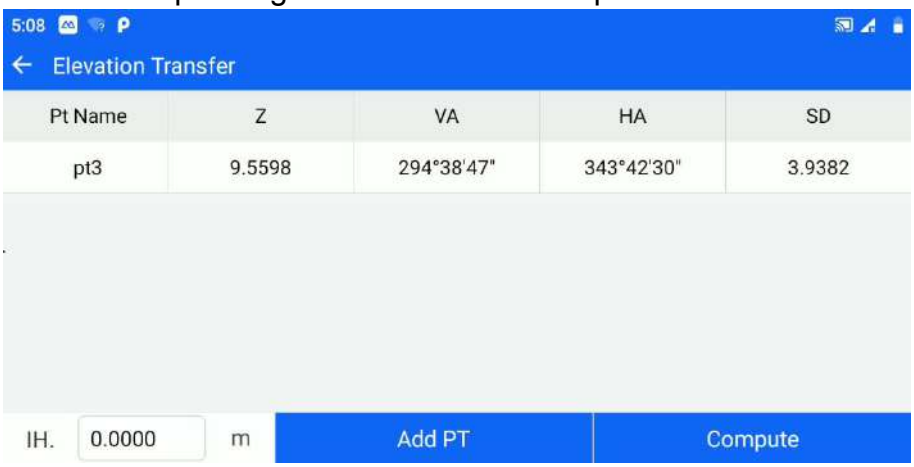


【Measure】: Click measure when shining on the target point to get the slant distance from the measuring station to the target point.

Record]:After you have measured the target point, click "Record" to return to the point list and record the distance measurement point to the measurement point library.

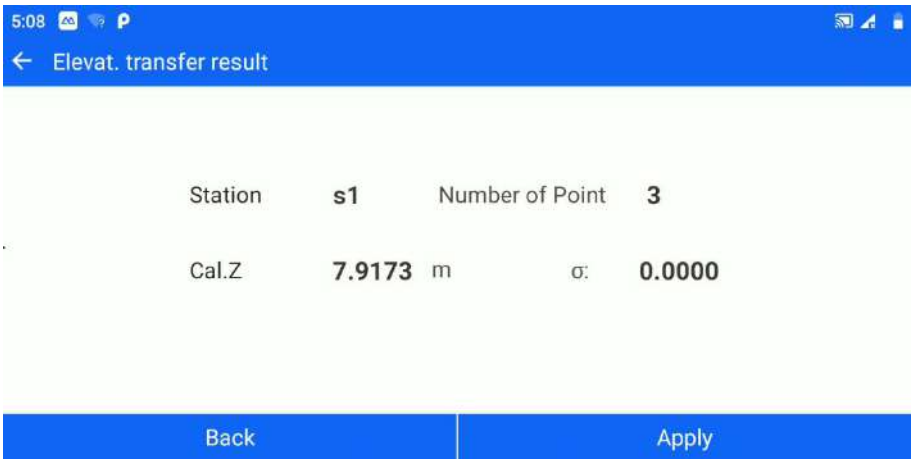
[OK]: After you have measured the target points, click "OK" to return to the point list.

4. The elevation transfer point list interface shows all the points that have been measured currently. At the bottom, you can set the "Instrument height". Click on the corresponding data to "delete" the operation.



[Add points]: You can continue to add known points for measurement, repeat steps 2~3. A minimum of 1 known point is required for elevation transfer.

【Calculation】: Based on the current existing measurement points and the set instrument height, calculate the elevation of the measurement site.



[Return]: Return to the elevation transfer point list interface, you can continue to add points to calculate.

【Application】: Apply the calculated elevation to the current measurement site, and the Z coordinate of the measurement site in the point database is changed correspondingly.

Point to linear set up station

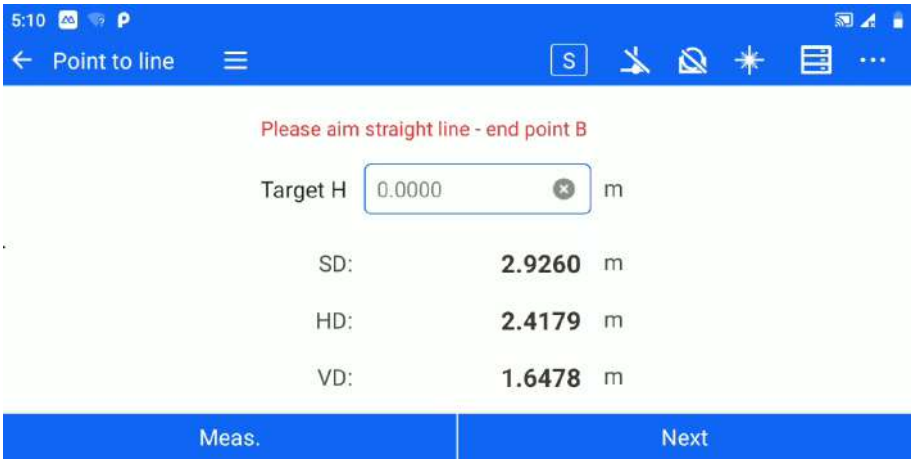
For projects that only need local relative coordinate system, users can use the function of "Point-to-Line Setting" to establish local relative coordinate system based on a certain line. You can enter the point to line setting interface through [Set Station] - [Point to Line Setting]. The operation steps are as follows.

1. Click [Point to straight line set station] to enter the measurement interface of straight line - starting point A. Enter the target height according to the instruction, click "Measure" for the starting point of the reference line, and then click "Next".

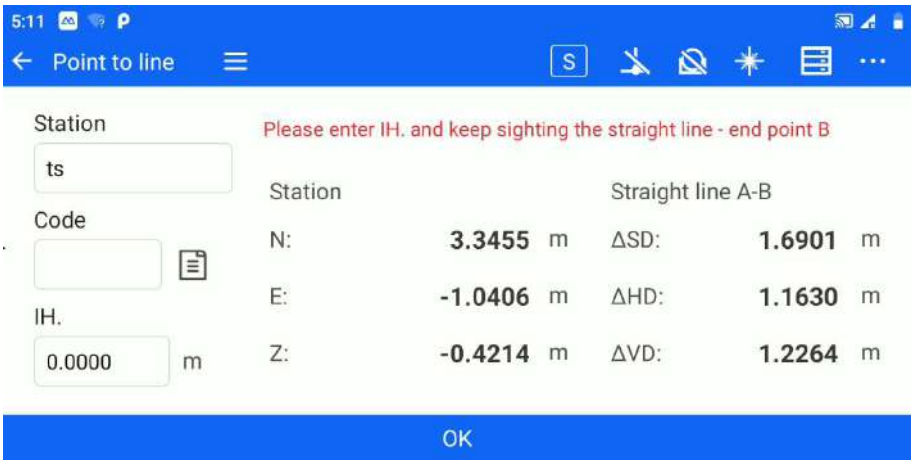
A

2. Enter the measurement interface of straight line - end point B. Enter the

target height according to the instruction, click "Measure" for the end point of the reference line, and then click "Next".



3. Enter the point-to-station interface. Continue to align the end point of the reference line (as the rear view point), enter the point name, legend code and instrument height of the station, and click "OK" to complete the point to line station setting. The local relative coordinate system of the reference line established by the station is with point A as the coordinate origin (0,0,0), point B as the coordinate north direction, and the coordinates of point B relative to point A are (Hd, 0, Vd).



CHAPTER

7

Collection procedure

This chapter introduces.

- Coordinate measurement
- Single pitch eccentric
- Planar eccentricity
- Cylindrical eccentricity
- Edge-to-edge measurement
- Overhang height measurement
- Line and extension point measurements
- Line and angle point measurement

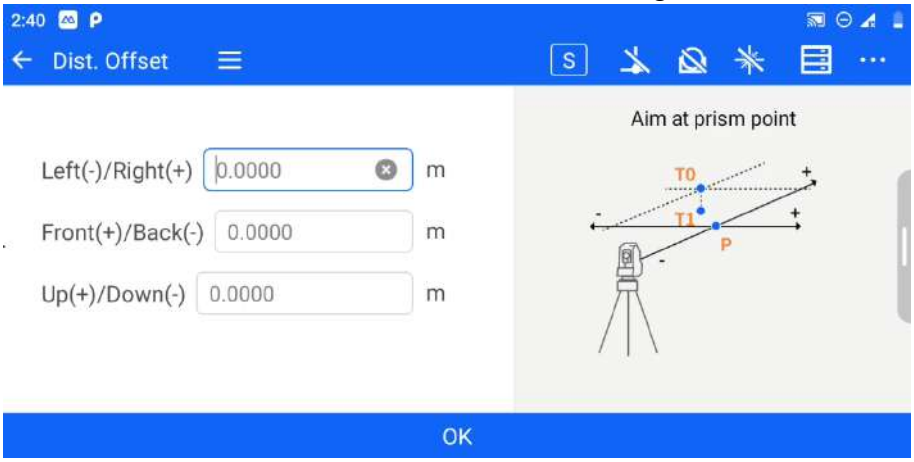
Coordinate measurement

See Chapter 2 [Basic Measurement] - [Coordinate Measurement].

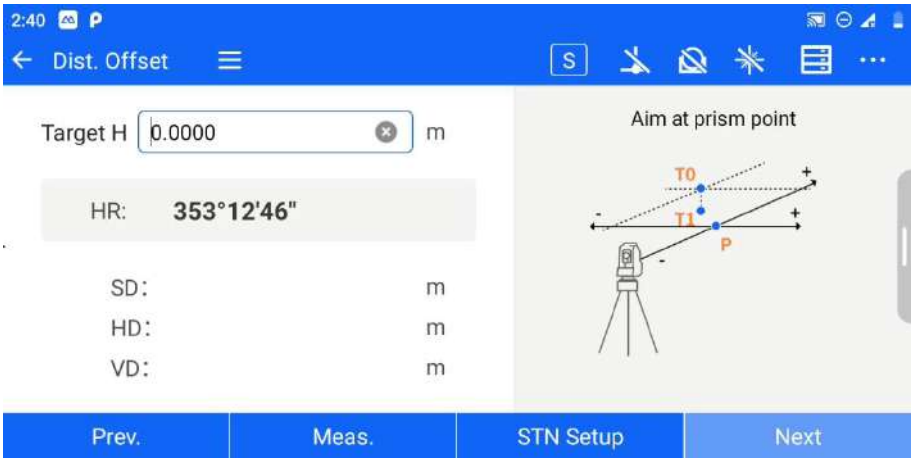
Single pitch eccentric

If the point to be measured (P) is known to deviate from the eccentric point (T0) in the observation direction of the front and rear, left and right eccentricity, then the coordinates of the T0 point can be measured by the monodistance eccentricity function. You can enter the single distance eccentricity interface through [Acquisition program] - [Single distance eccentricity]. The operation steps are as follows.

1. Enter the eccentric distance as shown in the figure below and click "OK".



Click "Measure" to get the distance between the station and the target point.



3. Click "Next" to display the distance and coordinates of point T0.

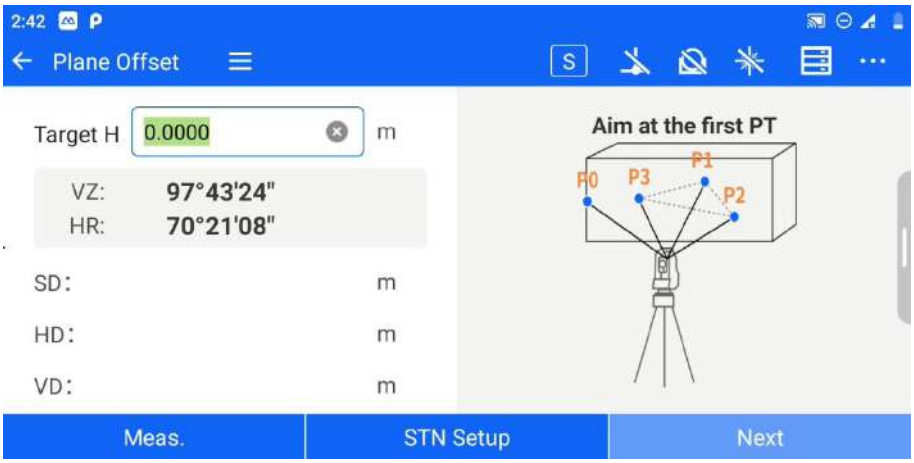
[Record]: Record the eccentric points obtained by calculation to the point library.

[Next point]: You can recalculate the next point from step 1.

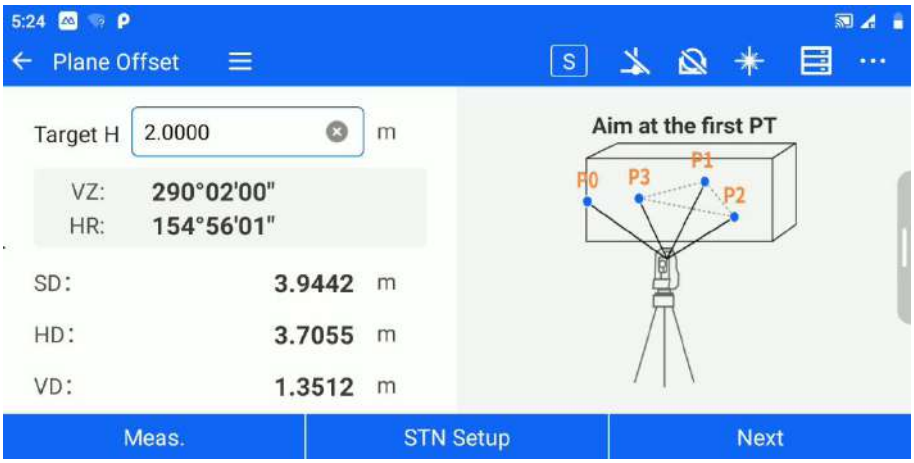
Planar eccentricity

This function is used to determine points that cannot be measured directly, such as determining the distance or coordinates of a plane edge. The plane eccentricity interface can be accessed through [Acquisition Program] - [Plane Eccentricity]. The operation steps are as follows.

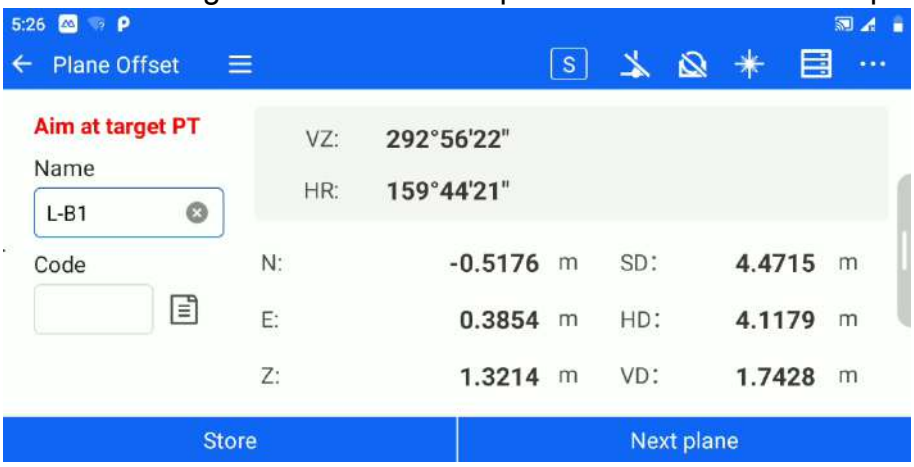
1. Point the first point P1 on the plane and click "Measure" to get the distance measurement data. Click "Next".



2. repeat step 1 and measure the second point P2 and the third point P3 on the plane to determine the plane being measured.



Then the instrument calculates and displays the coordinates of the point of intersection of the alignment axis and the plane - the coordinates of point P0.



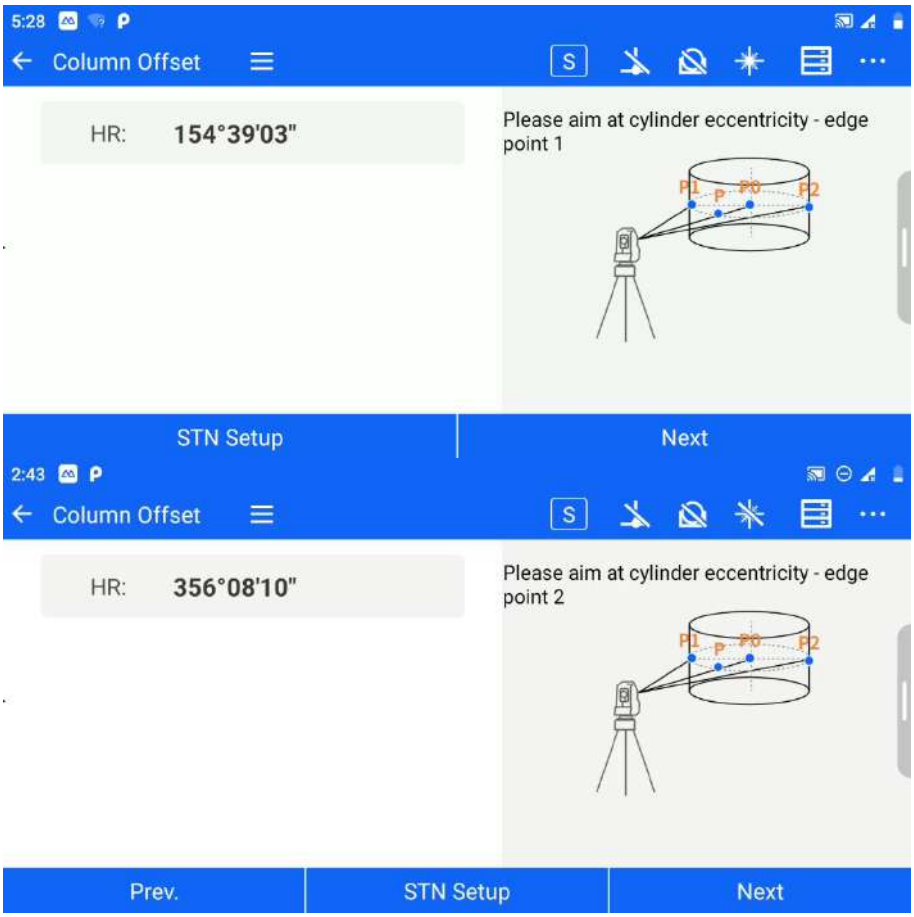
[Record]: Record the eccentric points obtained by calculation to the point library.

[Next plane]: You can recalculate the next point from step 1.

Cylindrical eccentric

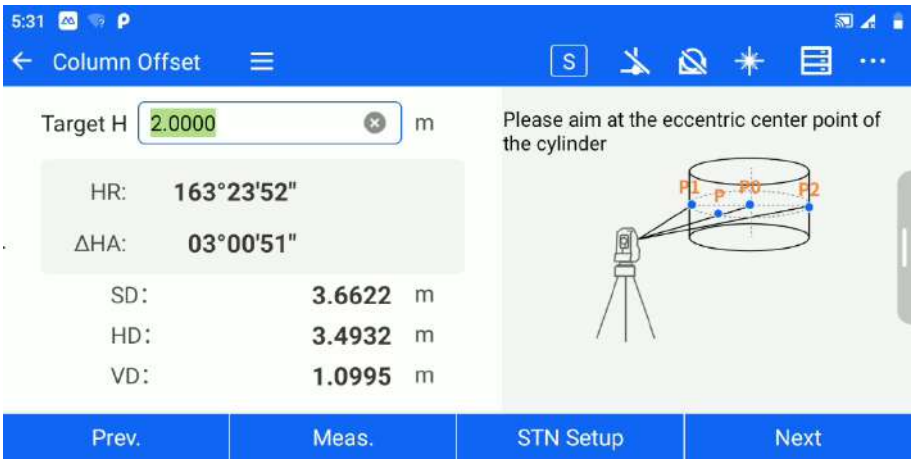
This function is used to determine the circular center point position of cylindrical objects, such as the determination of large trees, oil tanks, etc. The cylindrical eccentricity interface can be accessed through [Acquisition Program] - [Cylindrical Eccentricity]. The operation steps are as follows.

1. Align the first point P1 on the edge of the cylinder, click "Next", and get the horizontal angle data while going to the next step.

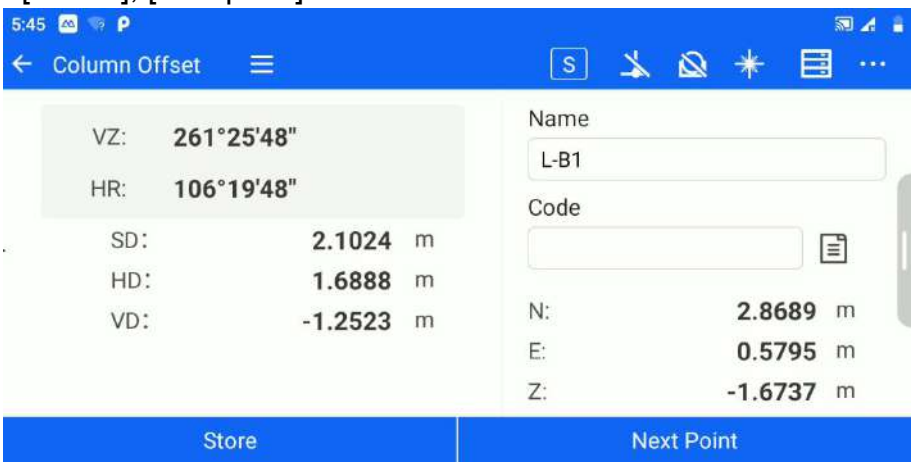


2. Aim at the second point P2 on the edge of the cylinder and click "Next" to get the horizontal angle data while going to the next step.

3. Aim at point P on the cylindrical surface and click "Measure" to get the azimuth and distance data. Note that if you want to measure the coordinates of point P0, enter 0 for the target height; if you want to measure the coordinates of the ground point corresponding to P0, enter the height of P from the ground for the target height.

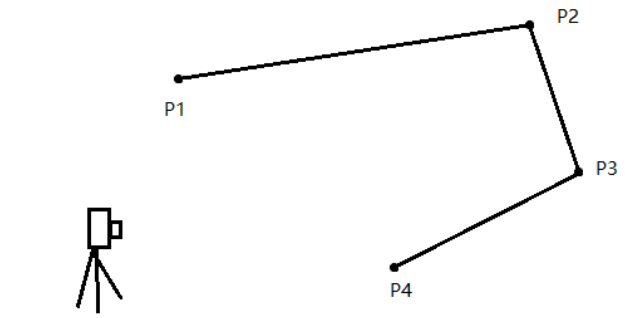


4. Click "Next" to derive the coordinates of the center of the cylinder, you can choose [record], [next point].

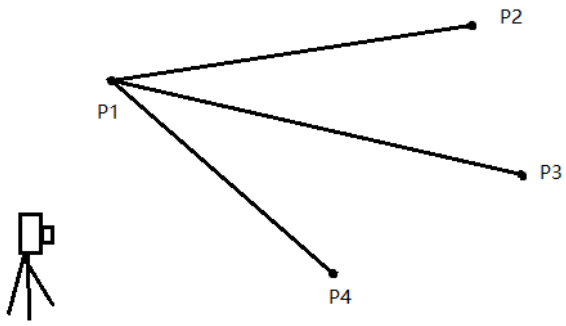


Measurement on the opposite side

After measuring a series of points, you can connect the target points by "ray" or "line" to calculate the slope, flat distance and height difference between the two points.



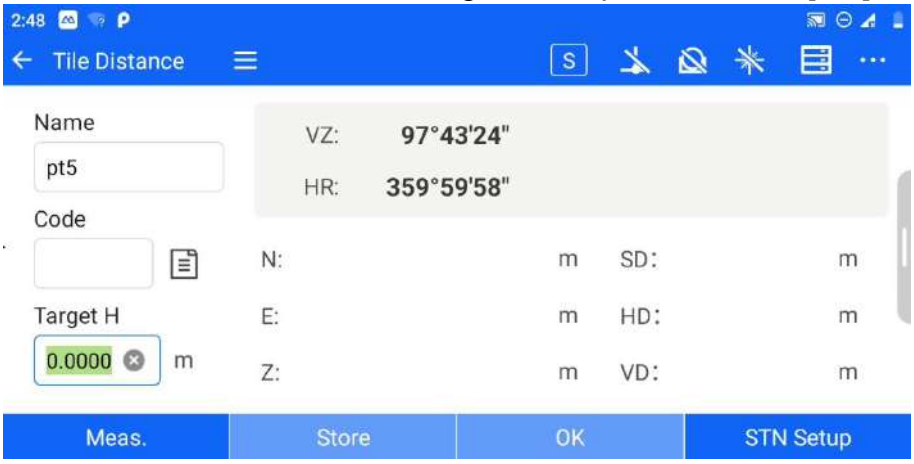
折线对边



射线对边

You can enter the interface of edge measurement through [Acquisition Program] - [Edge Measurement]. The operation steps are as follows.

1. After the user sets up the station, click [Measure on the side] to enter the measurement interface. After measuring the first point P1, click [OK].

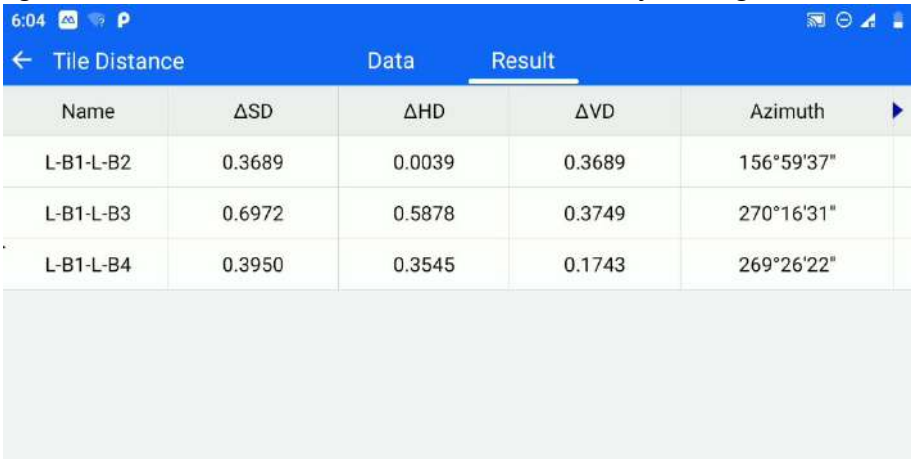


2. Enter the [Measurement on the side] data page to display the measurement point data information.

【Measurement】: Enter the measurement interface, you can add points for measurement operation.

Clear]:Clear all the point information of current data page.

3. After measuring 2 or more points, you can switch to the [Result] page to view the edge-to-edge measurement results. The radio box at the bottom of the data page can choose the calculation method of "ray to edge" or "fold to edge".



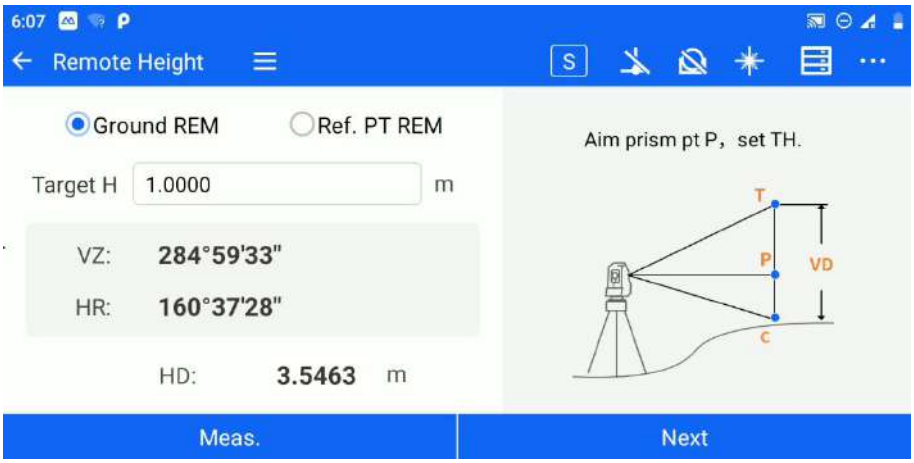
Overhang height measurement

Overhang height measurement is used to directly measure the height difference from the overhang point to the base point where the prism cannot be placed above the base point, divided into ground overhang height and reference point overhang height. You can enter the overhang height measurement interface through [Acquisition Program] - [Overhang Height Measurement].

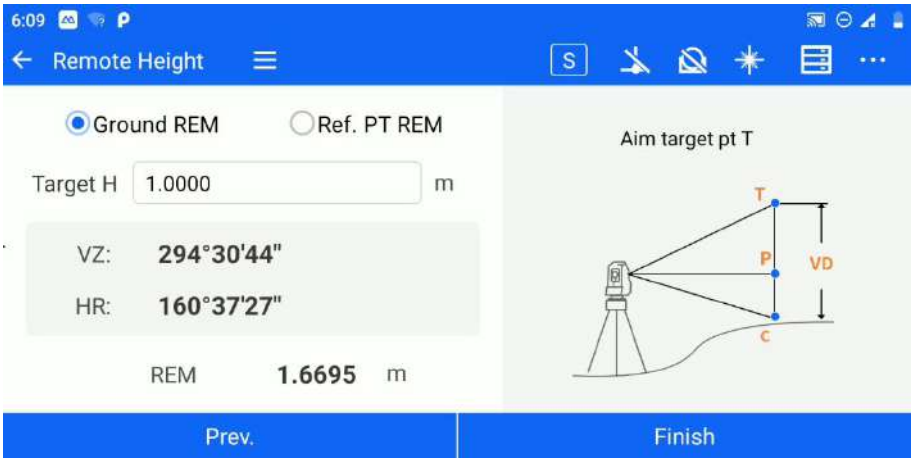
Ground Overhang

The ground overhang height is used to calculate the distance from the target point to the ground, and the target height needs to be filled in. The operation steps are as follows.

1. The user enters [Overhead Measurement] and selects "Ground Overhead". Aim at the target point P, set the target height, and click [Measure] to get the angle and distance information. Then click [Next].



2. Illuminate the target point T and derive the suspension height value in real time.



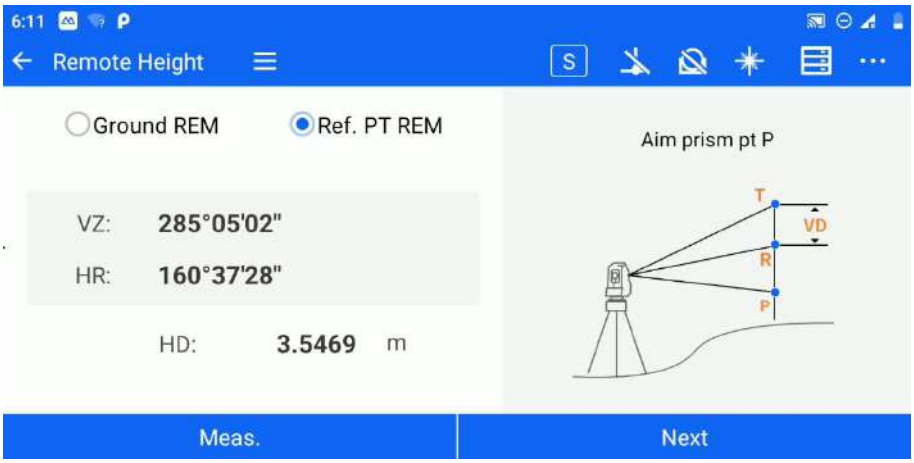
Previous]: Return to the previous step, you can view the previous measurement information.

【Finish】: Restart the suspension height measurement.

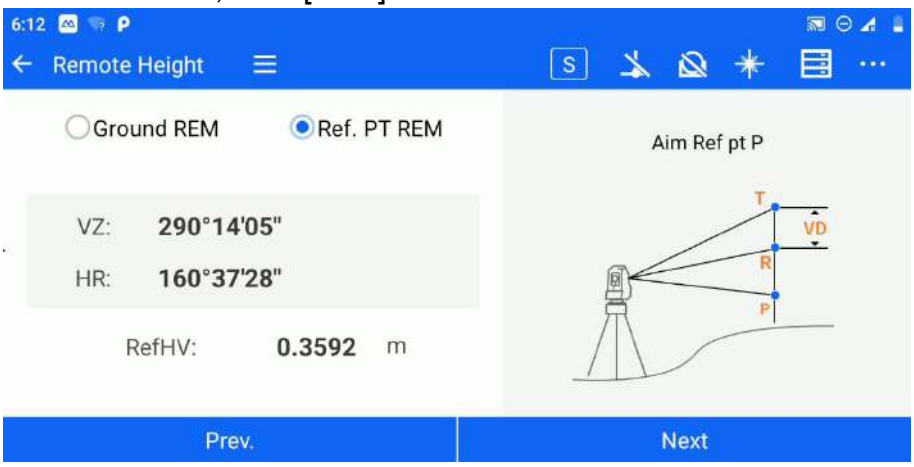
Reference point overhang height

The ground overhang height is used to calculate the distance from the target point to the reference point without filling in the target height. The operation steps are as follows.

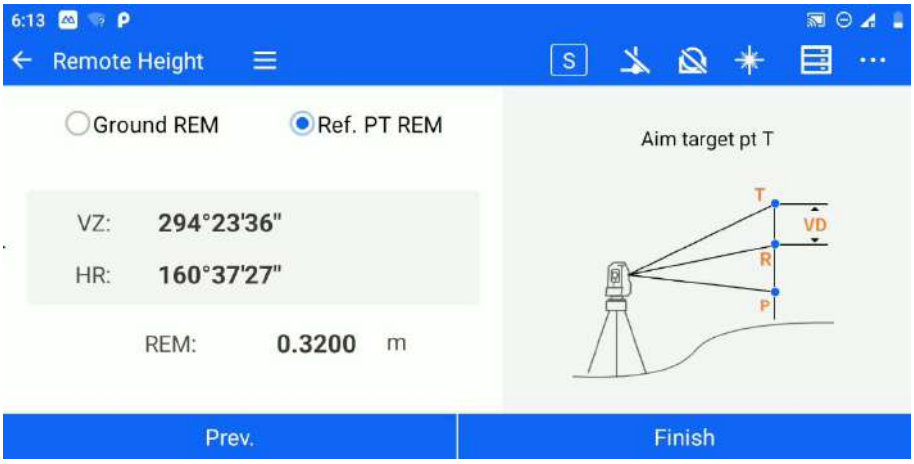
1. The user enters [Overhead Measurement] and selects "Reference Point Overhead". Point the prism P and click [Measure] to get the angle and distance information. Then click [Next].



2. Align the reference point R, the software calculates the reference height difference in real time, click [Next].



3. Illuminate the target point T, and the software calculates the suspension height value in real time.



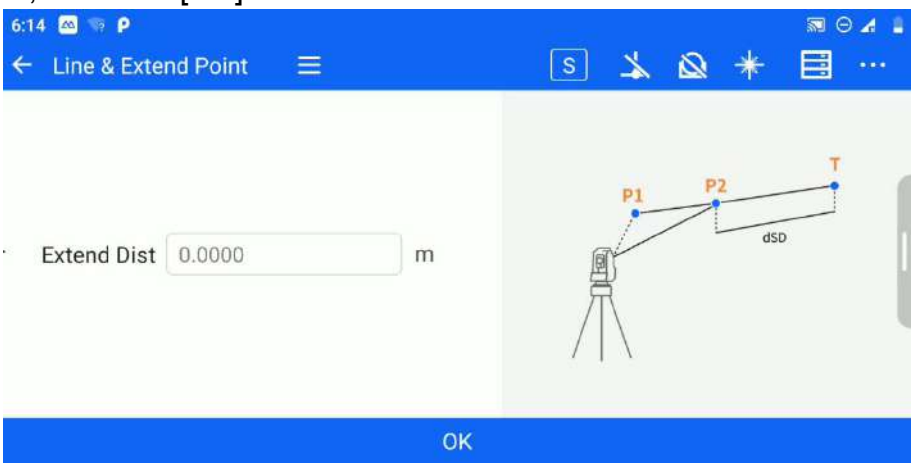
Previous]: Return to the previous step, you can view the previous measurement information.

【Finish】: Restart the suspension height measurement.

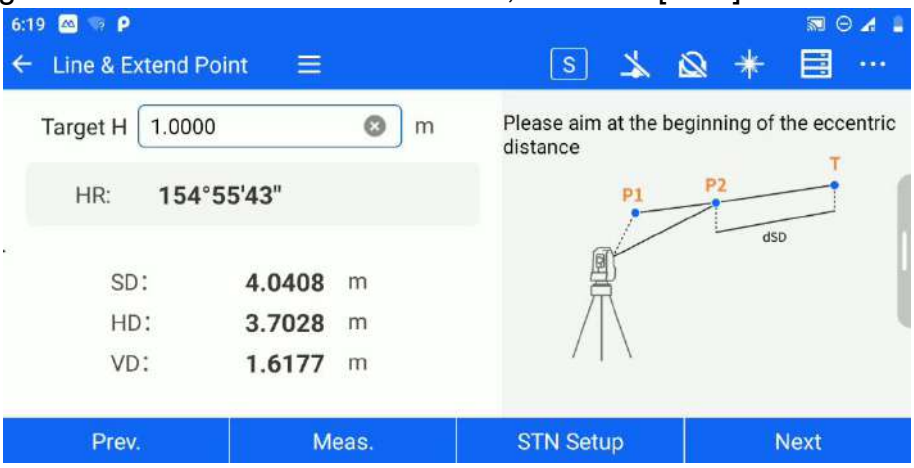
Line and extension point measurements

When the point to be measured is on the line of two measurable points and the distance from the point to be measured to the last measurement point is known, the [Line and Extension Point Measurement] (two distance eccentricity) function can be used for calculation. Enter the measurement interface through [Acquisition program] - [Line and extension point measurement]. The operation steps are as follows.

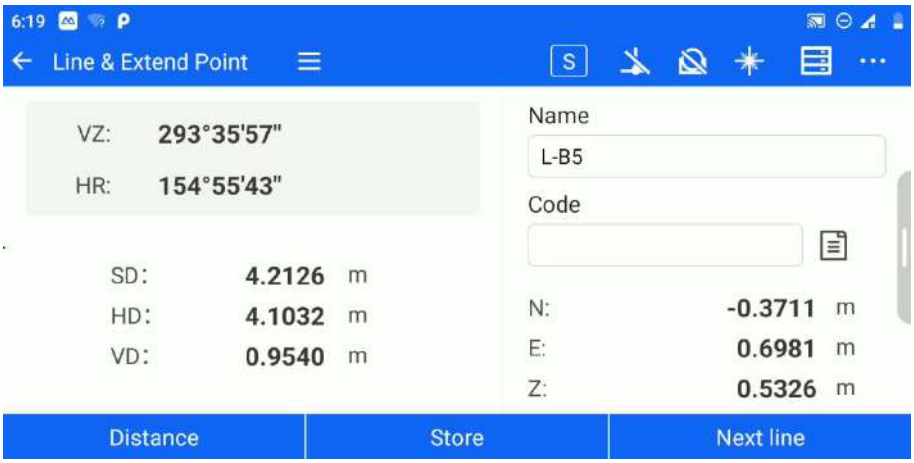
1. Users enter [Line and Extension Point Measurement], enter the extension distance, and click [OK].



2. Enter the target height, illuminate the starting point, click [Measure], get the angle and distance measurement data, and click [Next].



3. The software displays the calculated coordinates of the target point, click on the distance to reset the distance value, and the coordinates of the extension point can be calculated.



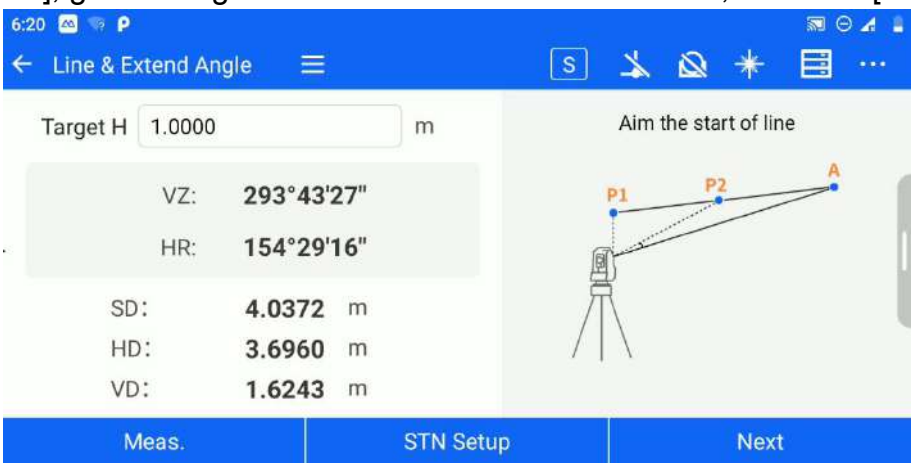
[Record]: Record the target points obtained by calculation to the point library.

[Next line]: You can recalculate the next point from step 1.

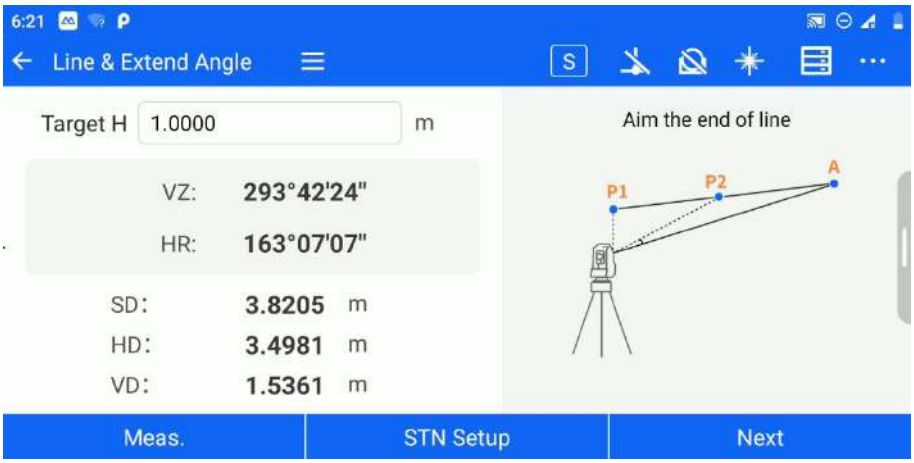
Line and corner point measurement

When the point to be measured is on the line of two measurable points, but the distance relationship between the point to be measured and the measurable point is not known, you can use the [Line and Angle Point Measurement] function for calculation. Enter the measurement interface through [Acquisition Program] - [Line and Angle Point Measurement]. The operation steps are as follows.

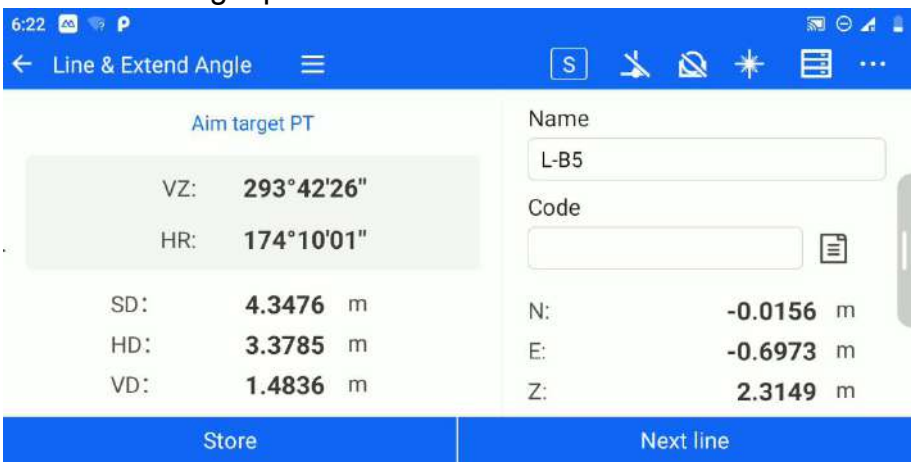
1. Enter the target height, illuminate the starting point of the straight line, click [Measure], get the angle and distance measurement data, and click [Next].



2. Enter the target height, illuminate the end of the straight line, click [Measure], get the angle and distance measurement data, and click [Next].



3. Shine the light on the target point, and the software displays the calculated coordinates of the target point.



[Record]: Record the target points obtained by calculation to the point library.

[Next line]: You can recalculate the next point from step 1.

CHAPTER

8

Placement procedure

This chapter introduces.

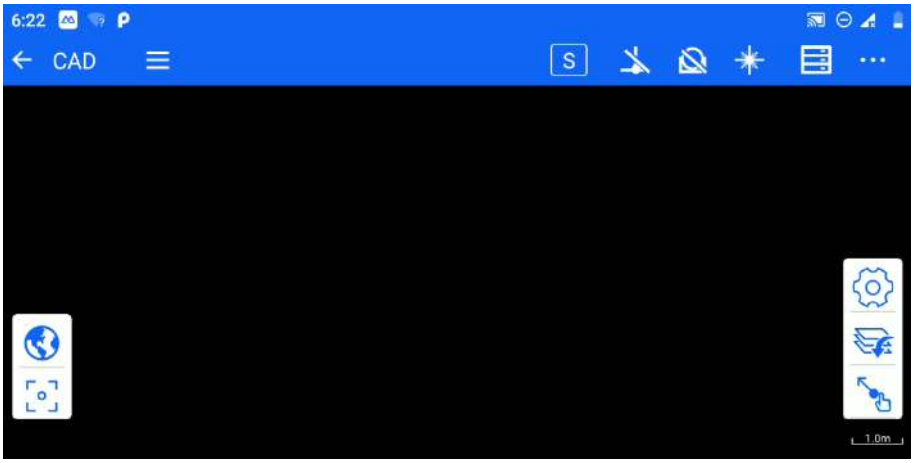
- CAD proofing
- Coordinate placement
- Image Assisted Release
- Angular Distance Release
- Directional line placement
- Straight line placement
- Reference line placement
- Reference arc release

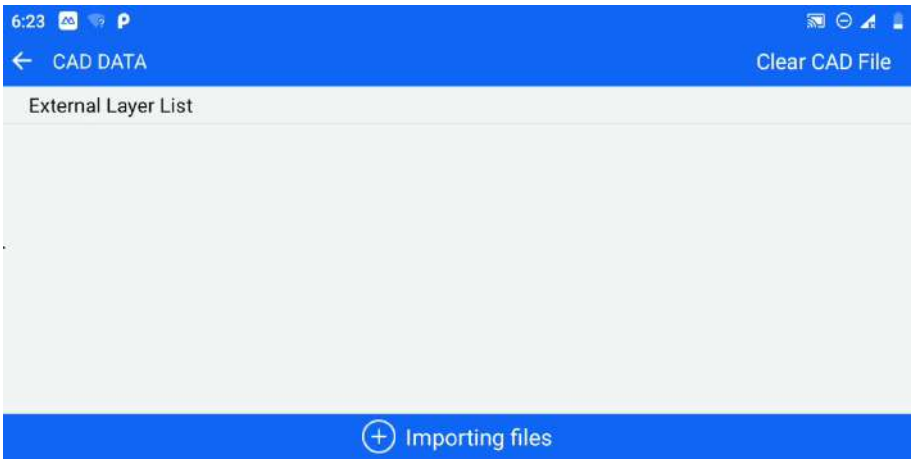
CAD Release

CAD release allows you to select features from imported dxf and dwg format files and perform point release and line release on the selected features.

CAD data import

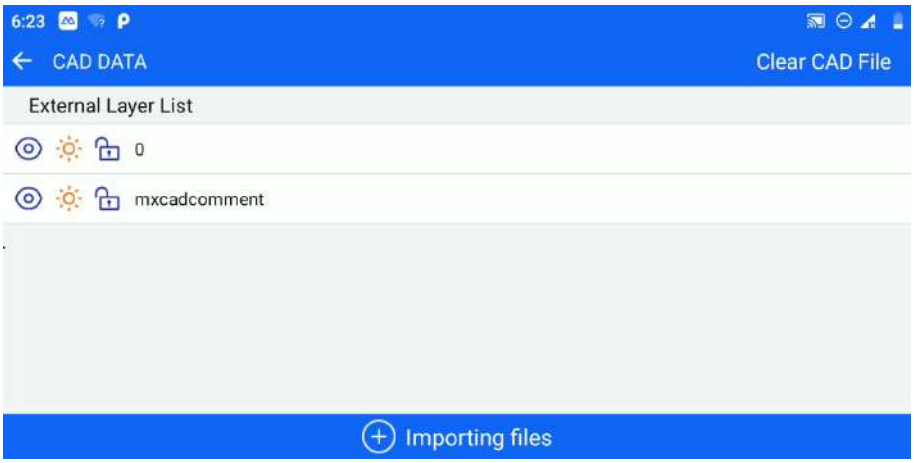
Click [Release Program] → [CAD Release] to enter the CAD release interface, expand the right toolbar, click [Data] button to enter the CAD data interface, click [Import File] button below to select and import CAD data, import data support *. dxf, *.dwg format, select the data and click OK to jump to the CAD data interface and display the data content.





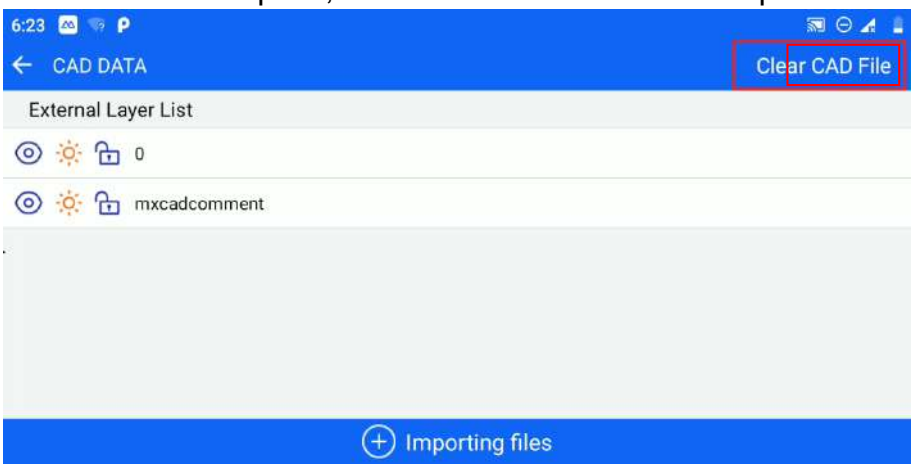
Layer display

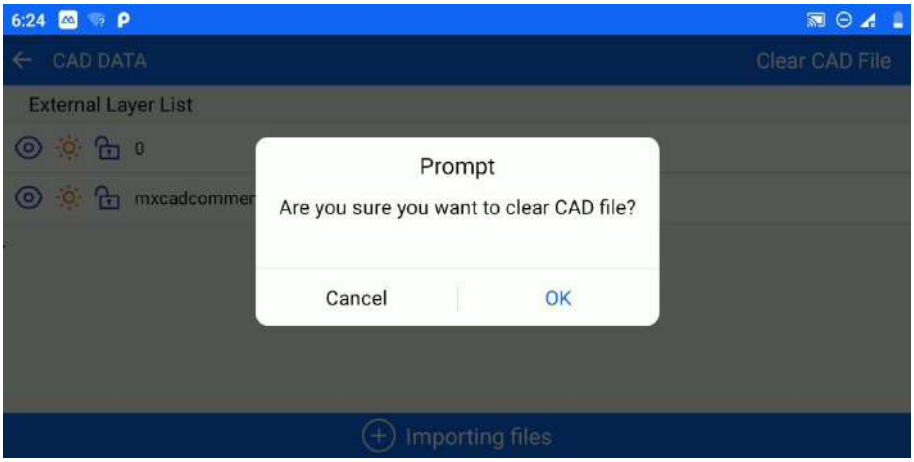
Click the [Data] button in the CAD release interface to enter the data interface, and control the display of the corresponding layer by the eye in front of the layer, the layer is displayed when the eye is open, and not displayed when the eye is closed.



Delete base image

After importing external data, click the [Data] button in the CAD release interface to enter the data interface, click the [Clear Base Map] button in the upper right corner of the interface, a pop-up window will appear to indicate whether to confirm the deletion of the CAD base map file, click OK to clear the base map.

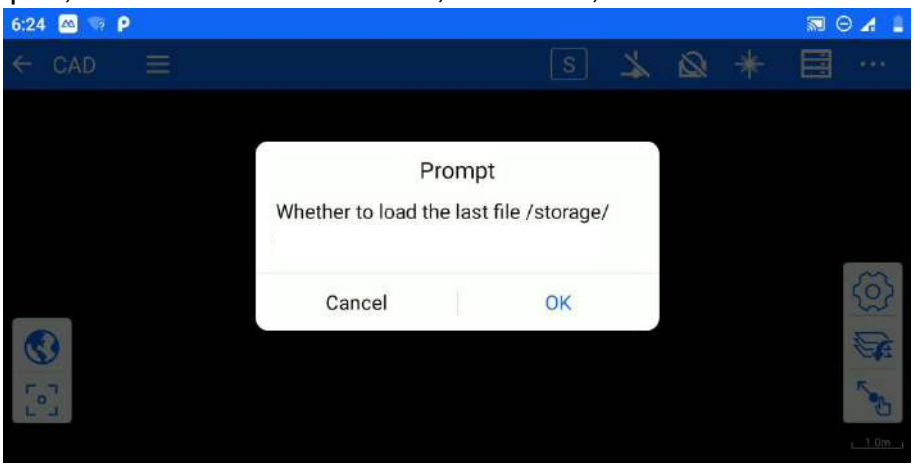




Open the last bottom image

After you have opened the CAD base drawing file, the next time you enter the CAD release module, a pop-up window will prompt whether to open the last file, if

you click Open, the last file will be loaded; otherwise, it will not be loaded.



Note: 1. When switching between projects and the New function is performed, the CAD release screen correctly displays the imported data and is not affected.

CAD Release Tool

When you enter the CAD Release screen, click on the Settings button in the right toolbar to expand the CAD module's related tools.

Font size: You can modify the dot name size of the acquisition points in the CAD release interface.

Toggle base image: You can toggle the base image to black/white.

Switch coordinate system: Click this button to switch between displaying user coordinate system or world coordinate system.

Conversion of base map source length units: You can convert the base map source length units to m or mm.

Redraw: When the interface is enlarged, there may be a phenomenon that the arc is not drawn smoothly, click Redraw to refresh it to make it draw correctly.

Blow up the entity: you can blow up the selected feature into multiple entities. The operation method is.

1. After loading the CAD file, click on the graphical interface to select the block or polyline.

2. Click [Blow up entity], the selected block can be blown up into multiple

independent entities.

Line Plotting

1. importing the CAD files to be released for sampling.

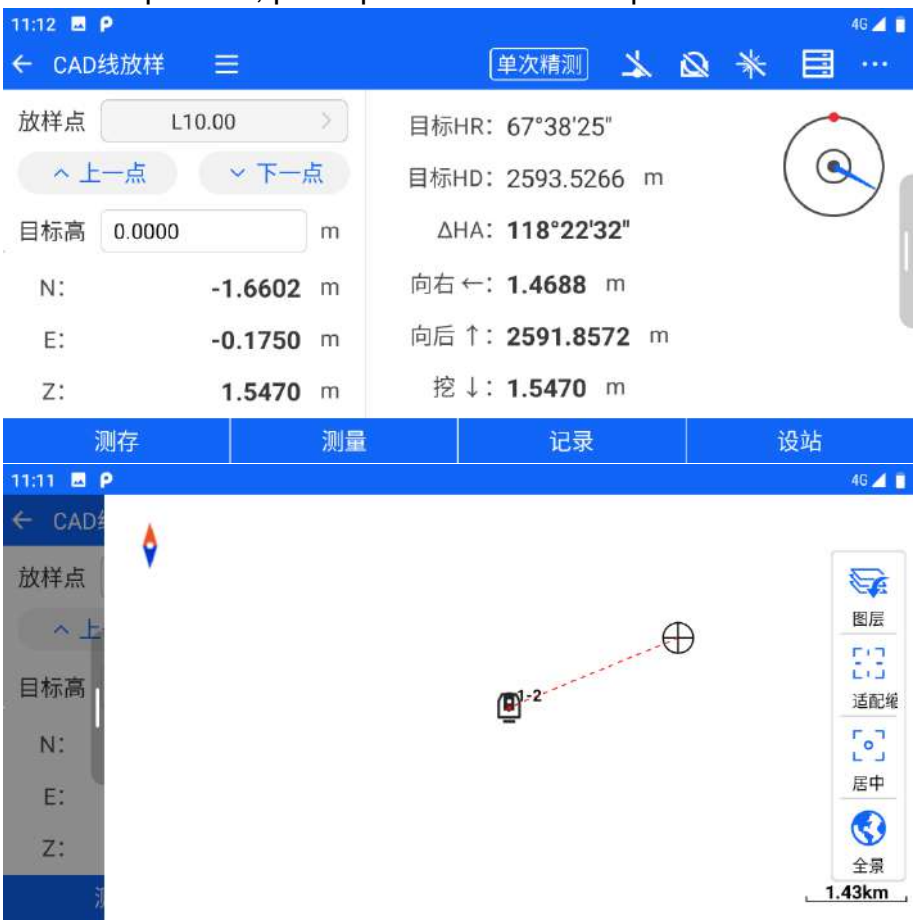
2. Click to select the target line to be released, and display the "Release" button.

3. Click "Release" button to enter the release parameter setting interface, you can set the release parameters such as left/right offset, front/back offset, front/back offset increment, top/bottom offset, etc.

The default checkbox of "release line node" in the setting interface of release parameters means that the release target can also be switched to the node of the release line when it is switched by the increment of front and rear offset; if the checkbox of release line node is unchecked, the release point will only be switched by the integer multiple of the increment of front and rear offset and will not be switched to the node of the release line.

Click OK to enter the release interface, click the previous point and next point button to switch the target points by front and back offset increments, click the measurement and storage/measurement-record to calculate the release information,

and expand the graphic interface on the right to display the position relationship between the current position, prism points and release points.



Point Release

For CAD interface graphics, you can use the [Select Point] button to select special marker points, and click OK after successful selection to release the selected points.

The special marker points that can be selected are: line start point, line end point, line node, any point on a circle arc, and any point on a circle. The operation steps are as follows.

1. Enter the [CAD release], click "select points", the interface shows the pick logo.

2. Drag the pick marker to the special marker point to be selected, release the pick marker and click the "Release" button.

3. pick up the release point successfully, jump to the release interface to start the release.

4. The total station illuminates the prism, and then clicks the measurement and

storage/measurement-record to calculate the release information, according to which the prism can be moved to the position to be released.

Coordinate Placement

The coordinates can be selected by the point library or manually entered to select a certain release point for the release operation.

The operation steps are as follows.

1. Enter [Coordinate Release], click "Select Release Point Bar" to jump to the interface of "Select Release Point", you can select the target points to be released by manual input or list selection of points.

2. After selecting the release point, click OK, return to the release interface, click the previous point and next point button to switch the point data in the release point library for release.

3. The total station illuminates the prism, click on the measurement and storage/measurement-record to calculate the release information, and refer to the release information tips to find the release position.

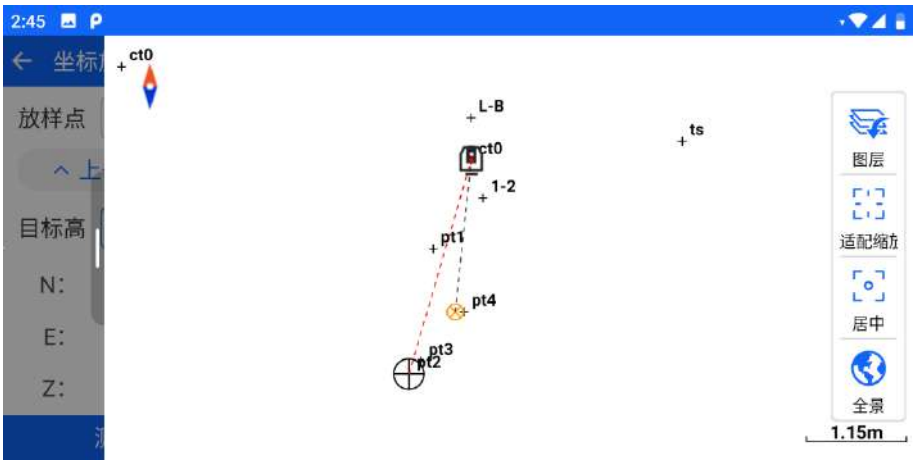


Image Assisted Release

The total station is equipped with image function, which will display the camera view on the screen. When the release point is set, it will mark the location of the release point on the interface and perform the release prompt to the left/right and up/down. So that it is easier to find the point to be released.

The module can be accessed through [Release Program] - [Image Assisted Release]. It should be noted that image assisted release is only supported on total station. Other Androidid devices do not show this option.

The operation steps are as follows.

1. Enter [Image Aided Release], open the left slide bar, and click Set Release Point. Same as other setting release points, you can select the release points by manual input, point name search, list selection, etc.

2. After selecting the release point, the graphical interface shows the hints to the left/right and up/down; the side slider also shows the release distance hints.

3. According to the instructions to turn the eyepiece, when the target point in the visual range, you can see a red mark on the target point. It is convenient to take a picture and put the sample.

[Measurement and storage]: While measuring prism points, save prism point information to the total station point library.

[Measurement]: Measure the coordinates of the prism point.

Record]: When the coordinates of the prism points have been measured, click Record to save the prism point information to the total station point database.

[Set Station]: Jump to the station rear view screen to reset the station.

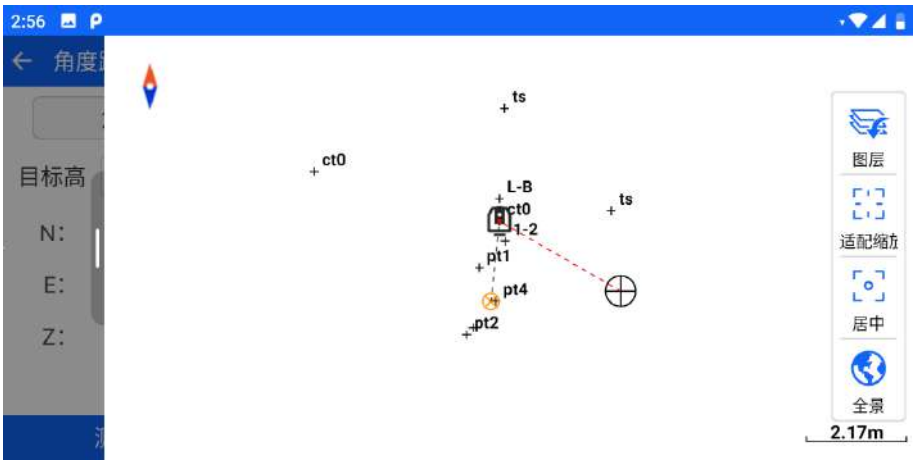
Previous point]/[Next point]: Switch to select the release point in the release point library.

Angular distance release

Angular distance release can be set by entering the horizontal angle, angular flat distance and height difference from the release point to the survey site.

Click [Angular Distance Release] to enter the angular distance setting interface, set the horizontal angle, angular distance and height difference from the release point to the survey site.

Click OK to jump to the angle and distance release interface, and click angle and distance parameters to modify and adjust the release point setting parameters. Click Save/Measure/Record to display the release information, and move the prism according to the release information to reach the target location of the release point.

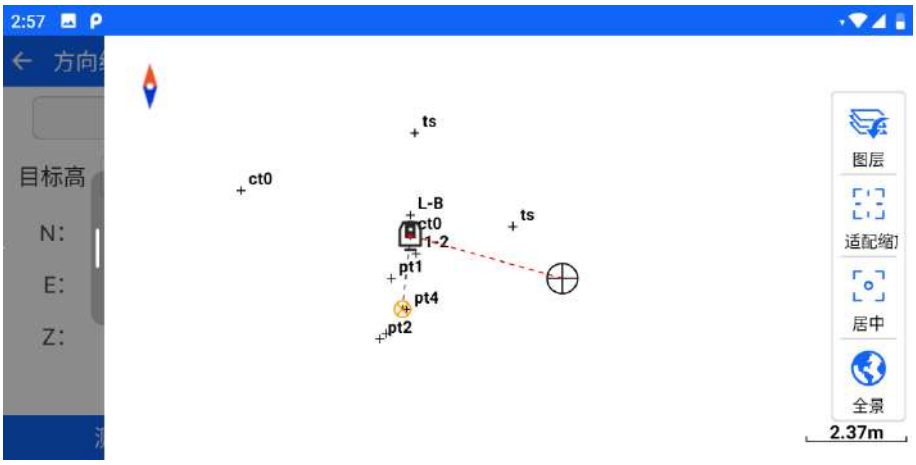


Directional line placement

Directional line placement can be set by inputting azimuth, level distance and elevation difference from reference point to reference point to set the placement point for placement.

Click [Directional Line Placement] to enter the directional line parameter setting interface, after selecting the reference point (the reference point can be selected by manual input, list selection, measurement selection, etc.), set the azimuth, flat distance and height difference from the sample point to the reference point.

Click OK to jump to the interface of the directional line, and click on the directional line parameters to modify and adjust the parameters of the reference point settings. Click Save/Measure/Record to display the release information, and move the prism according to the release information to reach the location of the release point.



Straight Line Plotting

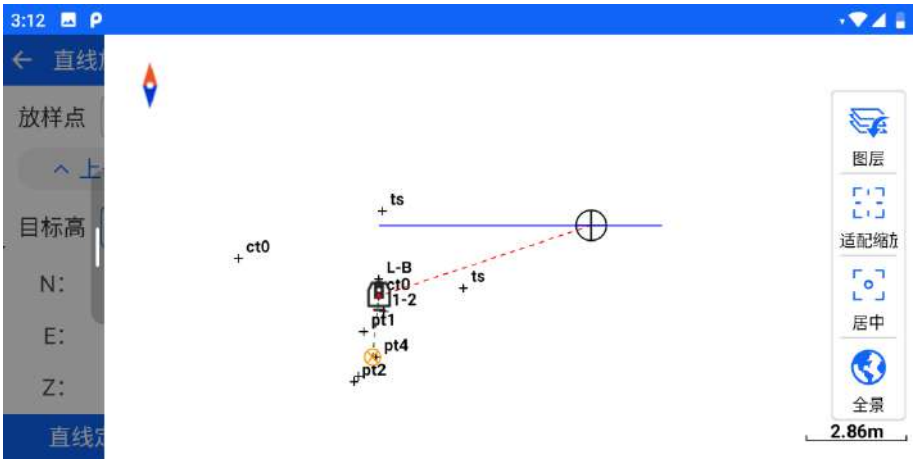
Straight Line Placing allows you to place custom lines by setting the placing parameters.

Click [Line Release] to enter the line definition interface, set the starting point and end point to create a custom line.

After setting the line, click OK to enter the setting interface of release parameters, you can set the release parameters such as left/right offset, front/back offset, front/back offset increment, top/bottom offset, etc. Click OK to enter the line release interface.

Click "Line Definition" to modify and adjust the line information.

Click the previous point and next point button to switch the target points according to the configuration of the release parameters, click the measurement and storage/measurement-record to calculate the release information, and expand the graphic interface on the right side to display the position relationship between the current position, prism points and release points.



Reference line placement

Reference line placement can define the reference line by setting parameters such as start/end point and baseline offset, rotation, etc., and perform placement operations on the reference line after configuring the placement parameters.

Reference Line Definition

Click [Reference Line Placement] to enter the reference line definition interface, select the starting point and end point of the reference line (can be selected by manual input, list selection, measurement selection, etc.); set the baseline offset, including horizontal offset, vertical offset, rotation angle and other parameters.

Reference line placement

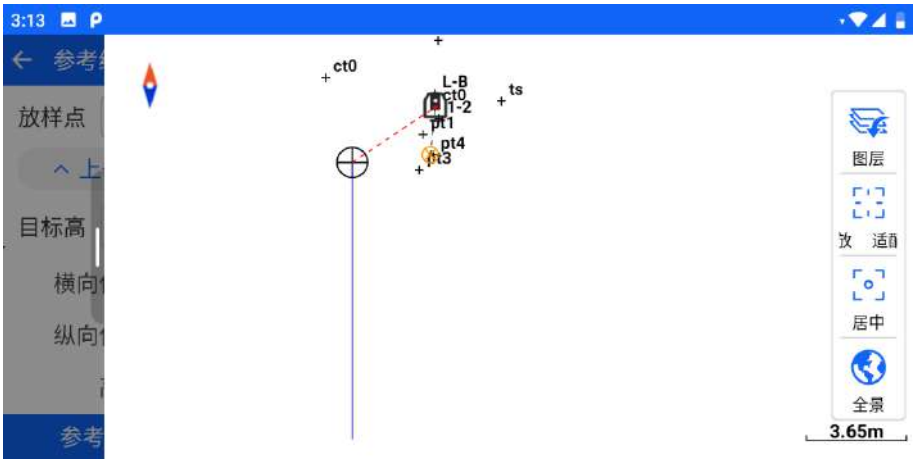
After defining the reference line and its baseline offset, click OK to enter the setting interface of release parameters, set the release parameters such as left/right offset, front/back offset, front/back offset increment, top/bottom offset, etc., and then click OK to enter the reference line release interface.

If the front and back offset increment is set, the release screen shows the switch button of the previous and next point, and click it to switch the target point of the

release according to the offset increment.

After the target point is selected, click on the measurement and storage/measurement-record to calculate the release information, and expand the graphic interface on the right side to show the position relationship between the current position, prism points and release points.

Click the "Reference Line" button to jump to the reference line definition interface to modify the reference line parameters.



Reference Arc Release

The reference arc release can be defined in different ways, and the release operation can be performed on the reference arc after configuring the release parameters.

Reference Arc Definition

Click [Reference Arc Release] to enter the reference arc definition interface, there are three reference arc definition methods to choose from: "center + start point", "start point + end point + radius", "start point + end point + point on the arc ",

after selecting the reference arc definition method, you can set the parameters as required.

After "Center + Start" or "Start + End + Point on Arc", click "Calculate" button to automatically solve the reference arc radius information.

After inputting the reference arc information, click OK to jump to the setting interface of the release parameters.

Note: 1. When using "Center + Start" and "Start + End + Point on Arc"

method to calculate the radius of the reference arc, only the 2D projection coordinates are considered, i.e. the radius is calculated in the 2D plane, independent of the Z coordinate of the reference point.

2. The graphical interface draws a 2D planar graph of the reference arc, but the elevation information of the reference point is still retained and effective when the release operation is performed.

3. When using the "Start + End + Top" method to set the reference arc, the top point of the arc is always between the start and end points.

Reference Arc Release

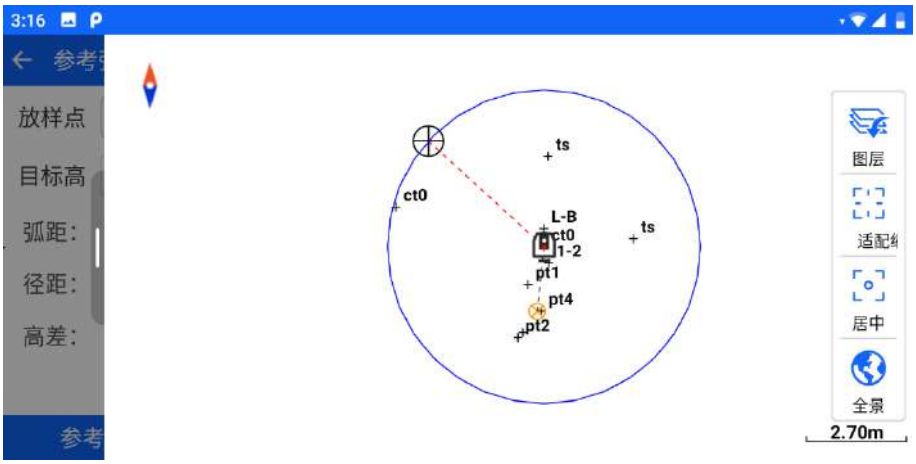
Enter the setting interface of release parameters, you can select different release targets and set their corresponding release parameters.

Placement point

Select the release point item, set the arc distance, diameter distance and other parameters and then click OK to jump to the reference arc release interface, click Save/Measure-Record to calculate the release information, and expand the graphic interface on the right to display the current position, prism points and the position relationship between the release points.

"arc distance": set to a, then the arc distance a is offset clockwise starting from the starting point in the reference arc, and 0 < a < total arc length.

"Diameter distance": set to b. If b<0, the distance b will be approached to the center of the circle starting from the starting point; if b>0, the distance b will be moved away from the center of the circle starting from the starting point.



Release arc

Select the arc release item, set the closing difference, starting arc distance, diameter distance, arc increment and other parameters and then click OK to jump to the reference arc release interface, click Save/Measure-Record to calculate the release information, and expand the right graphical interface to display the current position, prism points, and the position relationship between the release points.

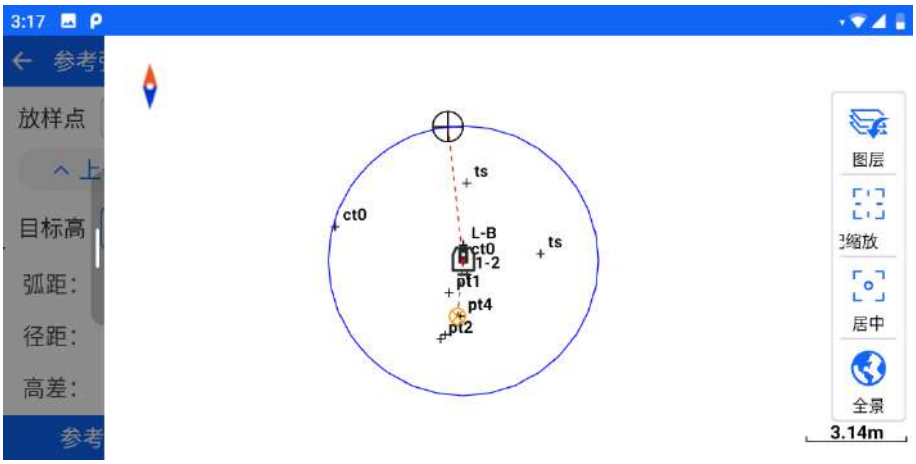
"Closure Difference": including three modes of end point closure difference,

evenly divided closure difference, and end point closure difference. If end point mode is selected, the remainder of the total arc length/arc increment when the release point switching is performed is attributed to the last release point, and so on for other modes.

"starting arc distance": set to c, then the starting release point is the position in the reference arc after the starting point is offset clockwise by arc distance c, and 0 < c < total arc length.

"Diameter distance": see the parameters of the release point item.

"Arc Increment": set to d, then the release interface can switch the release point in steps of arc increment d via the Previous Point Next Point button, and 0<d< total arc length.



Release strings

Select the chord item, set the closing difference, starting chord length, diameter distance, chord increment and other parameters and then click OK to jump to the reference arc release interface, click Save/Measure/Record to calculate the release information, and expand the graphic interface on the right to display the current position, prism points and the position relationship between the release points.

"Closure difference": see the parameters of the release arc term.

"starting chord length": set to e, then the starting release point is the position of the starting point in the reference arc clockwise offset from the chord length e corresponding to the arc length, and 0 < e < diameter.

"Diameter distance": see the parameters of the release point item.

"Chord increment": set to f, then the release interface can switch the release point in steps of chord increment f by the up point down point button, and 0<f< diameter.

Release sample rounding angle

Select the release center angle item, set the closing difference, starting center angle, diameter distance, angle increment and other parameters and then click OK to jump to the reference arc release interface, click Save/Measurement-Record to calculate the release information, and expand the graphic interface on the right to display the current position, prism points, and the position relationship between the release points.

"Closure difference": see the parameters of the release arc term.

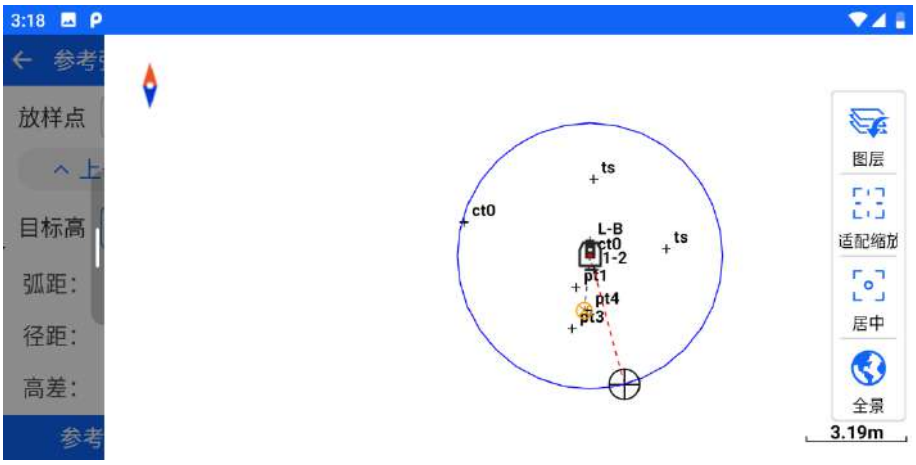
"starting circular angle": set to g, then the starting release point is the position of the starting point in the reference arc offset clockwise by an angle g, and 0 < g < 360.

"Diameter distance": see the parameters of the release point item.

"Angular increment": set to f, then the release interface can switch the release point in steps of angular increment f by the up point down point button, and 0<f<360.


3:16
放样参数设置
放样点
放样弧
放样弦
放样圆心角
闭合差
终点
起始圆心角
000:00:00.00000
径距
0.0000
m
角增量
000:00:00.00000
取消
确定


3:18
参考弧放样
单次精测
放样点
L17.54
上一点
下一点
目标高
0.0000
m
弧距:
7.5981
m
径距:
-1.8239
m
高差:
2.4044
m
目标HR: 165°00'21"
目标HD: 4.1870 m
目标弧距: 17.5383 m
ΔHA: 21°02'07"
向右 ←: 0.6214 m
向后 ↑: 2.4557 m
挖 ↓: 2.4044 m
参考弧
测存
测量
记录
设站


3:18
放样点
目标高
弧距:
径距:
高差:
ts
ct0
L-B
ct0
1-2
pt1
pt4
pt3
ts
图层
适配缩放
居中
全景
3.19m

CHAPTER

9

Calculation Tools

This chapter introduces.

- Unknown point orientation correction
- Orientation-free calibration

Coordinate orthorectification

- Coordinate backcalculation
- Area perimeter
- Angle conversions
- Distance conversion
- Point average
- Slow curve calculation
- Equipartition of line segments
- Calculators

Unknown point orientation correction

The unknown point orientation correction function is used to post-process the data recorded from the unknown point orientation set-up measurements, i.e., to perform hind sight correction. The module can be accessed through [Calculation Tools] - [Unknown Point Orientation Correction]. The operation steps are as follows.

1. Precondition: the station has been set up by unknown point orientation, and the coordinates of several points are measured, and the correct coordinates of the hind sight point are known.

2. Enter [Unknown Point Orientation Correction], which displays the list of unknown point orientation stations and the corresponding measurement points.

3. Click the parameter of the set-up station that needs to be calibrated to enter the list of corresponding measurement points.

4. Click [Correction], enter or list to select the hind view point coordinates, click [OK], then complete the unknown point orientation correction. The corresponding measurement coordinate points in the point data are corrected according to the

selected hind view point coordinates.

Orientation-free calibration

The orientation-free correction function is used to post-process data recorded from orientation-free set-up measurements, i.e., to perform hind-sight correction. It is divided into known point method and common point method. The module can be accessed through [Calculation Tools] - [Orientation-free Correction].

Known point method

The known point method is used for back-view correction when the correct coordinates of one of the measurement points are known. The operation steps are as follows.

1. Precondition: the station has been set up by direction-free, and the coordinates of several points have been measured, and the correct coordinates of one of the measurement points have been known.

2. Go to [Orientation-free correction] and select the known point method. Click the list of selected points button after the station to select the station to be corrected.

2. Click on the list selection button after the measurement point to select the measurement point for which you know the correct coordinates.

3. Enter or list select the known coordinates corresponding to the measurement point at the known coordinates. Click [Correction].

6. If the correction is successful, the corresponding measurement coordinates in the point data are modified to the corrected coordinates. Note that if the difference

between the known point coordinates and the actual observed value is more than 10cm, the correction will not be successful.

Common Point Method

The common point method is used for hindcast correction in the case where two different stations have been set up without orientation in the same coordinate system, and two different stations have observed the same prismatic point. The operation steps are as follows.

1. Pre-condition: there are two direction-free stations and corresponding measurement points, and one of the measurement points for the two stations set up public observation.

2. Go to [No directional correction] and select the public point method. Select measurement site 1, public measurement point 1, measurement site 2 and public measurement point 2, respectively.

3. Select the orientation of the common point, if the common point is on the left side of the line from station 1 to station 2, that is, select "station 1->2 left", and vice versa, select "station 1->2 right".

4. After setting, click [Calibration]. If the calibration is successful, the corresponding measurement coordinates of both stations in the point data are modified to the corrected coordinates.

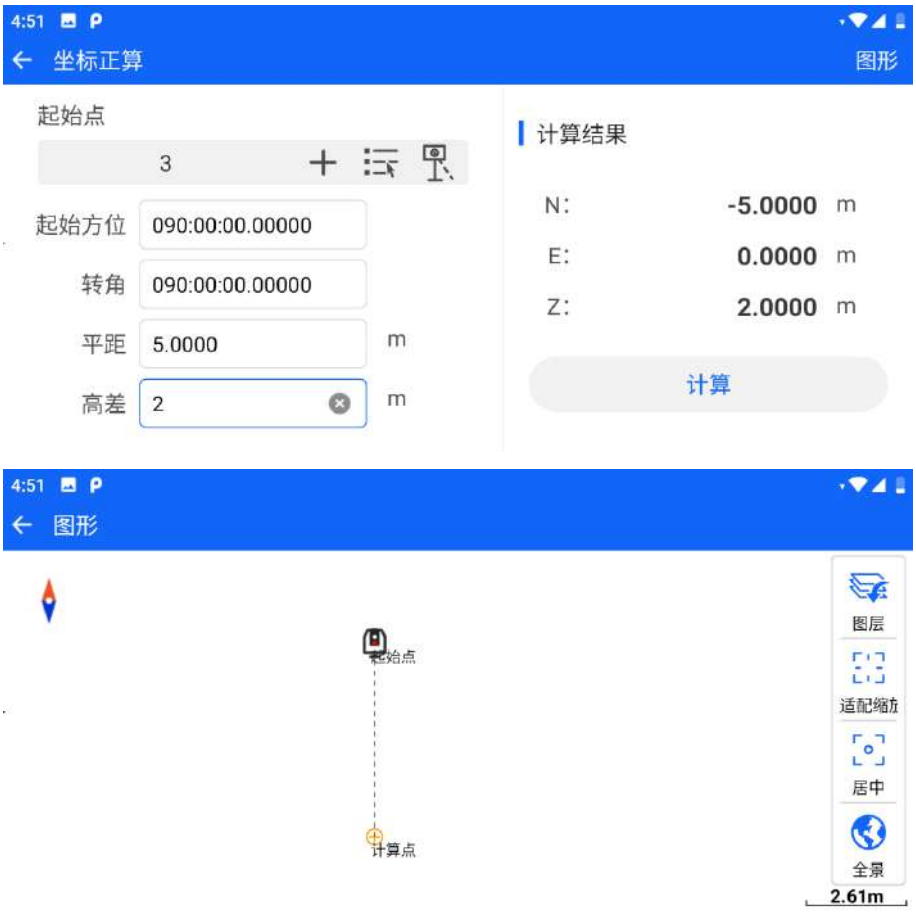
点名	点类型	N	E	Z	图例
unknown1	坐标测量点	-3.0306	-1.7994	-0.0247	已知
unknown2	坐标测量点	-3.0379	-2.4036	-0.0374	已知
unknown3	坐标测量点	-3.0445	-3.0088	-0.0471	已知
unknown4	坐标测量点	-4.2347	-2.9961	-0.0443	已知
unknown5	坐标测量点	-5.4263	2.4145	0.0520	已知
unknown6	坐标测量点	0.5906	-1.1918	0.0711	已知

Coordinate orthogonal calculation

The coordinate orthogonal calculation function can derive the specific coordinate information of the end point by setting the spatial relationship between the start point and the end point relative to the start point.

The starting point can be input and selected by manual input, list selection and measurement selection, etc. After selecting the starting point, set the starting azimuth, rotation angle, flat distance and height difference information of the ending point relative to the starting point, click "Calculate" button, and then display the calculation result of the coordinates of the ending point after projection.

Click on the "Graph" button to view the relationship between the start and end points of the plane.

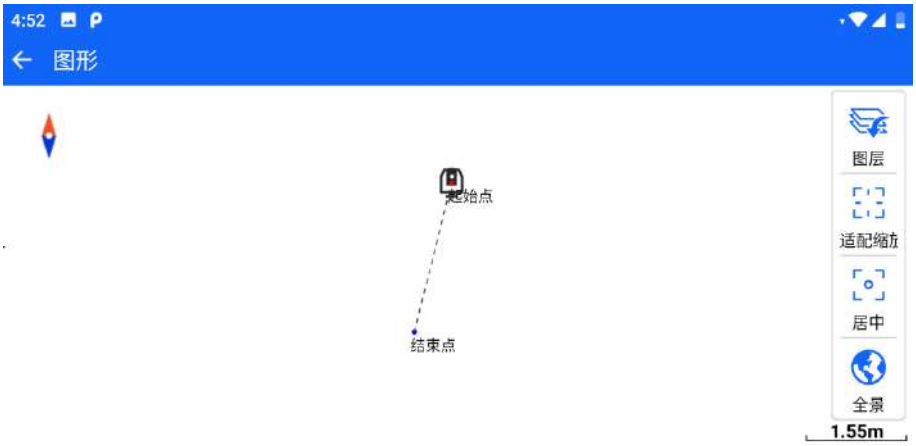


Coordinate backcalculation

The coordinate back-calculation function can derive the spatial information of the end point with respect to the start point from the coordinate information of the start point and the end point.

The start point and end point can be input and selected by manual input, list selection and measurement selection, etc. After selecting the start point and end point, click the "Calculate" button, and the SD (spatial linear distance between the start point and the end point), HD (horizontal linear distance between the start point and the end point), VD (height difference between the start point and the end point), azimuth and slope information of the end point relative to the start point will be displayed after calculation. (horizontal distance between start point and end point), VD (height difference between start point and end point), azimuth and slope information.

Click on the "Graph" button to view the relationship between the start and end points of the plane.

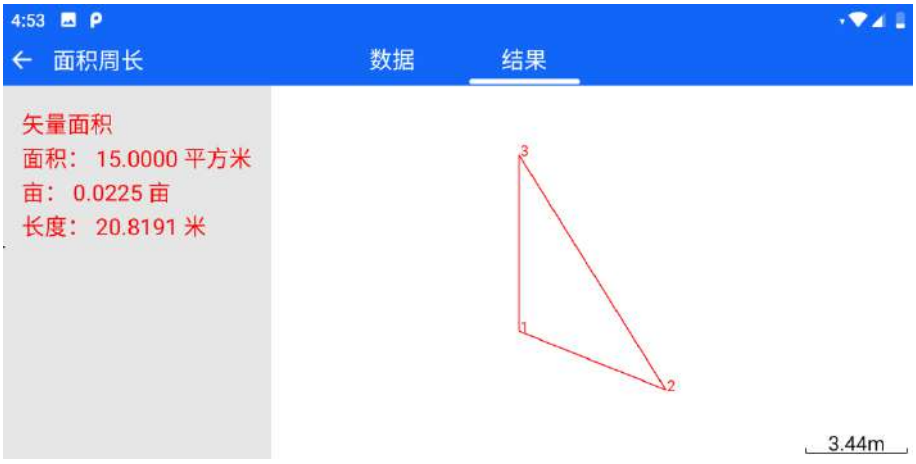


Area perimeter

Click to enter the area perimeter, you can select multiple point data to form the group of polygon vertices that need to calculate the area by manual input, list selection of points, measurement selection of points, etc.

After entering point data, click on any point data item to edit, delete, move up, move down, etc.

Click Calculate after you finish the selection, you can jump to the result interface to view the calculation results, including graphical results and area length data results.



Angle conversion

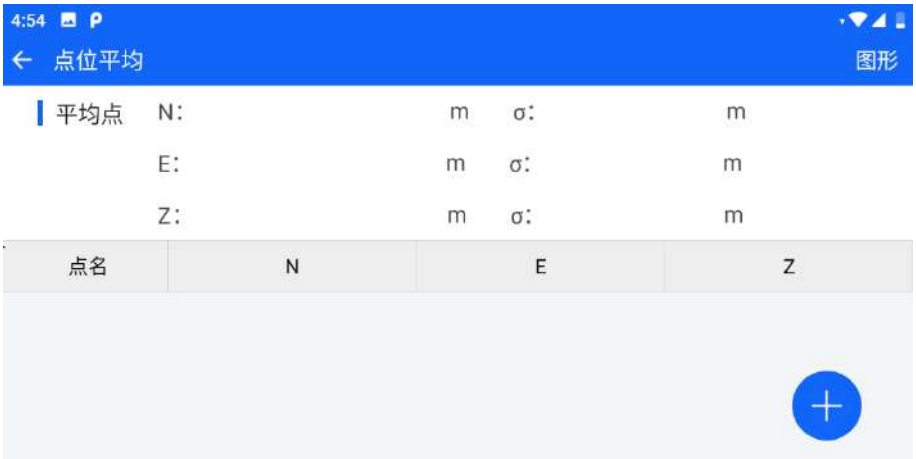
Supports the conversion of radians, degrees, gauges, minutes, mils, and degrees-minutes-seconds units to each other. After entering the value in any item, click [Calculate] to calculate the value in other formats.

Distance Conversion

Support converting each distance unit of kilometer, meter, centimeter, millimeter, yard, mile, foot, inch and nautical mile to each other. After entering the value in any item, click [Calculate] to calculate the value in other formats.

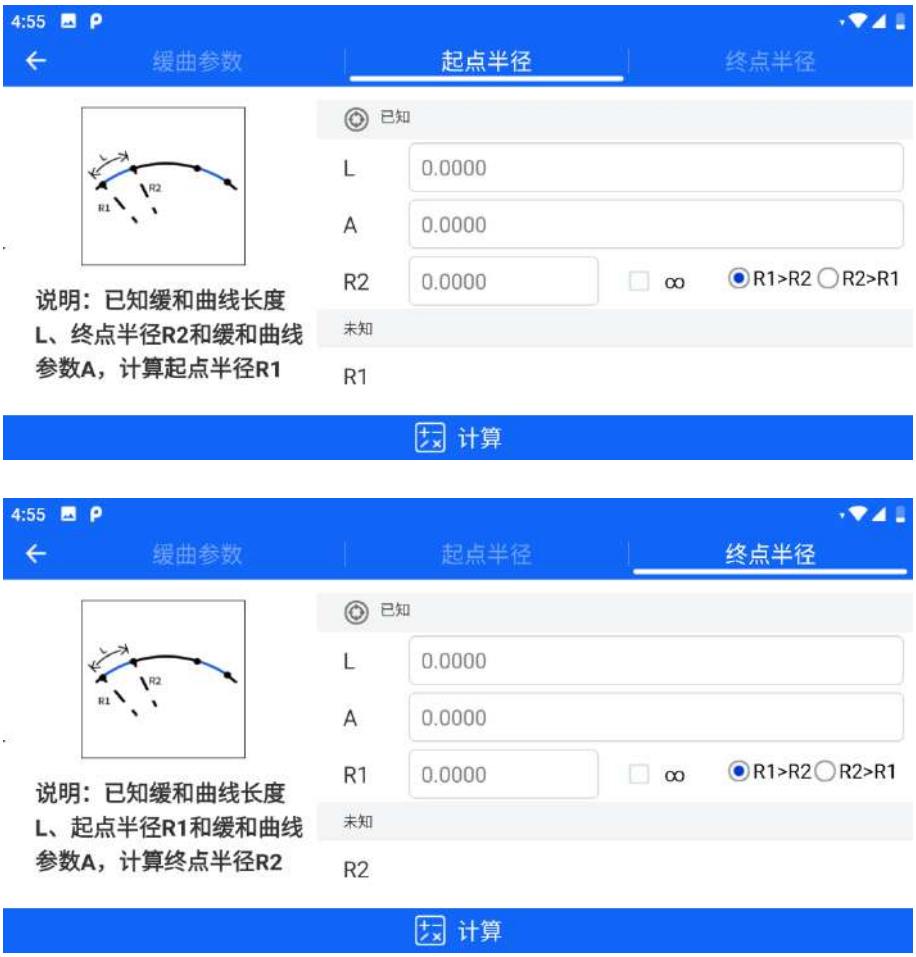
Point average

Users can click [Calculation Tools] - [Point Average] to enter this interface and calculate the average of several points coordinates by this function. Click the Add button to add the points to be calculated to the list below, then the average value of coordinates of the selected points will be displayed at the top in real time.



Slow Curve Calculation

Users can click [Calculation Tools] - [Gentle Curve Calculation] to enter this interface and calculate the gentle curve parameters, starting half-longitude and ending radius by this function.



Line Segment Equivalents

The line segments are divided into equal parts according to two types of equal parts: constant number equal parts and constant distance equal parts.

You need to input the coordinates of start point and end point, there are three input methods, which are manual input, list selection, and measurement selection. Then select the equipartition method, input the parameters, and click [Calculate] to get the equipartition result. Click [Graph] to get the graph of the line segment after equipartition; click Save to save the equipartition points to the library of release points.

Calculators

Tool for performing simple mathematical calculations.

CHAPTER

10

Project Management

This chapter introduces.

- Project Management
- Point Library
- Legend coding

Project Management

Enter the project management interface, you can view the current project properties, legend codes and other information, open, delete or view the history of projects, create new projects and other operations.

Open Project]: Click the project you need to open, click "Open" to open the selected project.

Delete Item]: Click on the item to be deleted and click "Delete" to delete the selected item.

View Properties]: The current item can be viewed by clicking the "View Properties" button on the first line; the history item can be viewed by clicking the item that needs to be viewed and clicking "Properties" to view the properties of the selected item.

Legend Code]: Click the "Legend Code" button in the title bar to jump to view the current project's legend code content.

New Project]: Click the "+" button to enter the new project interface, enter the name (required), operator, comments, etc., select the legend code, click OK to complete the new project and open.

If the current total station has been inserted into an external USB flash drive, you can also copy the items in the USB flash drive to local storage, view the properties and delete them.

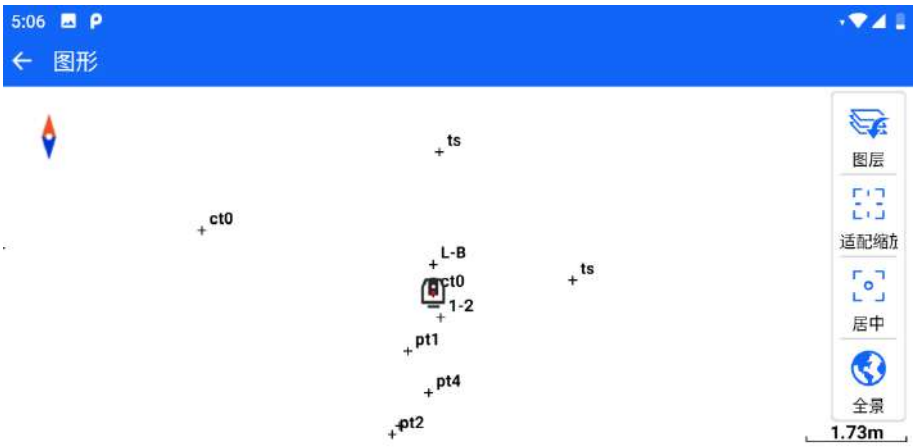
Locally stored items can also be copied to a USB flash drive.

Point Library

The point library can be accessed from the main screen or from the top bar of any measurement screen at icon.

Point bank generic functions.

1. Click [Graph] in the upper right corner to view the display of each type of point on the map.



2. Click "..." - [Clear] in the upper right corner to clear all points.

3. Click "..."-[Settings] in the upper right corner to set the loading order and the number of loading.

4. Click a point library data, you can choose to "edit" or "delete" the data. If there is a point record of the measurement points, you can also view the point record.

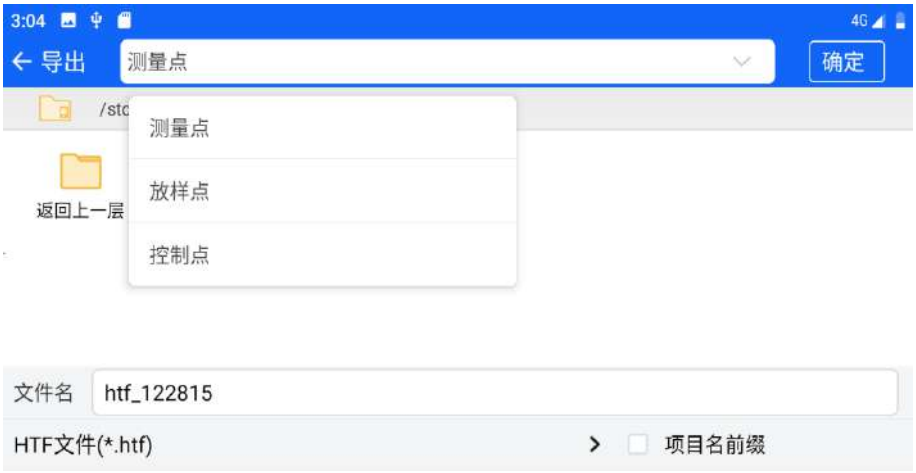
5. Enter a full or partial name in the name input box, and click "Search" to search for a point.

All points

When the point library is switched to select all points, the interface displays the NEZ and legend code information of all points (measurement points, release points, control points).

Click the hover button at the bottom right corner - "Import", you can import the sample/control points. Select the type of points you want to import (release points/control points) in the top bar, and then select the file to import. The detailed import operation is shown in the section of "Sample Points".

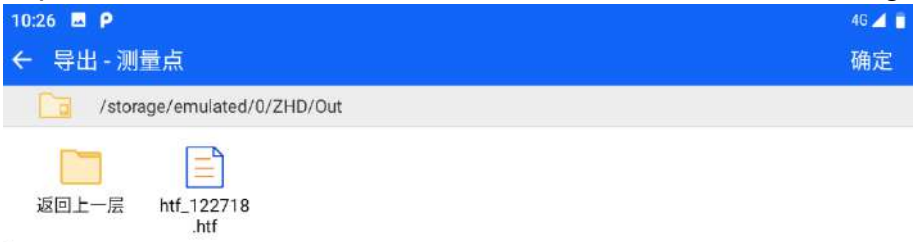
Click the "Export" hover button at the bottom right corner to export the measurement points/plotting points/control points. Select the type of points to be exported (measurement points/release points/control points) in the top bar, and then select the export format. The specific export operation steps and supported formats can be found in [Measurement Points], [Sample Points] and [Control Points] sections.

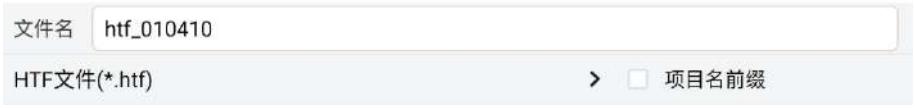


Measurement points

When the point bank selects measurement points, the information of all measurement points (including measurement points, rear view points, angle measurement points, distance measurement points and coordinate measurement points) is displayed.

Click on the hover button at the bottom right corner - "Export" to export the measurement points. Select the desired export format, enter the file name and click "OK" to export the measurement points to the total station memory. Currently, the supported export formats are *. htf, *.txt, *.csv, *. dat, *. GSI, *. dxf and *. gt7.





Placement point

The sample points support "Add", "Import" and "Export" functions, and the

entrance is the hover button at the bottom right corner.

Add]: Click the hover button-[Add] to enter the interface of adding release points. You can select points in the list or manually input to add sample points.

[Introduction].

1. Click the hover button - [Import] to enter the sample point import interface. Select a file and click "OK.

2. Enter the custom format setting interface, make the following settings and

click "OK" to complete the data import.

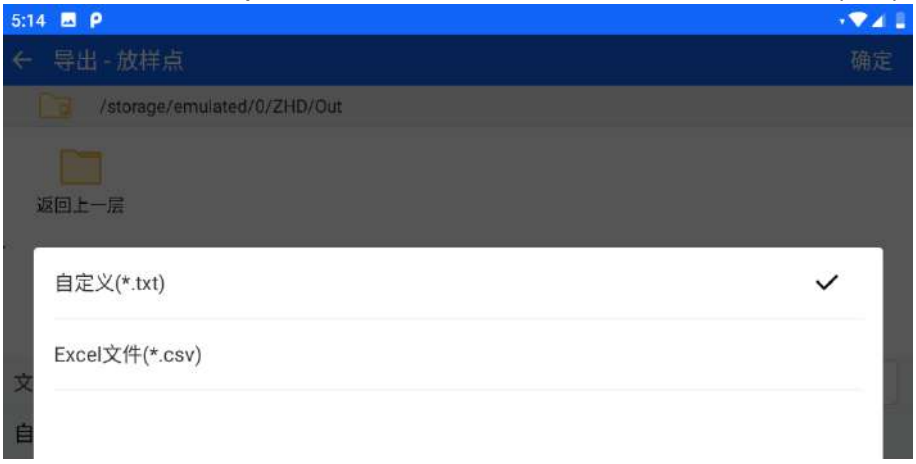
① Select the fields to be imported in the "Selectable Fields" list, the selected fields will be automatically populated in the "Selected Fields" list, click the button to select/unselect all fields. The "Imported Content" section displays the header section of the imported fields in order.

②Click the "Template" button to display three common templates by default (Name, Legend Code, NEZ; Name, NEZ, Legend Code; Name, NEZ).

③You can set the angle format, separator, and whether to include the format file header, etc.

[Export].

1. Click the hover button-[Export] to enter the export interface of release points. The available export formats are custom txt and Excel file (csv).



Control Points

Control points also support "Add", "Import" and "Export" functions, the function

entrance and operation steps are the same as [Release Point], so we will not repeat here.

Legend Code

The legend code can be accessed from the top bar of the project management interface.

"Type selection": click the type drop-down box, the available legend types are "all", "point", "line" "Surface". After selecting the type, the legend code of that type is displayed below.

"Group Selection": Click the group drop-down box to display all groups under the current type. After selecting a group, the corresponding legend code for that type is displayed below.

"Group editing": click "Group" in the upper right corner to enter group editing. You can "add", "delete", "edit" and other operations to the group. No group can be deleted or edited.

[Add]: Click the Add Hover button at the bottom right corner and enter the group name.

[Delete]/[Edit]: Click a group data, that is, the pop-up entrance.

"Legend code editing": click a legend code data, click [Edit], you can edit the legend code, grouping, style.

"Legend code deletion": click a legend code data and click [Delete] to delete the code.

"Add legend code": click the hover button at the bottom right corner - "Add" to enter the add interface, you can add the legend code.

"Save as Template": Click the hover button at the bottom right corner - "Save as Template", you can save the current project legend code as a legend code template

in xml format.

CHAPTER

11

Roads

This chapter introduces.

- Road design
- Line calculation
- Road sampling
- Structure placement

Road design

Click Road -> Road Design to enter the road library interface, you can add road data by manually creating or importing road files, and also edit, delete and export the existing roads.

broken chain

Broken chain refers to the phenomenon of discontinuity of stakes due to local rerouting or sectional measurement. Overlapping stakes are called long chains and interrupted stakes are called short chains.

Click [Broken Link] to enter the broken link pile interface, you can add a broken link pile, and click a broken link pile to delete or edit the pile.

Add]: Click the "+" button to enter the broken link adding interface. Edit the pile name, enter the previous mileage and the next mileage, click "OK", and the completed broken link pile can be viewed under the broken link pile list.

Edit]: Click a broken link pile and select "Edit" button to modify the pile name, previous mileage and next mileage of the pile, click "OK" to finish the modification.

Delete]: Click a broken pile, select the "Delete" button, and click "OK" to delete the selected broken pile.

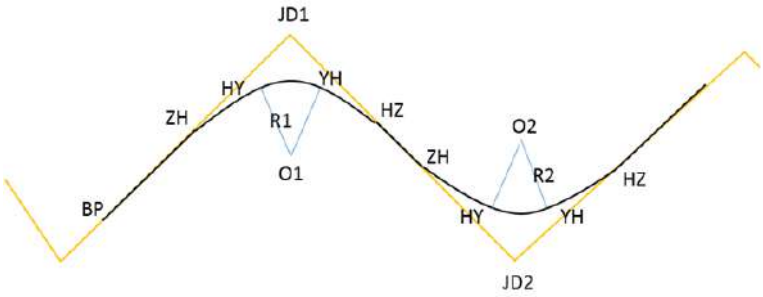
Apply】: After finishing adding and modifying the broken link pile, click the

"Apply" button, it will return to the "Road Design" interface and prompt "broken link data has been updated".

Flat section design line

The flat section design supports the use of the intersection method and the line element method. The intersection method is based on certain conventions (e.g. single intersection line defines the combination of line elements within the intersection as gently-rounded-curved-gently), and has certain expression restrictions on the line shape; while using the line element method, the line shape can be arbitrarily combined, and for complex curves, such as ovoid lines, multi-intersection curves, virtual intersections and other data, the line element method is available to define the line, and the line element method defines the line to support the folded line line.

Intersection method



Intersection: The intersection of two adjacent lines (JD1, JD2...)

ZH: the point where the line intersects the first easing curve, i.e. the starting point of the first easing curve.

HY: the point where the first easing curve intersects the circular curve, i.e. the end of the first easing curve.

YH: the point where the circular curve intersects the second easing curve, i.e. the starting point of the second easing curve.

HZ: the point where the second easing curve intersects the straight line, i.e. the end of the second easing curve.

ZH-HY: first easing curve; YH-HZ: second easing curve.

HZ-ZH: straight line; HY-YH: circular curve.

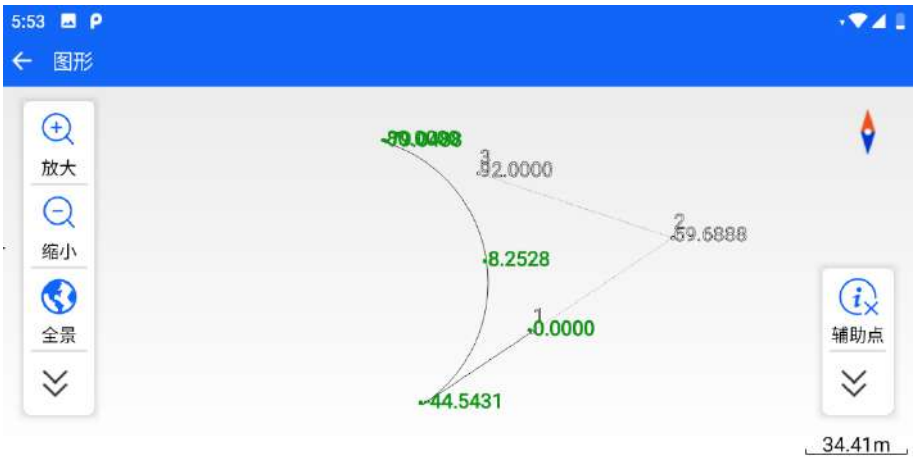
Select [Intersection Method] to enter the intersection table data editing interface.

Add]: Click "+" button to add the intersection data, get the intersection name, N, E, intersection mileage (only the mileage of the first two points need to be entered) and arc radius, the first easing curve length, the second easing curve length from the straight curve table, if there is the radius and curve length corresponding to the intersection point, then enter it; if not, then do not enter it.

【Graph】: The data under the current intersection method list is automatically formed into a graph preview to see if the graph is correct.

"Line Auxiliary Points": Click the icon on the right side to display the corresponding auxiliary points and auxiliary dashed lines in the preview map, and click the icon again to make the auxiliary points disappear.

Apply】: After the intersection method has been edited, click "Apply" to update th e latest data.



[Edit]: You can edit the already inputted intersection data.

[Insert]: Insert an intersection data above the selected point.

[Delete]: Delete the selected intersection data.

Involving virtual intersection and turn-back (turning more than 180 degrees) curves, in addition to the line element method can be supported, in the intersection method, the corresponding virtual intersection point switch is supported.

The first point of the virtual intersection combination is entered normally, and the second point is entered by checking "special intersection" and turning on the virtual intersection switch.

Line Element Method

The line element legal line is also called the building block legal line, which is a combination of complex highway plane line "whole into zero" decomposition into a number of line units. If the starting point information of the route plane curve is known, such as coordinates, tangent direction and radius of curvature, any unit is set up from the starting point and extended in any direction, and the information at the end of this unit, such as coordinates, tangent azimuth and curve radius, can be calculated, and at the same time, the same information is used as the starting point of the next unit. This is calculated unit by unit downward, just like building blocks.

Simple line segments mainly include straight lines, circular arcs, and gentle curves.

"Straight line": the letter L indicates that only the line element length needs to be entered.

"Arc": the letter A indicates that the input starting radius (∞ represents infinity, i.e., a straight line), line element length, and direction (the forward direction is the reference deflection direction).

"Gentle Curve": The letter S indicates that the starting radius, ending radius, line element length, and direction are entered.

Starting Point]: Click "Starting Point" to enter the starting point interface to edit the starting point information.

【Graph】: See the intersection method

Apply】: After the line element method data has been edited, click "Apply" to upd ate the current data.

[Edit]: You can edit the already entered line element data.

[Insert]: Insert a line metadata above the selected point.

[Delete]: Delete the selected line metadata.

Pile-by-pile table

Enter the interface of flat section design -> pile-by-pile table to display, configure, view and export the flat section mileage data.

Setting]: You can set the starting mileage, ending mileage, mileage interval, offset distance and staking method for flat section mileage data export, click OK to apply successfully, and return to the stake-by-stake table interface at the same time.

Export]: Export the flat section data according to the parameter configuration set in the pile-by-pile export setting interface.

Longitudinal section design line

The longitudinal section is a form of expression of the longitudinal alignment of the road (line height undulation).

In the general working process, click to add variable slope point data including: variable slope point mileage, variable slope point elevation, radius (longitudinal curve radius), and add all the elements of variable slope points of the line in the order of mileage in turn.

Cross-sectional design line

Entering the cross-section editing interface, the software displays three Tab items: standard, super high, and widening. You can create, edit and delete the data information of cross section, super height and widening respectively.

Standard

[Add]: Click the Add button at the bottom right corner to choose to add left/right cross-sectional panels.

"Name": the name of the board is entered.

"Slope": from the road centerline outward, the slope of the slab is positive for uphill and negative for downhill. The slope value is the ratio of the height difference between the two end points of the slab and the width of the slab, and provides two types of slope ratio input: percentage and proportional.

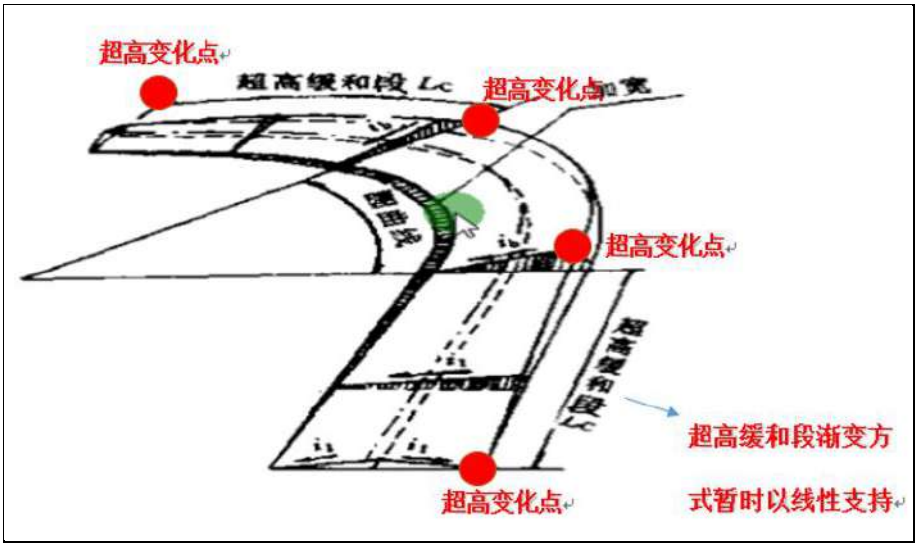
"width": the width of the current board.

"Road Teeth": Click to enter the height difference of roadside road teeth.

[Same left and right]: Check the box to indicate that the left and right slopes are the same, and the right slope data will be overwritten as symmetrical data with the left slope (Note: the original right slope data will be lost and can't be recovered), check the box to add, and the same left and right cross-sectional slabs will be created synchronously.

Ultra High

To reduce the centrifugal force generated by the vehicle driving on the curved road, the road is made into a one-way cross slope in the form of high outside and low inside called super high.



In the [Super High] section, you can enter the super high change point information according to the design drawing.

Select the cross-sectional slab that corresponds to the role of superelevation, and use the motorway superelevation as an example to explain here.

The super height is located in the "left side of the motor vehicle" section, entered as follows.

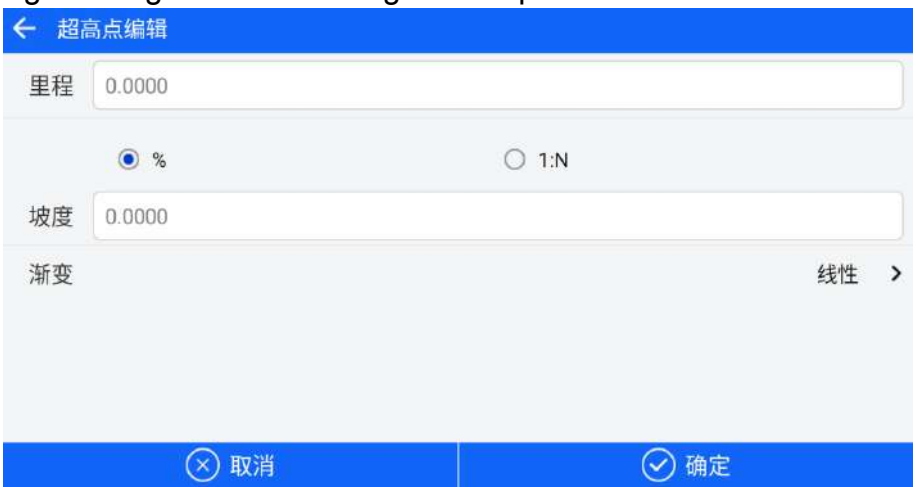
To simplify the example, we assume that the ultra-high change points on the drawing read as follows.

Ultra High Change Point 1: Mileage 0 Slope -1.5%

Ultra High Change Point 2: Mileage 10 Slope 2%

Ultra High Change Point 3: Mileage 20 Slope 2%

Ultra High Change Point 3: Mileage 30 Slope -1.5%

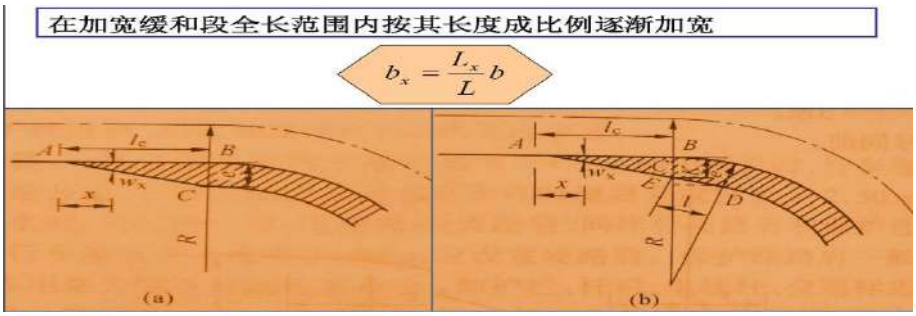


Finish adding the four ultra-high points in turn, and you can view them correspondingly in the [Graph] screen.

Click "Cross Section" to view the cross section height information of the current location corresponding to the mileage.

Widening

In order to transition the pavement from the normal width to the curve, a widened width is set so that a widening mitigation section is required. On the widening mitigation section, the pavement has a gradually changing width. The setting of widening transition can be used in different ways according to the nature and grade of the road.



In the [Widening] section, you can enter the widening change point information according to the design drawings.

Select the cross-sectional plate that corresponds to the widening effect, and take the motorway widening as an example here.

The widening is located in the "right-hand motor vehicle" section, entered as follows.

To simplify the example, we assume that the widening change point on the drawing reads as follows.

Widening change point 1: Mileage 0 Width 4.5

Widening change point 2: Mileage 10 Width 5.2

Widening change point 3: Mileage 20 Width 6

Widening change point 4: Mileage 30 Width 5.2

Widening change point 5: Mileage 40 Width 4.5

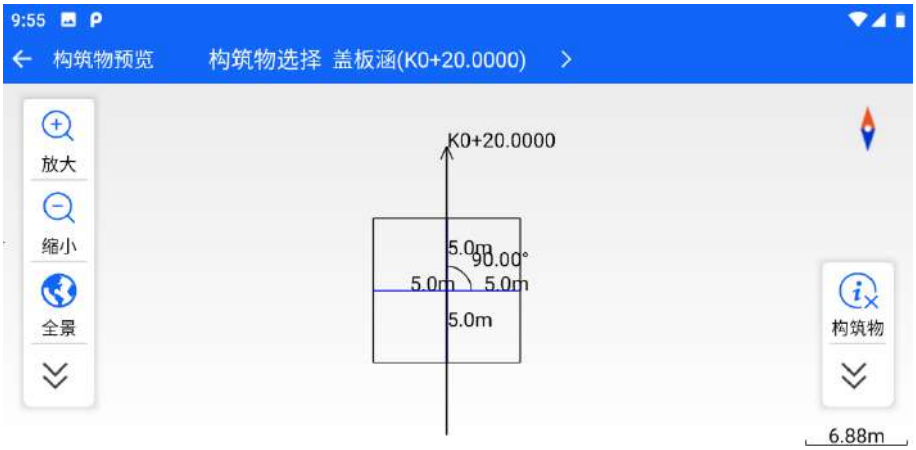
Click "Graph" to enter the preview interface, and click "Cross Section" button to view the cross section widening information of the current position corresponding to the mileage.

Note: you can switch any [standard], [super high], [widening] to view the data entry, to confirm that the three interfaces are correct, any click on the "application" can be applied to the current cross-section (standard cross-section + super high + widening) in the road.

Structure design

Click "Structure Design" to enter the structure editing interface. The software supports four types of structure design: cover culvert, round slab culvert, channel and flyover, and supports two ways of oblique intersection and oblique intersection. Click "+" button to select structure type and practice in structure information interface, input mileage value, angle, forward width, backward width, left length, right length, center

elevation and cross slope, and click "OK" to complete structure design.



Add】: New road structure, click "+" button in the structure information interface to select the structure type and practice, enter the mileage value, angle, forward width, backward width, left length, right length, center elevation and cross slope, click "OK " to complete the structure design.

Graphics]: Click the "Graphics" button to enter the structure preview interface,

you can view the designed structure graphics, click the top structure selection bar to switch other structure graphics display.

Apply】: Click "Apply" button to update the structure design data.

Line Calculation

After the current project has existed road data, click to enter the "line calculation" interface, select the need to query the road data at the top of the interface, you can query the relevant road data information through the coordinates or mileage information.

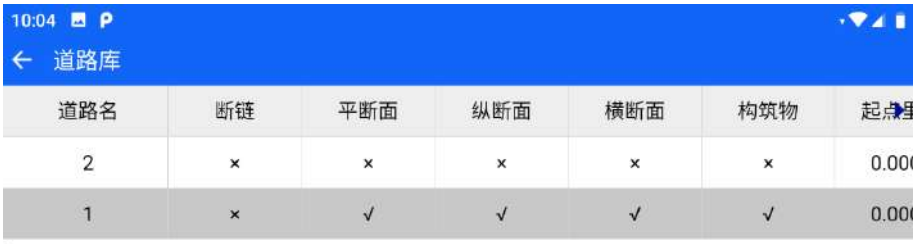
Check Coordinates]: Input the location information (NEZ coordinates), click "Check Coordinates", and the mileage, offset and azimuth information of the coordinates relative to the currently selected road will be displayed on the right side.

[Check Mileage]: Enter the mileage and offset distance you need to check, click "Check Mileage", and the coordinates of the corresponding mileage and offset distance in the road data will be displayed on the left side, and the azimuth information will be displayed on the bottom right side.

Road Release

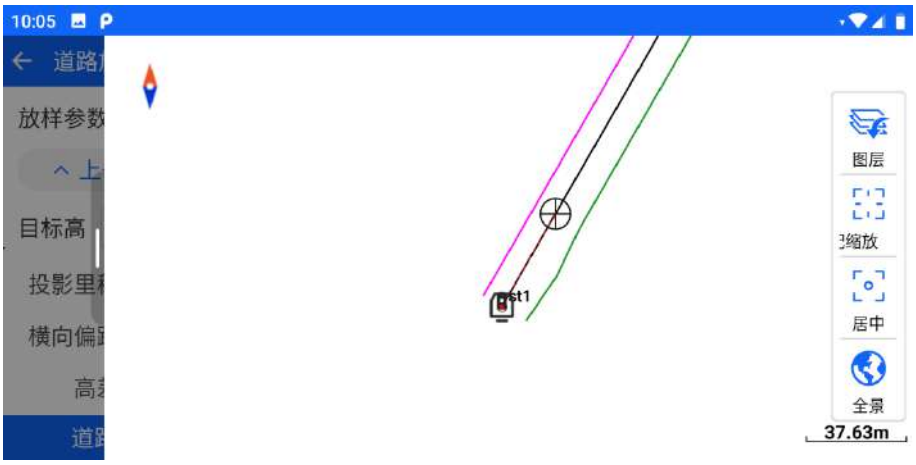
Enter the road sampling interface, you can sample the current road data, you can also switch the road library has existed other road data for sampling. The steps of the sampling operation are as follows.

1. Select road data: click the "Road" button, jump to the road library, click to select the road data need to be put back to the sample interface.



2. Release parameter setting: After selecting the road data, click the release parameter column to jump to the release parameter setting interface, which can determine the specific release target points by setting the release mileage, mileage increment, left and right offset, upper and lower offset and other information.

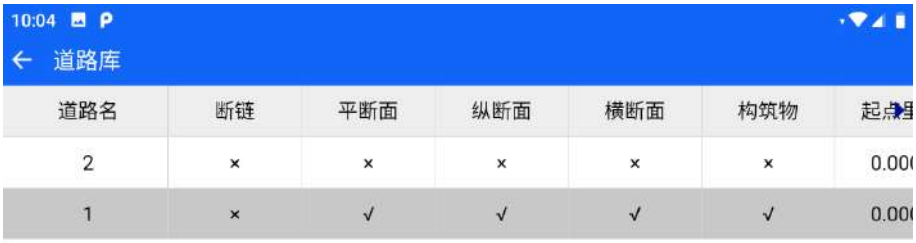
3.Road release: After setting the mileage increment, you can switch the target points by clicking the previous point and next point button in the release interface with the mileage increment as the interval (if the mileage increment is 0, the previous point and next point button will not be displayed), click the measurement and storage/measurement-record to calculate the release information, and expand the graphic interface on the right to display the position relationship between the current position, prism points and release points.



Structure release

The structure sampling interface can be used to sample the feature points of the structure data in the road data. The steps of the release procedure are as follows.

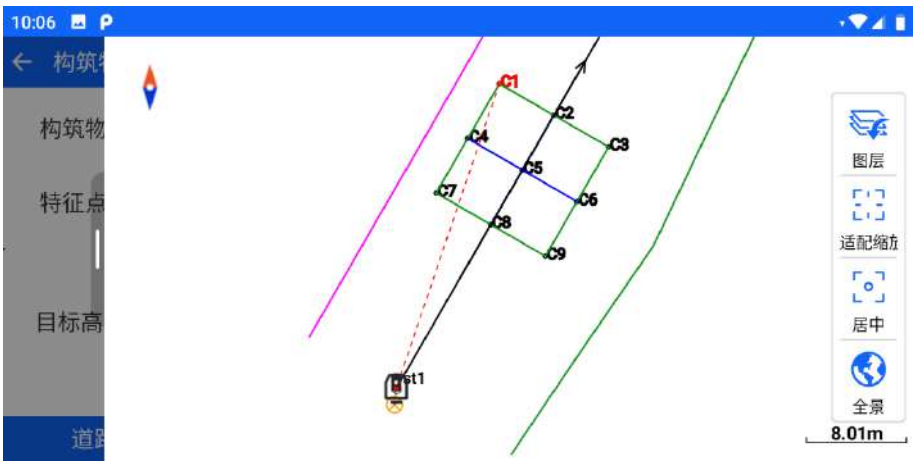
1. Select road data: click the "Road" button, jump to the road library, click to select the road data need to be put back to the sample interface.



2. Feature point selection: After selecting the road data, click the structure

column and feature point column respectively to select the structure and its feature points that need to be released for the current road data.

3. Structure release: After selecting the feature points to be released, click Measure and Save/Measure and Record to calculate the release information and expand the graphic interface on the right to show the position relationship between the current position, prism points and release points.



CHAPTER

12

Bridges

This chapter introduces.

- Pier formwork library
- Bridge arrangement
- Cone slope design library
- Pier placement
- Tapered slope release

Pier formwork library

Bridge pier is the collective name of bridge pier and bridge abutment, which is the building supporting the superstructure of the bridge. The overall steps of pier and abutment release with T-Survey software are: ① enter [Pier and Abutment Formwork Library] to design pier and abutment formwork; ② enter [Bridge Layout] to design the location of pier and abutment on the bridge; ③ enter [Pier and Abutment Release] to release the feature points of pier and abutment.

The pier design on T-Survey is based on the road, i.e., the road design is required before designing the piers. The steps for setting up the pier template library are as follows.

1. Pre-requisite: have been in the [Road] - [Road Design] module to design a road (including at least the flat section).

2. Enter the [Pier Formwork Library] and select the designed road in the top column.

3. After the road is selected, click the bottom right corner of the "Add" hover button to enter the pier template design interface.

The parameters to be set are template name, angle and layout method. (0,180) when the layout method is orthogonal, and (0,180) when the layout method is oblique intersection vertical distance or oblique intersection oblique distance.

4. In the pier template design interface, click the hover "Add" button, you can enter the feature point to add interface.

If the feature point type is cylindrical, the parameters to be set are point name, vertical coordinate, horizontal coordinate, and pile diameter. The pile diameter should be larger than 0.

If the feature point type is selected as corner point, the parameters to be set are point name, vertical coordinate and horizontal coordinate.

"Only check the longitudinal mirror": the cross-axis determined by the pier angle as the reference for longitudinal mirroring to calculate the mirror point.

"only check the horizontal mirror": the vertical axis of the horizontal axis determined by the angle with the pier as the reference, the horizontal mirror to calculate the mirror point.

"simultaneously check the longitudinal mirror, transverse mirror": respectively,

the horizontal and vertical axis determined by the pier angle as the reference, calculate the horizontal mirror, vertical mirror and horizontal and vertical mirror points, that is, a total of three mirror points.

5. After the completion of the feature point settings, click "OK" to return to the pier template design interface, the right side will correspond to the relative position of the feature point and the horizontal and vertical axes, which points to the arrow above indicates the direction of the road forward.

6. Click "Save", that is, to complete a pier template design.

Click a template in the list of pier templates to "delete"/"edit" the template.

Click "..." -> "Empty" in the upper right corner to empty the list of pier templates.

Bridge arrangement

Once the pier formwork design is completed, the bridge layout can be carried out to define the distribution of piers in the bridge. The steps of the bridge layout are as follows.

1. Pre-condition: At least one pier template has been designed in [Bridge] - [Pier Formwork Library] module.

2. Go to [Bridge Layout] and select the designed road at the top bar.

3. After selecting the road, click the "Add" hover button at the bottom right corner to enter the new bridge interface. The parameters you need to set are the bridge name.

4. In the new bridge interface, click the hover "Add" button to enter the pier layout interface.

The parameters to be set are pier name, pier template selection, axis mileage, axis offset, axis angle, and elevation. If the user selects the pier template is oblique intersection slope distance / oblique intersection vertical distance, the axis line angle

is not editable, and it is directly displayed as the angle in the template by default.

"Check offset first, then rotate": use the axis as a reference, first offset based on "axis offset", then rotate based on "axis angle".

"Check Rotate then Offset": the axis is used as the reference, and the rotation is based on the "axis angle" first, and then the offset is based on the "axis offset".

5. After the pier arrangement is complete, click "OK" to return to the bridge new interface, the bottom will correspond to the bridge just added piers.

Click a template in the pier list, you can "delete"/"edit" the pier operation.

6. Click "Save" to complete a bridge design.

Click a bridge in the bridge list to "delete"/"edit" the bridge.

Click "..." -> "Clear" in the upper right corner to clear the bridge list.

Cone Slope Design Library

Cone slope refers to the conical slope built at the joint of bridge and roadbed to protect the slope of road embankment from scouring. The overall steps of cone slope sampling with T-Survey software are: ① enter [Cone Slope Design Library] to design

cone slope; ② enter [Cone Slope Sampling] and sample the target points of cone slope according to the set equal fraction.

The cone slope design on T-Survey is based on the road, i.e., the road design is required before designing the cone slope. The steps of cone slope design are as follows.

1. Pre-requisite: have been in the [Road] - [Road Design] module to design a road (including at least the flat section).

2. Enter [Cone Slope Design Library] and select the designed road in the top bar.

3. After choosing the road, click the "Add" hover button at the bottom right corner to enter the cone slope design interface.

The parameters to be set are cone slope name, position, cone top mileage, cone top offset, cone top elevation, approximate slope height, transverse slope ratio N, longitudinal slope ratio M, and axial pinch angle.

The approximate slope height, horizontal slope ratio N and vertical slope ratio M cannot be less than 0.

4. After the cone slope setting is finished, click "OK" to return to the cone slope design library, that is, to complete a cone slope design.

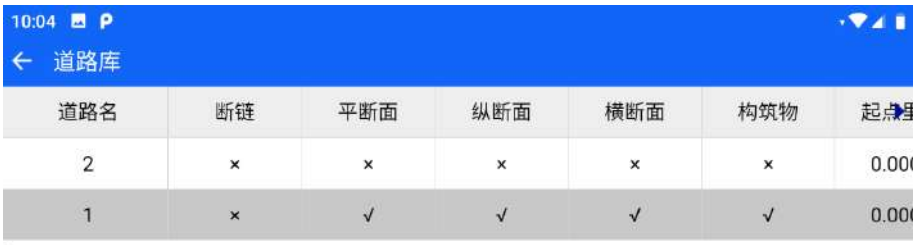
Click a tapered slope in the tapered slope design list to "delete"/"edit" the tapered slope.

Click "..." -> "Clear" in the upper right corner to clear the cone slope list.

Pier placement

The pier release interface can be placed on the road data of the bridge pier data feature points. The steps of the release operation are as follows.

1. Select road data: click the "Road" button, jump to the road library, click to select the road data need to be put back to the sample interface.

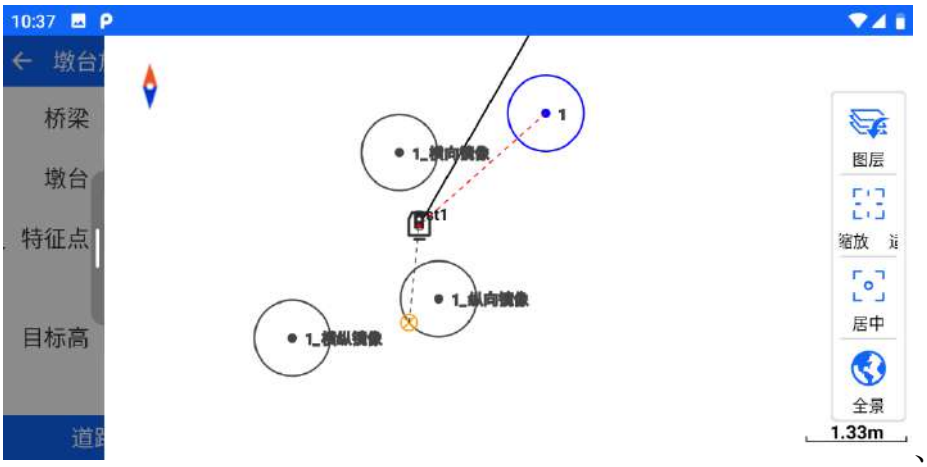


2. Feature point selection: After selecting the road data, click the bridge column, pier column, feature point column, respectively, to select the current road data need to put the bridge, pier and its feature points.

After selecting a road, the first feature point of the first pier of the first bridge of that road will be selected by default.

3. Pier release: After selecting the feature points to be released, click on the measurement and storage/measurement-record to calculate the release information

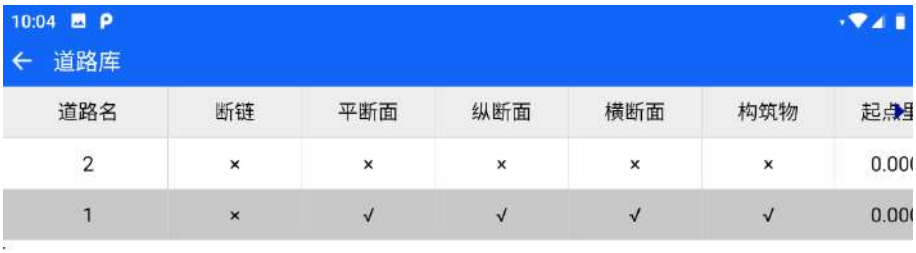
and expand the graphic interface on the right side to show the position relationship between the current position, prism points and release points.



Cone Slope Release

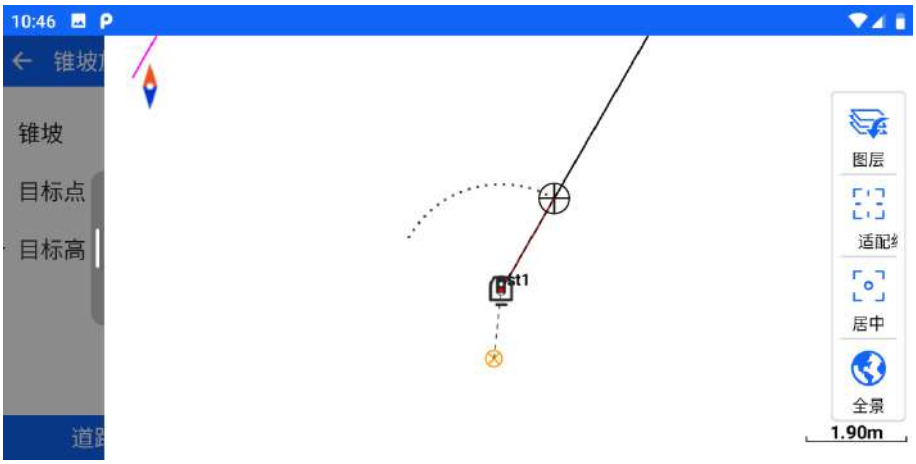
The cone slope release interface can release the target points of cone slope in the road data. The steps of the release operation are as follows.

1. Select road data: click the "Road" button, jump to the road library, click to select the road data need to be put back to the sample interface.



2. Target point selection: After selecting the road data, click on the cone slope column to select the cone slope of the current road data that needs to be released. The software will pop up the number of equal fraction settings, and after the setting is completed, the target point column will display the corresponding number of target points according to the number of equal fractions.

3. Cone slope sampling: After selecting the target points to be sampled, click on the measurement and storage/measurement-record to calculate the sampling information and expand the graphic interface on the right to show the position relationship between the current position, prism points and sampling points.



CHAPTER

13

Tunnel

This chapter introduces.

- Tunnel Section Library
- Tunnel feature points
- Tunnel over-excavation

Tunnel Cross Section Library

Depending on the tunnel construction stage, tunnel sections can be roughly divided into excavation, primary support and second lining. The overall steps of tunnel over-excavation using T-Survey software are: ① enter [Tunnel Section Library] to design the tunnel section (excavation, primary support, second lining); ② enter [Tunnel Feature Points] to add tunnel feature points when needed; ③ enter [Tunnel Over-excavation] to select tunnel section or feature points for over-excavation operation.

Tunnels on T-Survey are based on roads, i.e. road design is required before designing the tunnel cross-section. The steps to set up the tunnel cross-section library are as follows.

1. Pre-requisite: have been in the [Road] - [Road Design] module to design a road (including at least the flat section).

2. Enter [Tunnel Section Library] and select the designed road at the top bar.

3. After selecting the road, select the type of section to be designed (excavation, primary support, second lining), click the "Add" hover button at the bottom right corner to enter the tunnel section design interface.

Different section types design section process and methods are the same, the parameters to be set are name, offset in tunnel and section line element.

4. In the tunnel section design interface, click the hover "Add" button to bring up the section line element selection box, the options are "straight line", "arc" and "circle".

If the section element type is straight line, the parameters to be set are start height difference, start offset, end height difference and end offset. The start point cannot be the same as the end point.

If you select the section line element type as arc, you have the following three options to add.

①"Start point - End point - Turning angle": the parameters to be set are start height difference, start offset, end height difference, end offset, and rotation angle (cannot be 0).

②"Start - End - Radius": the parameters to be set are start height difference, start offset, end height difference, end offset, radius (cannot be less than half of the start and end distance), □ turning angle greater than 180° and □ counterclockwise.

③"Start point-circle center-rotation angle": the parameters to be set are start height difference, start eccentricity, circle center height difference, circle center eccentricity, rotation angle (cannot be 0).

If the section line element type is selected as circle, the parameters to be set are circle center height difference, circle center offset, and radius (cannot be 0).

5. After setting the section line element, click "OK" to return to the tunnel section design interface, the right side will show the relative position of the section line

element and the tunnel centerline.

Click "..." -> "Clear" in the upper right corner to clear the list of section line elements.

6. Click "Save" to complete a tunnel section design.

Click a section in the tunnel section list, you can "delete"/"edit" the section operation.

Click "..." -> "Clear" in the upper right corner to clear the list of tunnel sections.

Tunnel Feature Points

To set the tunnel feature points, proceed as follows.

1. Pre-requisite: have been in the [Road] - [Road Design] module to design a road (including at least the flat section).

2. Go to [Tunnel Feature Point] and select the designed road at the top bar.

3. After selecting the road, select the type of section where the feature points are located (excavation, primary support, second lining), click the bottom right corner of the "Add" hover button to enter the tunnel feature point design interface.

The process and method of designing feature points are the same for different section types, and the parameters to be set are point name, height difference and offset distance.

4. Click "Save" to complete the design of a tunnel feature point.

Click a feature in the tunnel feature list to "delete"/"edit" the feature.

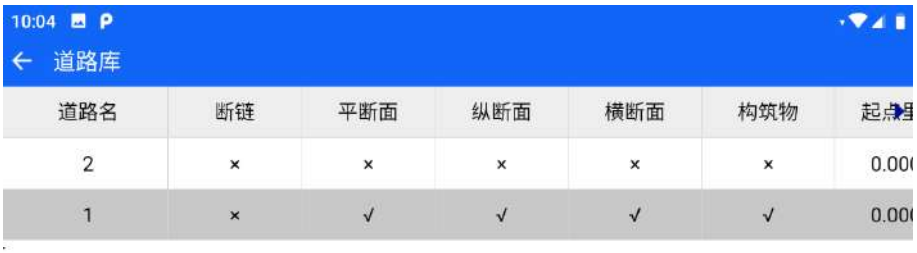
Click "..." -> "Clear" in the upper right corner to clear the list of tunnel feature points.

Tunnel over-under-excavation

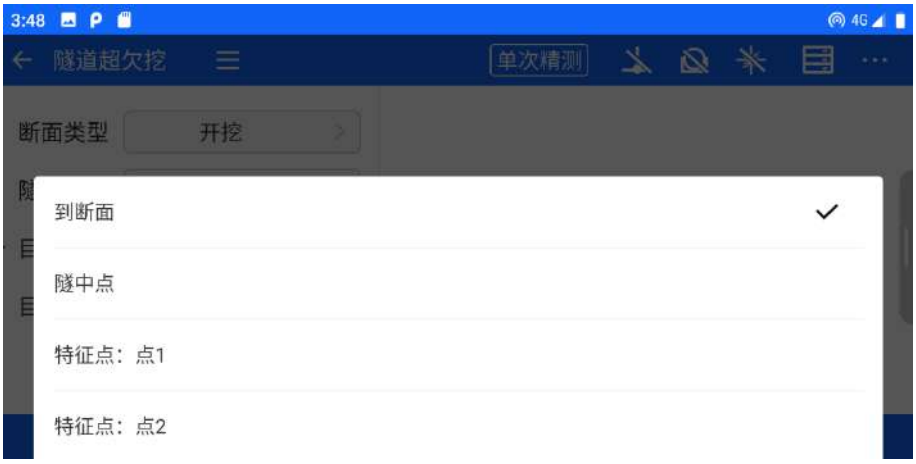
The tunnel over- and under-excavation module can measure the target point and then determine the over-/under-excavation type and value based on the currently selected cross-section. The steps for tunnel over- and under-excavation are as follows.

1. Pre-requisites: has been in the [Road] - [Road Design] module to design a road (including at least flat section), the road has been designed for different section types of tunnel cross-sections and tunnel feature points.

2. Select road data: click the "Road" button, jump to the road library, click to select the road data need to be put back to the sample interface.



2. Target selection: After selecting the road data, click the section type column, tunnel section column, target column, select the current road data need to tunnel over and under excavation section or feature points.



3. "To the section": If the target column selects to the section, click on the measurement of storage/measurement, the right side will show the over-under excavation, left and right distance and fill distance.

4. "To mid-tunnel point/feature point XX": If you select to mid-tunnel point or to feature point in the target column, click Save/Measure, the target angle and distance will be displayed on the right side, as well as the left/right distance, front/back distance and up/down distance.

CHAPTER

14

Configuration

This chapter introduces.

- Distance measurement parameters configuration
- Total station configuration
- Measurement aid configuration
- Unit/display configuration
- Total station calibration
- Total Station Information & Registration

Distance measurement parameters configuration

Users can click [Configuration] - [Ranging Parameters Configuration] to enter this interface. Only the total station installation software can set this item, other Androidid devices do not display the [Range parameter configuration] item.

[Reset]: Click Reset in the upper right corner to reset the current interface parameters to the factory default values.

Distance measurement mode

The optional ranging modes are: single precision measurement, multiple precision measurement (more than 0 times), continuous precision measurement and tracking measurement. For continuous and tracking measurement, you need to click "Stop" to stop the measurement.

Prismatic constants

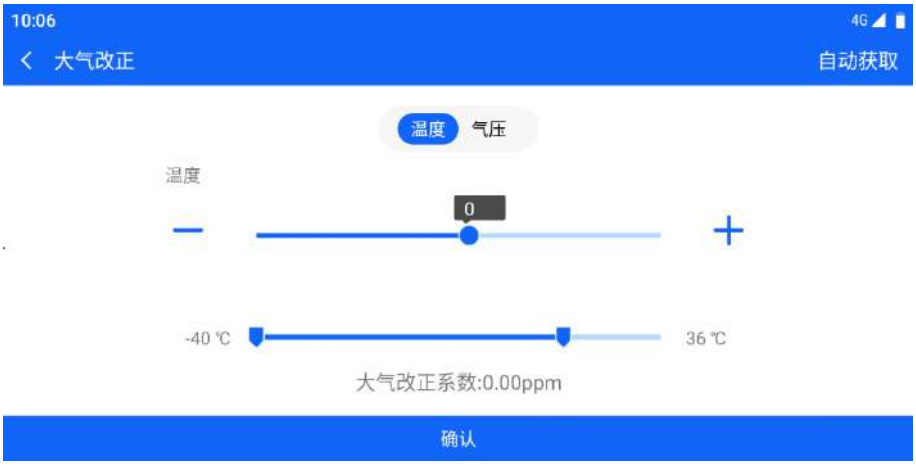
Manually enter the prism constant.

Reflector

The available reflectors are: prism-free, prismatic and reflective sheet. It is important to note that the selected reflector needs to be consistent with the actual reflector, otherwise it may affect the accuracy or measurement failure.

Atmospheric Correction

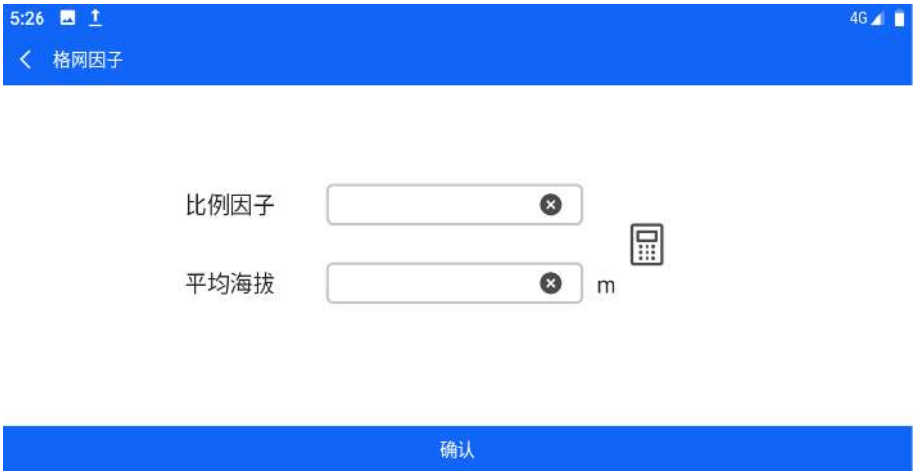
Atmospheric corrections can be calculated by temperature and pressure or set directly by dragging.



Automatic acquisition: The temperature and air pressure values in the current environment are automatically measured by the internal sensors of the total station.

Gridding factor

The default grid factor is 1, which can be obtained by scale factor and average elevation calculation.



: The grid factor was calculated based on the scale factor and the average elevation.

Atmospheric refraction coefficient

The optional atmospheric refraction coefficients are 0.0, 0.14, and 0.20.

Total Station Configuration

Users can click [Configuration] - [Total Station Configuration] to enter this interface. Only the total station installation software can set this, other Androidid devices do not show [Total Station Configuration] item.

[Reset]: Click Reset in the upper right corner to reset the current interface parameters to the factory default values.

Distance measurement beep

Turn on this option and the total station makes an audible alert when the measurement is successful.

Key Tone

Turn on this option and the physical keys of the total station turn on the key tone.

Screen Display

"Single screen adaptation": the screen on one side of the operation is on, and the screen on the other side is off.

"Double screen with display": both screens remain always on at the same time.

Laser Pointing

Turn on this option to shoot laser-assisted illumination.

Signal strength

Click this option to detect the current signal strength once in real time.

Baud rate

Support 115200.

Measurement aid configuration

Users can click [Configuration] - [Measurement Aid Configuration] to enter this interface.

The full configuration is displayed when the total station is installed.

Other Androidid devices show partial configuration when installed.

[Reset]: Click Reset in the upper right corner to reset the parameters of the current interface to the factory default values.

Shortcut measurement keys

There is a red quick measurement key (physical button) on the side of the total station. This configuration allows you to set whether the quick measurement key, when pressed, will perform a measurement operation or a measurement and storage operation.

Point number accumulation step

Each time a measurement point is saved, the point number is self-incremented, and this configuration is used to set the step of point number self-increment.

Points of note

When you open this item, you can save the measurement point during

coordinate measurement, and save the photo of the point at the same time. And you can view it in the measurement point library.

Rename tips

Open this item and it cannot save the rename point.

Unit/Display Configuration

Users can click [Configuration] - [Unit/Display Configuration] to enter this interface.

The full configuration is displayed when the total station is installed.

Other Androidid devices show partial configuration when installed.

[Reset]: Click Reset in the upper right corner to reset the parameters to their default values.

Angle unit

Used to set the units of each angle input box and angle display value of the software.

Distance unit

Used to set each length input box and distance display unit of the software.

Temperature units

Used to set temperature units, mainly for atmospheric corrections.

Barometric unit

Used to set barometric pressure units, mainly for atmospheric correction.

Horizontal angle

Used to set the horizontal angle display of the measurement interface.

Vertical angle

Used to set the vertical angle display of the measurement interface.

Angle reading

Used to set the accuracy of the angle display of the measurement interface.

Distance reading

Used to set the accuracy of the distance display of the measurement interface.

Coordinate order

Used to set the interface NEZ display order.

Soft Keyboard

"Full keyboard": soft keyboard will pop up when either numeric or text input box is selected.

"Text input only": soft keyboard pops up when only the text input box is selected.

Total Station Calibration

Total station calibration is generally used to calibrate the parameters of the total station, password: 12345678, when you really need to correct, please contact the service provider for calibration.

Total Station Information & Registration

When installed on a total station, the total station information displays the total station number, range and angle module version, service version, and registration time.

Click the "Register" button at the bottom to register your Total Station hardware.

When installed on other Androidid devices, the total station information can be used to connect to the device in "demo mode" and "Wifi".

"Demo mode": Use demo mode to connect the total station and the software displays simulated range and angle information. It can be used for demonstration.

"Wifi connection": the total station needs to open the hotspot first, after the Androidid device connects to the total station hotspot, select the connection method

as "Wifi", and follow the guide to complete the total station connection. After the connection is completed, the basic information of the connected total station will be displayed.

CHAPTER

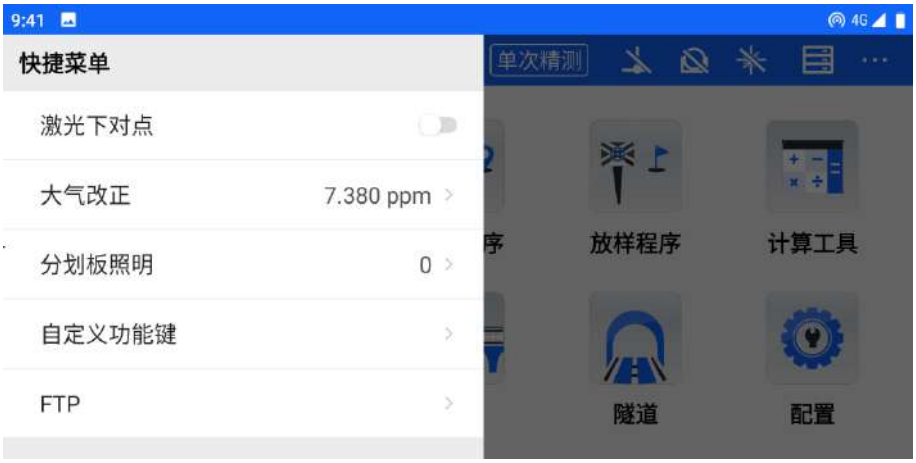
15

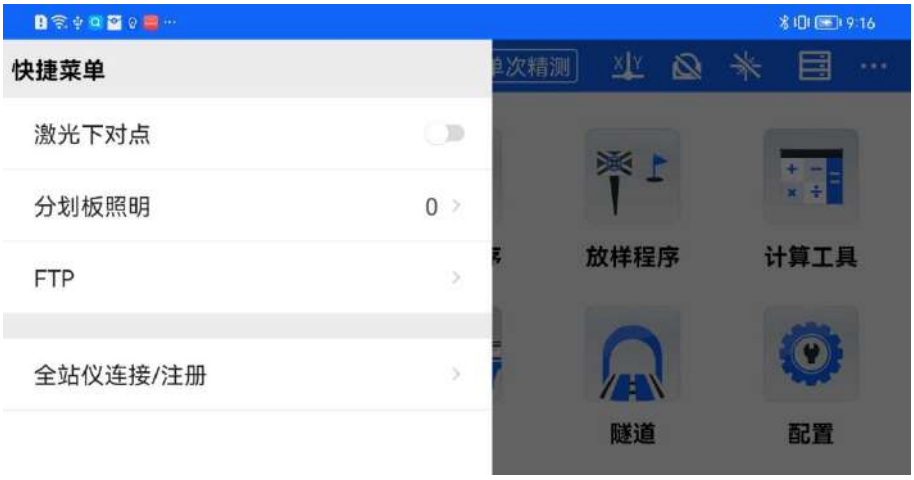
Quick Menu

This chapter introduces.

- Laser down to point
- Atmospheric Correction
- Prismatic constants
- Scoreboard lighting
- Custom function keys
- FTP
- Total station registration/connection

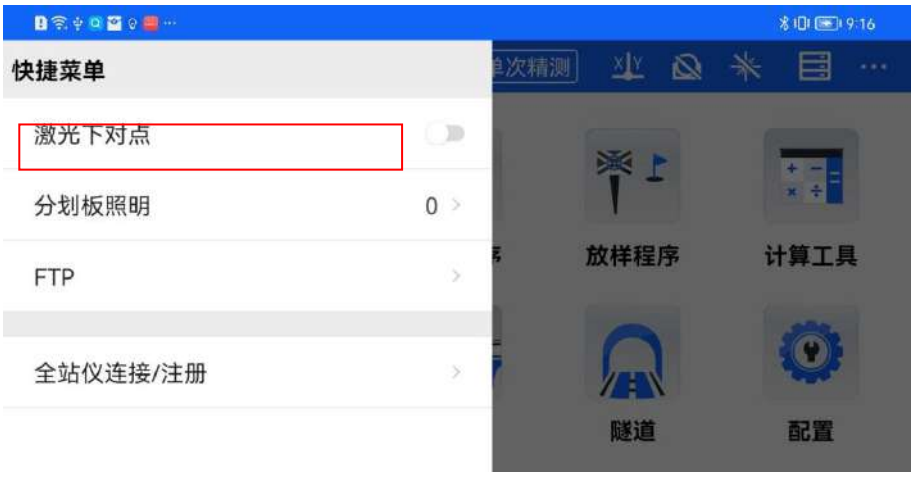
The shortcut menu can be opened by clicking on the top bar , which is the left side slider bar. The full configuration is displayed when installed on the Total Station, the partial configuration is displayed on other Androidid devices.





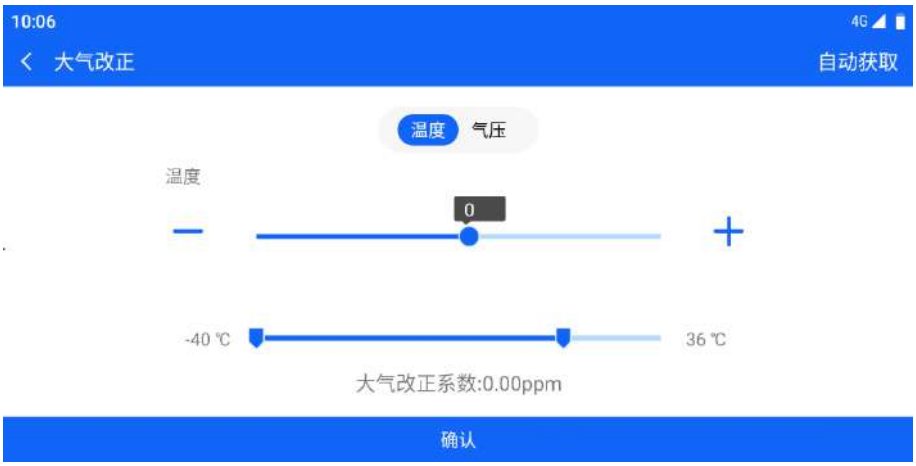
Laser down to point

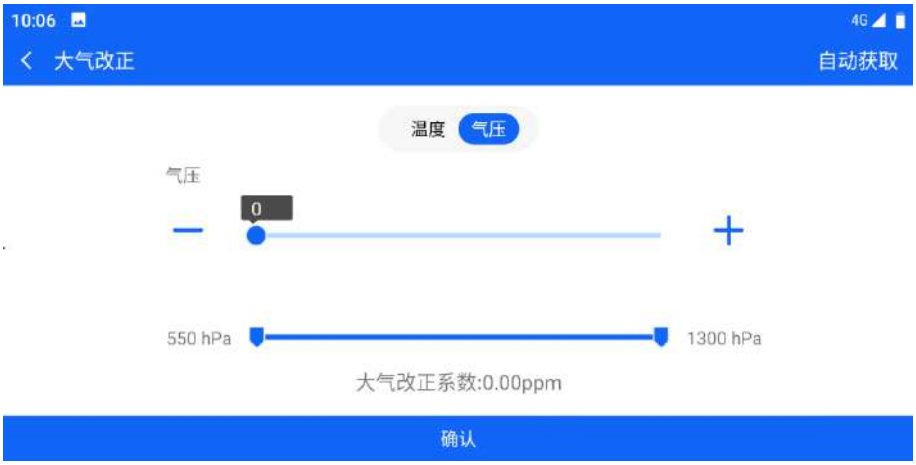
Turn on the laser down alignment, the laser shoots out from the bottom of the total station for easy alignment.



Atmospheric Correction

Atmospheric correction can be calculated by temperature and pressure or input directly. The setting here has the same effect as setting in [Ranging Parameters Configuration].





Prismatic constants

The prism constant of the prism can be set. The setting here has the same effect

as setting in [Ranging Parameters Configuration].

Divider lighting

Set the illumination level of the scoreboard for illumination during nighttime measurements.

Custom Function Keys

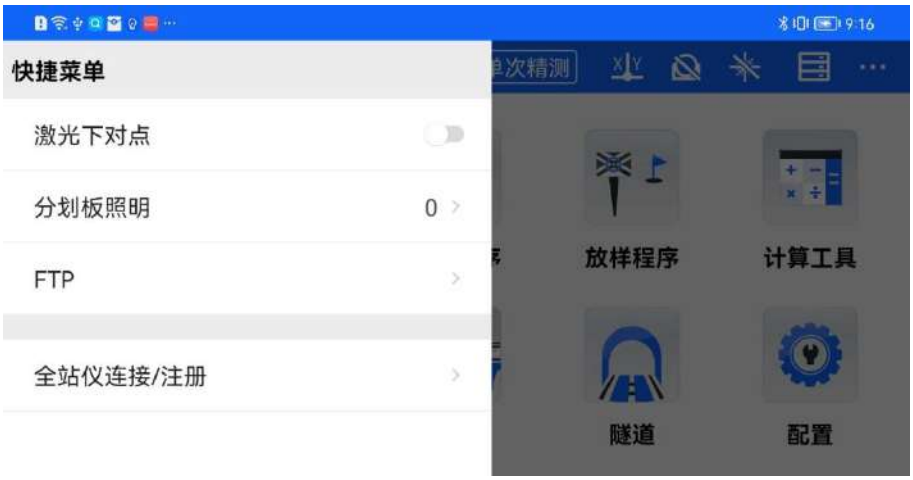
Used to set the shortcut jump parameters of the physical keys of the total station, the specific settable parameters are shown below.

FTP

Used for FTP transfer parameters, can be used for file transfer. By default, the software does not check "Transfer without encryption", users need to enter user name, password and port. If "Transfer without encryption" is checked, the software does not display the user name and password input box, and the user only needs to configure the port. When the device is connected to Wifi, the software will automatically fill in the IP parameters and the port number will be 2121 by default; after the user has configured all the parameters, click [Start], the user will follow the prompts on the software and enter the corresponding path on the address bar of the computer to download the FTP transfer files.

Total Station Registration/Connection

Total station registration can enter the interface of total station information and perform registration operation, which is consistent with the function of configuration-total station information; the cell phone terminal shows total station connection/registration, which can quickly enter the connection interface and perform registration operation after connection, which is consistent with the function of total station information.



CHAPTER

16

Top shortcut function

This chapter introduces.

- Distance measurement mode
- Tilt compensation
- Reflector type switching
- Laser pointing
- Point data
- More

Distance measurement mode

Click on the top bar 单次精测 to set the ranging mode, and you can set the mode as follows. The setting here has the same effect as the setting in [Ranging Parameters Configuration].

Tilt compensation

Click the top bar to compensate and correct the angular reading error caused by the tilt of the vertical axis of the instrument in X and Y directions. The compensation settings supported by the software are: turn on XY dual-axis compensation, turn on X single-axis compensation, turn off compensation.

Users can choose whether to turn on the tilt compensation according to the actual use scenario. In order to ensure the accuracy of the angle measurement, it is generally recommended to use the tilt sensor as much as possible, and its display can also be used to better level the instrument. If "compensation exceeded", it indicates that the instrument is out of the range of automatic compensation and must be adjusted to level the foot spiral.

Reflector type switching

Click the top bar to switch the reflector type to Prism, Prism-free, or Reflector. This setting has the same effect as the setting in [Ranging Parameters Configuration].

Laser Pointing

Click the top bar to turn the objective pointing laser on or off. This setting has the same effect as the setting in [Ranging Parameters Configuration].

Point Data

Click the top bar to enter the point library to view the measurement points, release points and control points.

More

Click on the top bar at to expand the more menus as shown below.

Distance measurement parameters configuration

For the shortcut entrance of [Ranging Parameters Configuration], see Chapter 10 [Configuration] for specific functions.

Measurement aid configuration

For the shortcut entrance of [Measurement Aid Configuration], see Chapter 10 [Configuration] for specific functions.

About

Displays the software version and update information.

Exit Software

Click this item to bring up the exit confirmation box, which can be used to exit the software.

CHAPTER

17

Inspection and Calibration

This chapter introduces.

Tube level

- Round level
- Telescope dividers
- Perpendicularity of the visualization axis to the horizontal axis
- Automatic compensation of zero point of vertical disc indicator
- Vertical index spread and vertical index zero setting
- Aligner
- Instrument addition constants (K)
- Parallelism between the alignment axis and the emitting electro-optical axis
- Prism-free distance measurement

Tube level

-Check

The method is described in the book "Accurate leveling instruments with tube level".

-Correction

1、In the inspection, if the bubble of the tube level deviates from the center, first use the foot spiral parallel to the tube level to adjust it, so that the bubble moves to the center nearly half of the deviation amount. The remaining half of the bubble will be adjusted by turning the level correction screw (on the right side of the level) with the correction needle until the bubble is centered.

2. Rotate the instrument 180° and check whether the bubbles are centered. If the bubble is still not centered, repeat step 1 until the bubble is centered.

3, the instrument will be rotated 90 °, with the third foot screw to adjust the bubble centered.

-Repeat the test and calibration steps until the alignment section is turned so that the bubble is centered in any direction.

Round level

-Check

After the long level is checked and calibrated correctly, if the bubble of the round level is also centered, there is no need to correct it.

-Correction

If the bubble is not centered, adjust the calibration screws below the bubble with a calibration pin or hexagonal hand to center the bubble. When correcting, loosen the correction screws (1 or 2) on the opposite side of the bubble offset direction, and then tighten the remaining correction screws on the offset direction to center the bubble. When the bubble is centered, the tightening force of all three calibration screws should be the same.

Telescope dividing plate

-Check

1、After leveling the instrument, select a target point A on the telescope line of sight, align A with the center of the cross wire of the dividing board and fix the horizontal and vertical brake hand wheel.

2. Turn the vertical micro hand wheel of the telescope so that point A moves to the edge of the field of view (point A′).

3、If the A point is moving along the vertical wire of the cross wire, that is, the A′ point is still within the vertical wire, as in the left figure, the cross wire is not tilted without correction. If the A′ point deviates from the center of the vertical wire, as in the right figure, the cross wire is tilted and needs to be corrected for the dividing plate.

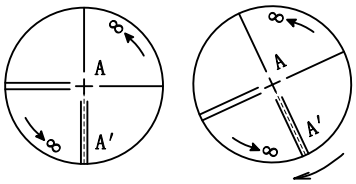


Figure 17-1

-Correction

1、First of all, remove the cover of the dividing plate holder located between the telescope eyepiece and the focus handwheel, you will see four dividing plate holders fixed

Screws (see attached picture)

2, use a screwdriver to evenly loosen the three set screws, rotate the dividing plate seat around the sight axis so that the A′ point falls on the position of the vertical wire.

3、Tighten the fixing screws evenly, and then check the calibration result by the above method.

4、Install the cover back to its original position.

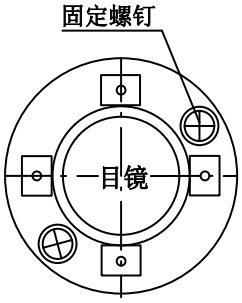


Figure 17-2

Perpendicularity of the visual alignment axis to the horizontal axis

-Check

1. Set target A at a distance of about 100 meters from the instrument and make the vertical angle of the target within ±3°. Accurately level the instrument and turn on the power.

2. Aim the telescope at target A in the left position of the disk and read the horizontal angle.

Example: Horizontal angle L = 10°13′10″

3、Loosen the vertical and horizontal hand wheel, rotate the telescope, rotate the right side of the illumination plate to align the same target A. Before illumination, tighten the horizontal and vertical hand wheel, and read the horizontal angle.

Example: Horizontal angle R= 190°13′40″

4、2C=L-(R±180°)=-30″≥±20″, need to be corrected.

-Correction

1. Adjust the horizontal angle reading with the horizontal micro hand wheel to the correct reading after eliminating C.

R + C = 190°13′40″ - 15″ = 190°13′25″.

2、Remove the shield of the dividing board located between the telescope eyepiece and the focusing handwheel, adjust the horizontal cross-wire correction screws on the dividing board, loosen the screws on one side first and then tighten the screws on the other side, move the dividing board so that the center of the cross-wire is aligned with the target A.

3、Repeat the test procedure, and correct until | 2C | ＜ 10″ meets the requirements.

4、Tighten the calibration screw and install the cover back to the original position.

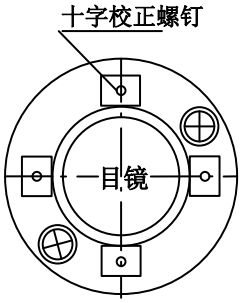


Figure 17-3

Note: The photoelectric coaxiality should be checked after calibration.

Vertical disc indicator zero point automatic compensation

-Check

1、After placing and leveling the instrument, make the pointing of the telescope and the center of the instrument consistent with the joint line of either foot spiral X. Screw the horizontal brake hand wheel.

2、After the power is turned on, the vertical disk indicator is zeroed, the vertical hand wheel is tightened, and the instrument displays the value of the current vertical angle at which the telescope points.

3, slowly turn the foot spiral X in one direction to about 10mm circumferential distance, the vertical angle displayed by the corresponding change to the disappearance of the "compensation beyond!" message, indicating that the instrument vertical axis tilt has been greater than 3′, beyond the design range of the vertical disk compensator. When the reverse rotation of the foot spiral recovery, the instrument and reappear vertical angle, in the critical position can be repeatedly tested to see its change, that the vertical disk compensator work properly.

-Correction

When the instrument compensation is found to be out of order or abnormal, it should be sent to the factory for repair.

Vertical index difference (i-angle) and vertical index zero point setting

-Check

1、After placing and leveling the instrument, turn on the machine, shine the telescope on any clear target A, and get the vertical angle disk left reading L.

2. Turn the telescope and the illumination part and then illuminate A to get the right reading of the vertical angle disk R.

3. If the vertical angle zenith is 0°, then i = (L + R - 360°) / 2, if the vertical angle horizontal is 0.

Then i = (L + R - 180°)/2 or (L + R - 540°)/2.

4、If｜i｜≥10″, the zero point of the vertical disk indicator should be reset.

5. The operation method is as follows.

(1) Install the total station to the calibration table, level it, click "Total Station Calibration", enter the password (please contact your local dealer to get it), and then enter the calibration interface.

Figure 17-4

2) Select the parameter item to be calibrated and enter the corresponding calibration interface.

Figure 17-5

3) Follow the instructions at the bottom of the interface until the calibration is finally completed.

Figure 17-6

Note: 1. Repeat the test steps to re-measure the indicator difference (i angle). If

the indicator difference still does not meet the requirements, you should check whether the step operation of the correction ***indicator zero setting*** (the vertical angle shown in the zero setting process is the value without compensation and correction, only for reference in the setting and not for other purposes) is wrong, and whether the target illumination is accurate, etc., and then set it again as required.

6、After repeated operations still do not meet the requirements, should be sent to the factory for maintenance.

Aligner

-Check

1. Place the instrument on a tripod, draw a cross on a piece of white paper and place it on the ground directly below the instrument.

2, after adjusting the focus of the aligner (for optical aligner) or open the laser aligner, move the white paper so that the cross is located in the center of the field of view (or laser spot).

3、Turn the foot spiral so that the center mark of the aligner coincides with the crossover point.

4、Rotate the illumination part, every 90°, observe the center mark of the alignment point and the overlap of the cross.

5、If the center mark of the optical aligner is always coincident with the cross when the alignment section is rotated, no correction is necessary. Otherwise, it should be corrected according to the following method.

-Correction

1、Remove the corrective screw cover between the optical aligner eyepiece and the focusing handwheel.

2、Fix the crossed white paper and mark on the paper the center mark fall point of the aligner for every 90° rotation of the instrument, such as points A, B, C and D in the figure.

3. Connect the diagonal points AC and BD with a straight line, and the intersection of the two lines is O.

4、Adjust the four alignment screws of the aligner with the alignment pin so that the center mark of the aligner coincides with the O point.

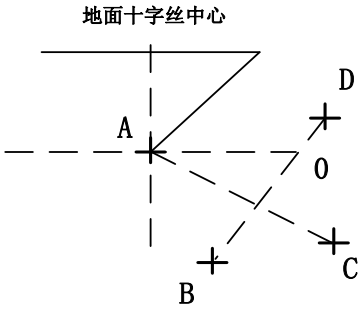


Figure 17-6

5. Repeat inspection step 4 and check the calibration until it meets the requirements.

6, for the laser under the point, then unscrew the laser cover, use 1 # hexagonal wrench to adjust the three screws, while tightening and loosening, and finally adjust the laser spot to 0 point.

7、Install the cover back to its original position.

Instrumentation plus constant (K)

The instrument constants are checked at the factory and corrected in the machine so that K = 0. The instrument constants rarely change, but we recommend that this test be performed once or twice a year. This test is suitable for the standard baseline, but can also be carried out according to the following simple method.

-Check

1、Select a flat site at point A to place and level the apparatus, and use vertical wire to carefully mark the same line on the ground at an interval of about 50m between points A, B and B, C, and accurately align the reflective prism.

2、After the instrument was set up with temperature and air pressure data, the flat distance of AB and AC was measured accurately.

3. Place the instrument at point B and align it accurately to measure the flat distance of BC precisely.

4. The instrument range constants can be derived as follows.

K = AC - (AB + BC)

K should be close to equal to 0, if | K | ＞5mm should be sent to the standard baseline field for strict inspection, and then corrected according to the inspection value.

-Correction

After strict inspection to confirm that the instrument constant K is not close to 0

has changed, the user, if required to make corrections, will set the instrument plus the constant according to the value of the integrated constant K. For example, if the K value measured by the above method is -5, and the original instrument constant in the instrument is -20, the newly set value is -20 - (-5) = -15.

● The vertical wire of the instrument should be used for orientation, strictly so that the three points A, B and C are in the same straight line. the ground at point B should have a firm and clear alignment mark.

● Whether the center of the prism at point B coincides with the center of the instrument is an important part of ensuring detection accuracy, therefore, it is best to use a tripod at point B and a base that can be used for both, such as a three-jaw prism connector and base interchange, the tripod and base remain fixed, and only change the prism and instrument above the base part, which can reduce the non-coincidence error.

Parallelism between the axis of visual alignment and the axis of emitting electric light

-Check

1、Place the reflecting prism at 50 meters from the instrument.

2. Use the telescope cross wire to precisely illuminate the center of the reflecting prism.

3、Check whether the center of the telescope crossfilament and the transmitting electro-optical axis alignment center coincide, such as the basic coincidence can be considered qualified.

-Correction

If the center of the telescope cross wire and the center of the transmitting electro-optical axis deviates greatly, it must be sent to the professional repair department for correction.

Prism-free distance measurement

The red laser beam, which is co-axial with the telescope and used for prism-free ranging, is emitted from the telescope. If the instrument is well calibrated, the red laser beam will coincide with the line of sight. External influences such as vibrations, large temperature changes, etc. can cause the laser beam to not coincide with the line of sight.

● Before precision ranging, the directional coaxiality of the laser beam should be

checked for any offset, otherwise it may lead to inaccurate ranging.

Warning.

Looking directly at the laser is usually dangerous.

Prevention.

Do not look directly at the laser beam, or shine it at others. Measurements may also be obtained by reflected light from the human body.

-Check.

Place the reflective sheet with the gray side facing the instrument at 5 and 20 meters. Activate the laser pointing function. Aim at the center of the reflector sheet with the center of the telescope crossfilament, and then check the position of the red laser dot. Generally, the telescope has a special filter so that the human eye cannot see the laser dot through the telescope. You can observe the degree of deviation of the red laser dot from the cross center of the reflector from above the telescope or from the side of the reflector. If the center of the laser coincides with the center of the cross, it means that it is adjusted to the required accuracy. If the position of the dot deviates from the cross mark more than the limit, it needs to be sent to a professional maintenance department for adjustment.

● If the laser dot illuminates the reflective surface too brightly, the white surface can be used instead of the gray surface to check.

Appendix A Symbol Meaning

Take the following example to illustrate the meaning of the symbols

Vz Zenith distance mode

V0 Vertical angle display mode of 0 when the telescope is horizontal at the positive mirror

Vh Vertical angle mode (0 when horizontal, positive elevation angle, negative pitch angle)

V% Slope mode

HR Horizontal angle (right angle)

HL Horizontal angle (left angle)

HD Horizontal distance

VD Height difference

SD Slant Distance

N North directional coordinates, dN denotes the difference of the release N coordinates

E Eastern coordinates, dE denotes the difference of the release E coordinates

Z Elevation coordinates, dZ denotes the difference between the released Z coordinates

m In meters

ft In feet

fi In feet and inches, feet before the decimal point and hundredths of an inch after the decimal point

X The value along the baseline direction in the point projection measurement, the direction from the starting point to the end point is positive

Y Point projection measurement of the value in the direction of vertical deviation from the baseline

Z The height of the target in the point projection measurement

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

RF Exposure Information

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.