
Android Total Station Product Series operating instruction



Manual Revision Status

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preface

Purpose of the Manual

Welcome to the user manual for the Zhonghaida Android Total Station Series. This manual explains how to configure and operate the Android Total Station Series. To ensure optimal product performance, please read the manual carefully. Note that the sample images and icons provided may differ from the actual product; please refer to the physical device for accurate specifications. You may contact our local sales representative for assistance.

Product Description

This manual uses the Zhonghaida Android total station as an example to guide you on how to operate the host units in the Android total station series.

Experience Requirements

To ensure optimal use of the Hi-Target Android total station, we recommend that you possess basic surveying knowledge and carefully read this manual. For any inquiries, please visit Hi-Targets official website: www.hi-target.com.cn.

Security Technology Tip



Note: The warning content typically indicates specific operational aspects requiring your special attention. Please read it carefully.



Warning: The warning message typically contains critical instructions. Failure to follow the warning may result in instrument damage, data loss, system failure, or even pose a threat to personal safety.

Exemption from Liability

Before using this product, please carefully read the user manual to ensure proper operation. Zhonghaida shall not be liable for any losses resulting from improper operation of the product due to failure to follow the manual requirements or misunderstanding its instructions.

Zhonghaida is committed to continuously improving product functionality and performance, enhancing service quality, and reserves the right to modify the content of the user manual without prior notice.

We have verified the consistency between the content described in the printed materials and the hardware/software specifications; however, deviations cannot be entirely ruled out. The images in this manual are for reference only. In case of any discrepancies between the images and the actual product, the actual product shall prevail. The final interpretation rights belong to Suzhou Xunwei.

Technology and Services

If you have any technical questions, please contact the technical centers at any branch or the Technical Department at headquarters by phone. We will promptly address your inquiries.

related information

You can find this manual through the following channels:

1. Visit the official website of Zhonghaida and locate it under "Service Center" → "File Download" → "User Manual".

Your suggestion

If you have any suggestions or feedback regarding this manual, please contact us. Your input will significantly enhance the quality of our documentation.

FCC Caution.

§ 15.19 Labelling requirements.

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.

§ 15.21 Information to user.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

§ 15.105 Information to the user.

Note: 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.

RF warning for Mobile device:

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 & your body.

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Instrument Characteristics and Applications

This chapter introduces:

- Instrument Features
- Instrument Purpose
- matters need attention
- Safety Guide

Instrument Features

feature-rich — This series of total stations is built on the Android hardware platform, supporting angle measurement, distance measurement, visual elevation measurement, visual centering, button indicators, guide lights, serial port, USB, centering and elevation measurement, button sounds, and compatibility with total station command communication protocols (Xunwei L Protocol and T Protocol). It comes with powerful industry-specific application software for project management, station setup, basic surveying, program-based measurement, road layout, bridge and tunnel surveying, map creation, and configuration. The devices can also be installed on handheld mobile devices, making them suitable for various professional surveying applications.

1. Absolute digital dial

Equipped with an absolute digital dial, the instrument can perform measurements immediately upon startup. Even if the power is reset during operation, the azimuth information will not be lost.

2. Robust memory management

It features large-capacity memory and facilitates file system management, enabling operations such as data addition, deletion, and transfer.

3. Prism-free ranging

All models in this series of total stations feature laser ranging without the need for a prism, enabling direct, long-distance, rapid, and high-precision measurements of objects made of various materials and colors—including building walls, utility poles, power lines, cliff faces, mountainsides, soil, and wooden piles. For targets that are difficult or impossible to reach, this prism-free ranging capability ensures effective measurement results.

4. Special Measurement Procedure

In addition to standard basic measurement functions, this series of total stations features specialized measurement programs capable of performing suspended height measurement, eccentricity measurement, opposite-side measurement, layout, back-stroke intersection, area calculation, as well as road design and layout tasks, fully meeting professional surveying requirements.

5. interchangeable eyepiece

This instrument features interchangeable eyepieces, allowing easy installation of curved tube eyepieces for convenient observation of the zenith direction and measurement of high-rise buildings.

6. Point alignment/visual alignment is optional under laser guidance

Convenient site indication feature for easy station setup.

Instrument Purpose

A total station is a measuring instrument capable of determining azimuth angles and target distances while automatically calculating the coordinates of target points. It plays a vital role in economic and national defense development. Applications such as mineral exploration, mining operations, railway and highway construction, bridge building, agricultural irrigation systems, and urban planning all rely on electronic total station measurements. In national defense contexts—including battlefield preparation, port facilities, fortresses, airports, military bases, and defense infrastructure projects—all require detailed and accurate geodetic surveys as their foundation. In recent years, electronic total stations have become indispensable tools for precision positioning and installation in large-scale engineering projects, shipbuilding, and the aviation industry.

This series of total stations employs an absolute encoding digital angle measurement system for angle measurement, while its ranging system utilizes an integrated circuit control board-based rangefinder. 运行 Android operating system and paired with measurement software, it simultaneously displays measurement results including horizontal angle, vertical angle, oblique distance, horizontal distance, height difference, and coordinates, supporting various measurement modes such as angle and slope measurement.

The prism-free ranging system is specifically designed for engineering project users and is particularly suitable for various construction fields. It can be widely applied in determining three-dimensional coordinates and positions of buildings, measuring suspended heights, assessing vertical alignment, locating pipelines, and conducting cross-sectional measurements. It is also applicable to triangulation control surveys, topographic surveys, cadastral surveys, and real estate surveys.

matters need attention

1. When measuring under sunlight, avoid directing the objective lens directly toward the sun. It is recommended to use a solar filter to mitigate this effect.
2. Avoid storing the instrument under high or low temperatures, and

refrain from using it during sudden temperature changes.

3. When not in use, the instrument should be stored in a box in a well-ventilated and dry location, with protection against vibration, dust, and moisture.

4. If there is a significant temperature difference between the operating environment and the storage environment of the instrument, the instrument should first be kept in the box until it acclimates to the ambient temperature before being removed for use to ensure optimal accuracy.

5. If the instrument remains unused for an extended period, the batteries should be removed and stored separately. Additionally, the batteries should be recharged monthly to prolong their service life.

6. When transporting instruments, they should be placed in boxes. During transportation, care must be taken to avoid compression, impact, and severe vibration. For long-distance transport, it is advisable to use soft padding around the boxes.

7. When setting up instruments, use high-quality wooden tripods whenever possible to ensure measurement stability and improve accuracy.

8. To enhance the accuracy of prism-free measurement, ensure that the objective lens remains clean. When cleaning exposed optical components, gently wipe them with degreased cotton or lens paper; never use other materials for wiping.

9. After use, remove dust from the instrument surface with a velvet cloth or brush. If the instrument is soaked by rainwater, do not power it on; instead, dry it thoroughly with a clean soft cloth and allow it to air dry in a well-ventilated area before reuse or packing.

10. Before commencing operations, thoroughly inspect the instrument to ensure that all specifications, functions, power supply, initial settings, and calibration parameters meet the required standards prior to proceeding.

11. If any abnormal instrument functionality is detected, non-professional maintenance personnel must not disassemble the instrument without authorization to avoid unnecessary damage.

12. The laser emitted by the prism-free total station must not be directed directly at the eyes during use.

Android Total Station Series User Manual



Note: All instruments undergo rigorous inspection and calibration upon factory delivery,

ensuring compliance with quality standards. However, minor variations in the optical and mechanical structural parameters are inevitable after long-distance transportation or exposure to environmental changes. Therefore, both newly purchased instruments and those arriving at the survey site prior to operation must undergo all the inspections and calibrations described in this section to guarantee the accuracy of the measurement results.

Safety Guide

When using prism-free laser ranging, the following safety precautions must be observed.

Ranging laser parameters

Description	Value
Wavelength	685nm
Maximum average radiated power	4.9mW

Laser warning label



warn :

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

This product is classified as 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 400 nm to 700 nm is within five times that of Class 2/II products.

warn :

Continuous direct-view laser beams are hazardous.

prevent :

Do not stare directly at the laser beam, nor direct the laser beam at

others. The reflected beam serves as the essential measurement signal for the instrument.

warn :

When a laser beam is directed onto surfaces such as prisms, flat mirrors, metal surfaces, or windows, direct visual observation of the reflected light may be hazardous.

prevent :

Do not focus on the laser reflection. When the laser switch is turned on (range measurement mode), avoid looking at the laser path or the prism. Observe the alignment prism only through the total stations telescope.

warn :

Improper use of Class 3R laser equipment is hazardous.

prevent :

To prevent injuries, all users must diligently implement safety precautions and exercise proper control within the distance where hazards may occur (in accordance with the IEC 60825-1:2001 standard).

Below is an explanation of the main sections of the following standard:

Class 3R laser products are used outdoors and on construction sites (for prism-free measurements).

Only individuals who have received relevant training and certification are authorized to install, commission, and operate such laser equipment.

b Install corresponding laser warning signs within the designated area of use.

c Prevent anyone from looking directly at the laser beam or using optical instruments to observe the laser beam.

To prevent laser damage to humans, the laser beam should be blocked at the end of the working path. The laser beam must not penetrate the restricted area (hazardous distance).*) Within this area, the laser beam must be turned off when anyone is active.

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

f Laser products should be stored properly when not in use and must not be operated by unqualified personnel.

Instrument Characteristics and Applications

g Prevent the laser beam from unintentionally irradiating surfaces such as flat mirrors, metal surfaces, or windows; exercise particular caution with flat mirrors and concave mirrors.

**The hazardous distance refers to the maximum distance from the laser beams origin where its intensity has diminished to a level that poses no harm to humans. For range finder products equipped with Class 3R/IIIa lasers, this hazardous distance is 1,000 m (3,300 ft); beyond this distance, the laser intensity decreases to Class 1 (the direct beam to the eyes causes no harm).*

names and functions of instrument components

This chapter introduces:

- Names of all components
- Keyboard Functions and Information Display

Component names

The names of the product components are as follows:

1-Coarse sight; 2-Objective lens focusing screw; 3-Vertical fine-tuning screw; 4-Display screen; 5-Eyepiece focusing screw; 6-Battery compartment cover; 7-Base; 8-Horizontal fine-tuning screw.



graph 2-1

9-Model name plate; 10-Camera; 11-Objective lens; 12-USB/TF/SIM interface; 13-Measurement center; 14-Fast measurement button.



graph 2-2

Keyboard Functions and Information Display



graph 2-3

Table 2.1 Key Functions:

key	name	function
0~ 9	entry key	Enter a number from 0 to 9, a letter, or a special character (see screen printing).
	Negative sign key	Enter a negative sign.
	Decimal point key	Enter a decimal point.
	delete key	Delete the previous character.
	Quick Access Key (F1~F6)	Adjust the function buttons at the bottom of the software interface.
	direction key	Move the cursor.
	HOME key	Return to the desktop.
	return key	Confirm/Enter to line break.
	Cancel/Return Key	Unselect/Return to the previous interface.
	Power switch key	Power on/off, lock screen.

Table 2.2 shows the symbol definitions:

symbol	content
V z	Azimuth distance mode
V 0	Vertical angle display mode where the telescopes horizontal position is set to 0 during normal viewing
V h	Vertical angle mode (0 for horizontal, positive for upward, negative for downward)
V%	Slope Pattern
HR	Horizontal Angle (Right Angle)
HL	Horizontal Angle (Left Angle)
HD	horizon range
VD	Elevation Difference
SD	slant-range
N	Northern coordinate: dN represents the layout N coordinate difference.
E	The eastern coordinate, dE, represents the E-coordinate deviation in layout.
Z	Elevation coordinate: dZ represents the Z coordinate difference in layout.
m	In meters
ft	In feet
fi	In feet and inches, the fraction before the decimal point is the foot, and the fraction after the decimal point is one percent of an inch.
X	In point projection measurement, the numerical value along the baseline direction is positive from the starting point to the ending point.
Y	The numerical value of the vertical deviation from the baseline direction in point projection measurement
Z	The elevation of the target in point cloud measurement

Preparation before measurement

This chapter introduces:

- Instrument Unboxing and Storage
- Install the instrument
- Battery installation/uninstallation, information, and charging
- reflecting prism
- Installation and Removal of the Base
- Telescope eyepiece adjustment and target alignment
- Input method for letters and numbers
- Precautions for USB drives
- Instrument Registration
- Notes on the instrument data storage size notification

Instrument Unboxing and Storage

- unpack

Gently lower the box with the lid facing upward, unlock the lock, open the lid, and remove the instrument.

- leave with

Cover the telescope dome so that the vertical adjustment handwheel of the sight and the level on the base face upward. Place the instrument flat (with the objective lens side facing downward) inside the case, gently tighten the vertical adjustment handwheel, close the case lid, and secure it with the lock bolt.

Installation device

- Operation Reference:

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

Use the plumb bob for centering and leveling

1) Mount the tripod

① First, open the tripod so that its three legs are approximately equidistant and the top surface is nearly horizontal, then tighten the three fixing screws.

② Align the center of the tripod approximately with the survey point on the same plumb line.

③ Firmly secure the tripod to the ground for stable support.

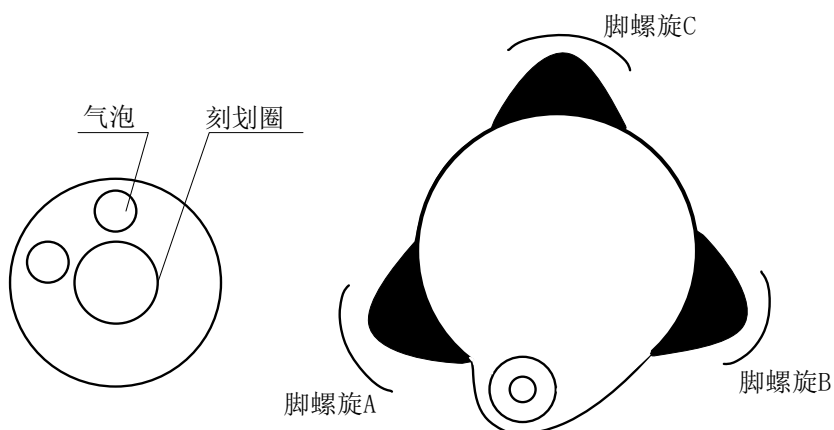
2) Mount the instrument on the tripod head

Carefully place the instrument on the top surface of the tripod. Hold the instrument with one hand and loosen the central connecting screw with the other hand. Gently move the instrument on the tripod until the hammer ball aligns with the center of the survey station marker, then securely tighten the connecting screw.

3) Use the circular level for rough leveling

① Rotate the two foot screws A and B until the bubble on the circular leveler aligns with a line perpendicular to the line connecting the centers of the two foot screws.

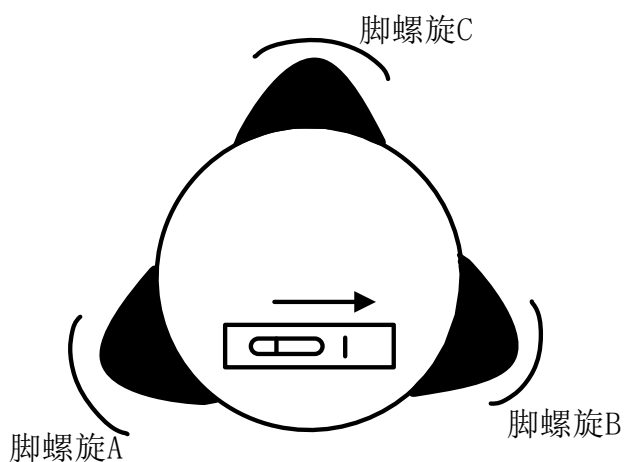
② Rotate the foot screw C to center the circular level bubble.



graph 3-1

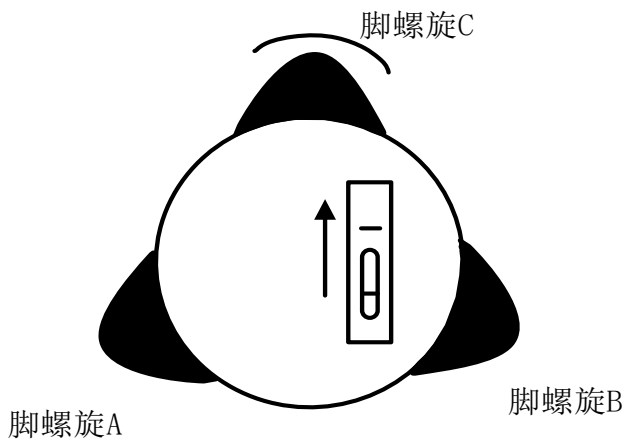
4) Use a pipe leveler to precisely level the instrument

① Release the horizontal brake screw, rotate the instrument so that the tube level is parallel to the line connecting the foot screws A and B, then rotate the foot screws A and B in opposite directions until the bubble on the tube level is centered.



graph 3-2

② Rotate the instrument 90° around the vertical axis, then turn the other foot screw C to center the bubble of the tube level.



③ Rotate the instrument another 90° , then repeat steps ① and ② until the bubbles are centered at all four positions.

Use the alignment tool for centering.

1) Mount the tripod

Set the tripod to the appropriate height with all three legs of equal length and fully extended, ensuring the top surface is nearly horizontal and directly above the survey station. Secure one leg of the tripod to the ground.

2) Installation of instruments and point alignment

Carefully mount the instrument on the tripod, tighten the central connecting screw, and access the compensator interface to align the laser beam. Hold the two remaining unfixed legs with both hands and adjust their positions using the optical alignment device. Once the alignment device is roughly aligned with the survey point, secure all three tripod legs to the ground. Then adjust the three foot screws of the total station to precisely align the alignment device with the survey point.

3) Use the circular level for rough leveling

Adjust the lengths of the three legs of the tripod to center the circular level bubble on the total station.

4) Use a pipe leveler to precisely level the instrument

① Release the horizontal brake screw, rotate the instrument until the tube level is parallel to the line connecting the pair of foot screws A and B. Then rotate foot screws A and B to center the bubble on the tube level.

② Rotate the instrument 90° so that it is perpendicular to the line connecting foot screws A and B. Rotate foot screw C to center the tube level bubble.

5) Precise centering and leveling

By observing the aligner, slightly loosen the central connecting screw, then move the instrument horizontally (without rotating it) to precisely align it with the survey station. Subsequently, tighten the central connecting screw and re-precisely level the instrument.

Repeat this operation until the instrument is precisely aligned with the measurement station.

Battery installation and removal, information, and charging

Battery Information

❖--Sufficient battery power for operation.

❖When this information first appeared, the battery still had approximately 4 hours of battery life remaining.

❖The battery 电量 is low; complete the operation as soon as possible, replace the battery, and recharge it. If the exact duration of operation cannot be determined, prepare a backup battery or recharge it before use.

❖From the moment the power outage occurs until the system shuts down, the situation typically lasts several minutes. The battery will be completely depleted; it should be replaced and recharged immediately.

pour :

①The battery's operational duration depends on environmental factors such as ambient temperature, charging time, and charging frequency. For safety reasons, it is advisable to charge the battery in advance or keep several fully charged backup batteries on hand.

② The battery remaining capacity display level depends on the current measurement mode. In angle measurement mode, the battery has sufficient remaining capacity, but this does not guarantee its usability in distance measurement mode. Since distance measurement consumes more power than angle measurement, switching from angle mode to distance mode may sometimes cause distance measurement to be interrupted due to insufficient battery capacity.

Precautions when removing the onboard battery compartment:

▲Before removing the battery compartment each time, always turn off the instrument's power first.

▲When installing the battery, press the button on the top of the battery compartment to secure it in place within the instrument.

Precautions during charging:

▲Although the charger features an overcharge protection circuit, the plug should still be unplugged from the socket after charging is complete.

▲ Charge within a temperature range of 0° to $\pm 45^{\circ}$ C; exceeding this range may cause charging abnormalities.

▲ The rechargeable battery can be recharged 300 - 500 times; complete discharge will shorten its service life.

▲To maximize the battery's lifespan, ensure to charge the device once a

month even when it remains unused for extended periods.

reflecting prism

When using the total station in prism mode for distance measurements and related tasks, a reflective prism must be placed at the target location. The reflective prism features a single or triple prism unit, which can be attached to the base via a connector and mounted on a tripod, or directly installed on the centering rod. The prism unit can be configured by the user according to operational requirements.

Installation and removal of the base

●dismantle

If necessary, the triangular base can be removed from the instrument (including the reflective prism base connector using the same base). First, use a screwdriver to loosen the locking screws securing the base, then rotate the locking knob counterclockwise by approximately 180° to detach the instrument from the base.

●install

Insert the three mounting feet of the instrument into the corresponding holes of the base to secure it onto the triangular base. Turn the locking knob 180° clockwise to lock the instrument to the base, then use a screwdriver to unscrew the locking screw from the left to secure the knob.

Adjustment of the telescope eyepiece and alignment of the target

Methods for Targeting (for Reference)

- ① Align the telescope with the bright sky, rotate the eyepiece, and focus until the reticle is clearly visible (first rotate the eyepiece toward yourself, then slowly move it inward to achieve clear reticle focus).
- ② Use the cross center in the scope to aim at the target point; maintain an appropriate distance (approximately 200 mm) between your eyes and the scope when aiming.
- ③ Use the telescopes focusing screw to achieve a clear image of the target.

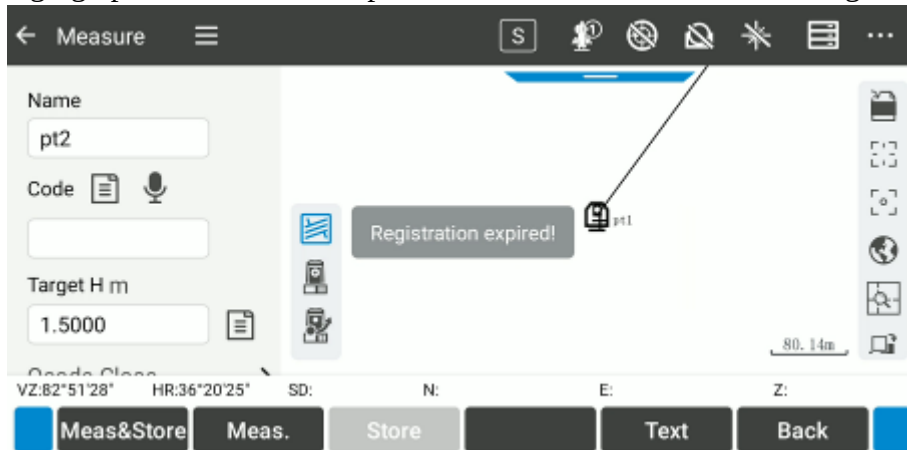
When the eyes move vertically or horizontally toward the eyepiece and detect parallax, it indicates that the focus or eyepiece refractive power is not properly adjusted, which will affect the accuracy of the angle measurement. The focus should be carefully adjusted and the eyepiece tube calibrated to eliminate the parallax.

Usb usage tips

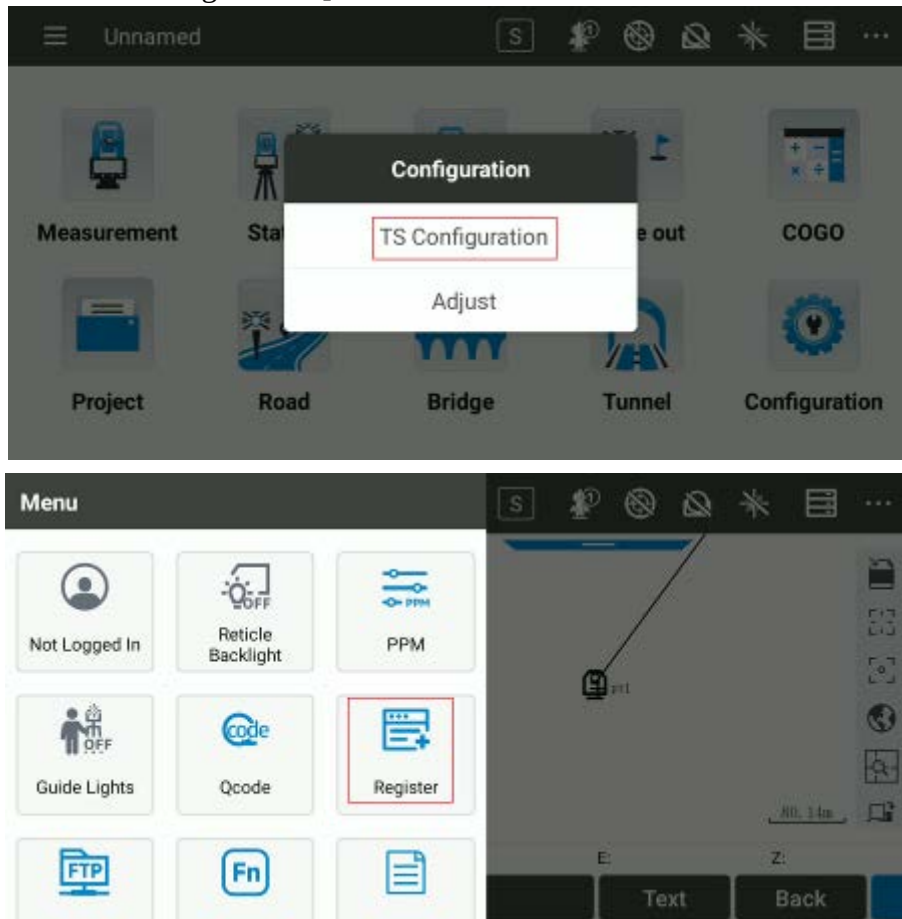
This device supports reading and writing to USB 2.0/2.1/3.0/3.1 128GB USB drives. Do not insert or remove the USB drive during software operation. If you remove the drive after completing the detection process, subsequent operations may cause errors.

Instrument Registration

Ranging operations cannot be performed before the instrument is registered.

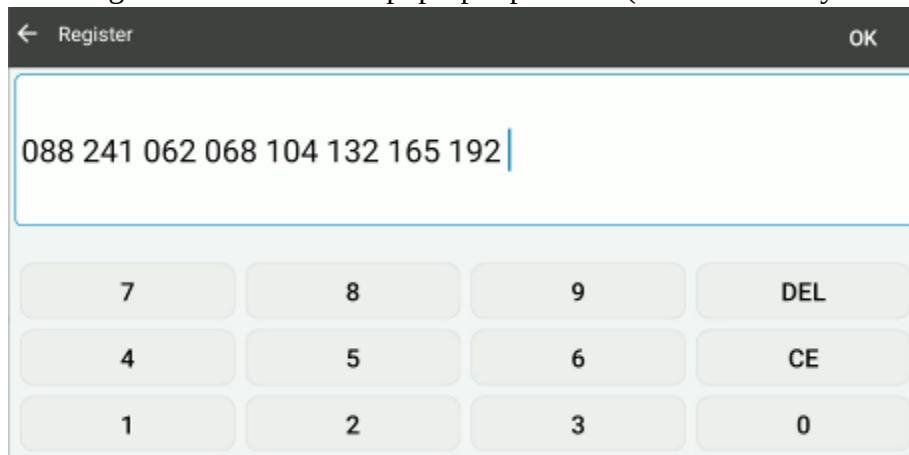


- 1) To register the instrument, go to the instrument registration interface by selecting [TS Configuration] from the configuration options on the main interface or choosing [Total Station Registration] from the main interface shortcut menu.



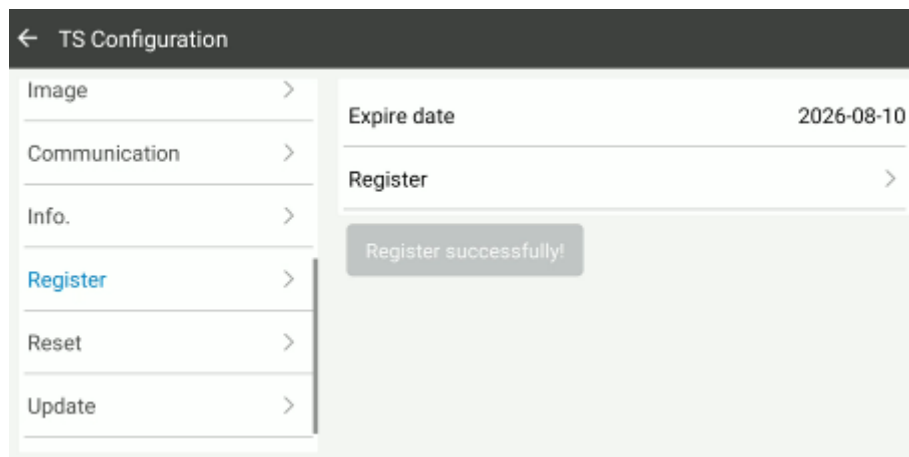
Preparation before measurement

2) After entering the total station information interface, click [Register], and enter the correct registration code in the pop-up input field (obtain it from your dealer).



The screenshot shows a 'Register' dialog box with a dark header bar containing a back arrow and the text 'Register', and an 'OK' button on the right. Below the header is a large white input field containing the registration code '088 241 062 068 104 132 165 192'. At the bottom of the dialog is a numeric keypad with buttons for digits 0-9, a 'DEL' button, and a 'CE' button.

3) After entering the correct registration code, press the [OK] key. The system will confirm successful registration, and the displayed registration expiration time is accurate.



The screenshot shows the 'TS Configuration' screen with a dark header bar containing a back arrow and the text 'TS Configuration'. On the left is a list of menu items: 'Image', 'Communication', 'Info.', 'Register' (highlighted in blue), 'Reset', and 'Update', each with a right-pointing arrow. On the right side, the 'Expire date' is displayed as '2026-08-10'. Below this, there is a 'Register' button with a right-pointing arrow. A grey toast message box in the center of the screen displays the text 'Register successfully!'.

Note on the instrument data storage size notification

1. When the instrument's memory is below 100 KB, a message will appear upon startup: "The disk space is below 100 KB; please organize or delete data."

Note: When deleting disk data, first export your measurement data to a USB drive to avoid unnecessary complications.

Software Overview and Simple Operation Process

This chapter introduces:

- Software Overview
- software installation
- Quick Guide

Software Overview

T-Survey is a total station software developed by Zhonghaida. Beyond basic station setup and data acquisition functions, it supports various layout programs, including CAD-based layout. The software facilitates design and layout operations for roads, bridges, and tunnels. This manual primarily outlines the host system architecture and key software features; for detailed functionality, refer to the T-Survey user manual.

software installation

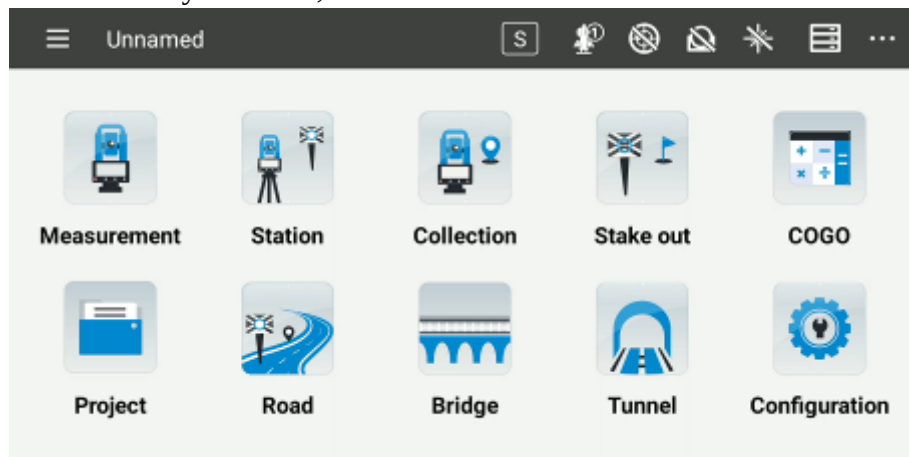
The T-Survey software requires Android 9 or later. It is compatible with Zhonghaidas professional Android total stations, professional survey notebooks, and regular smartphones. You can either directly copy the APK file (where APK stands for Android Package) to an Android control device for execution, or install it on a computer using a third-party mobile installer.

Quick Guide

The following is a quick start guide to operating the software. For detailed steps, refer to the explanations in each chapter. This guide is merely one solution provided to you; once you become proficient with the software, you may skip these steps. The typical workflow during operation is as follows:

I. Initial Settings

- 1、Open the T-Survey software; the main interface is as follows:



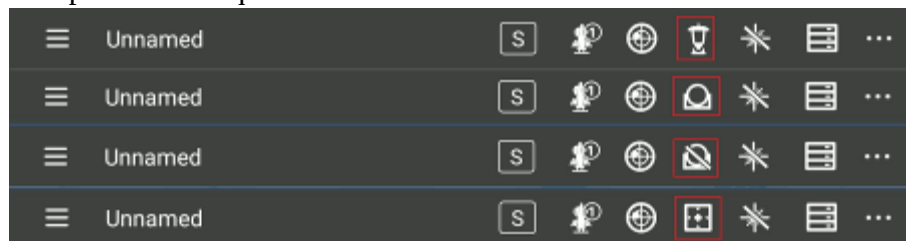
- 2、The tilt compensation feature of the total station compensates for angular reading errors caused by the instruments vertical axis tilting in the X and Y directions. The software supports the following compensation settings: enable XY dual-axis compensation, enable X single-axis compensation, or disable compensation entirely.





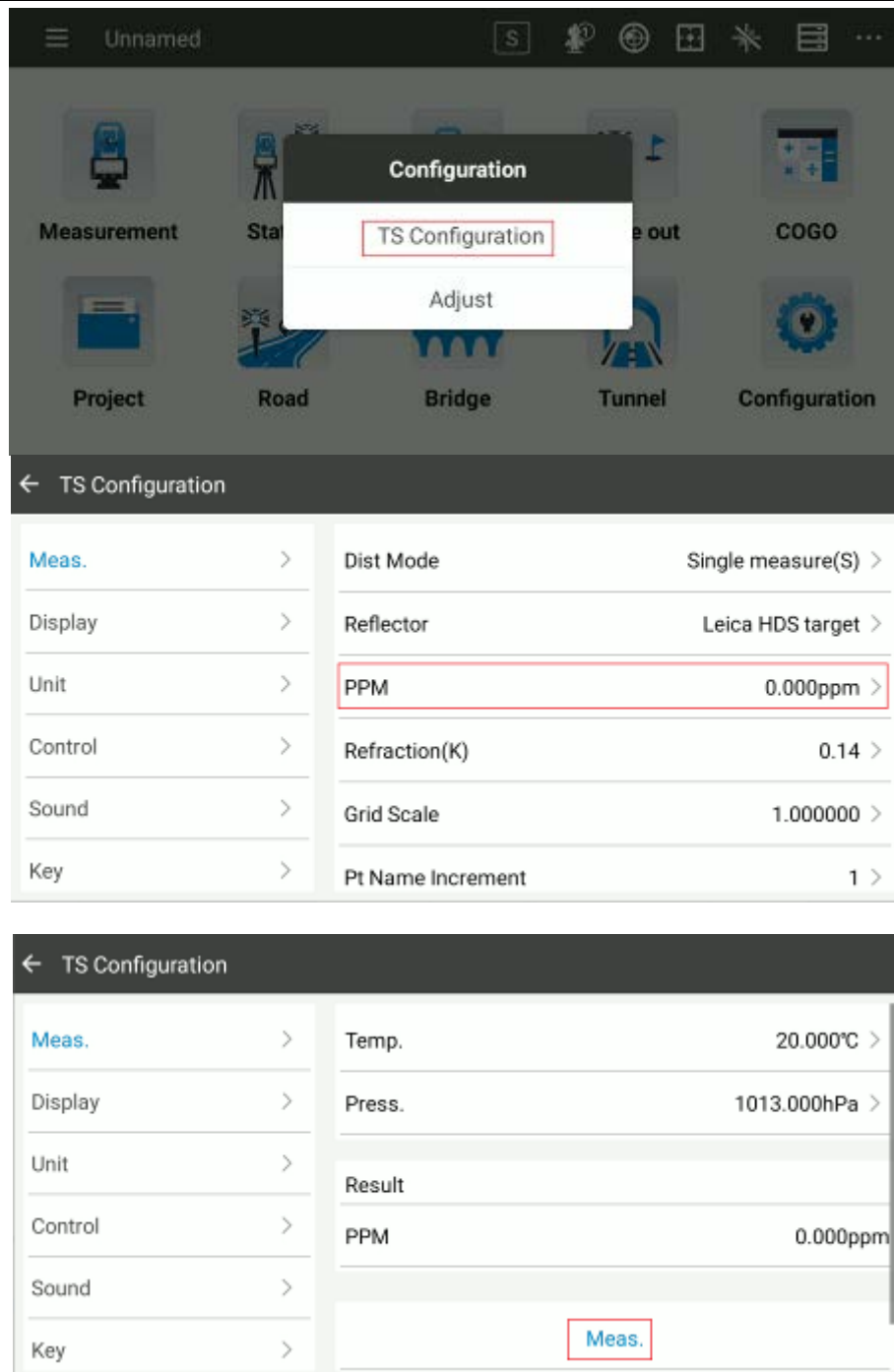
Users can choose whether to enable tilt compensation based on their specific usage scenarios. To ensure accurate angle measurements, it is recommended not to disable tilt compensation; its display also helps level the instrument more effectively. If "Compensation Out of Range" appears, it indicates the instrument has exceeded the automatic compensation range and requires adjustment using the foot screw for leveling.

- 3、 Set the ranging target type. The total station supports reflection modes including prism, reflective sheet, no prism, and custom prism. Users can configure these modes based on their operational requirements.



← Reflection Target Template				
Name	Absolute Constant	Type	Creator	
Hi-Target 360° Prism	-7.00 mm	Prism		
Default	0.00 mm	Prism		
Leica HDS target	0.00 mm	Sheet		
Leica reflective tape	0.00 mm	Sheet		
Default No Prism	0.00 mm	No prism		
OK Add Edit Delete Back				

- 4、 Set atmospheric correction. Distance measurements are affected by atmospheric conditions. To minimize this impact, apply meteorological correction parameters during measurement. Click the [Configuration] button in the lower-right corner to open [TS Configuration], then select [PPM] for settings. You can enter values manually or enable automatic measurement by the instrument.



II. Project Establishment

- 1、 To create a new project, click [Project], then click the blue floating [New] button on the interface (the new button is drag-and-drop). Enter the project creation interface, enter the project name (required), personnel, notes, and other information, select the desired legend template, and confirm to complete the project creation.

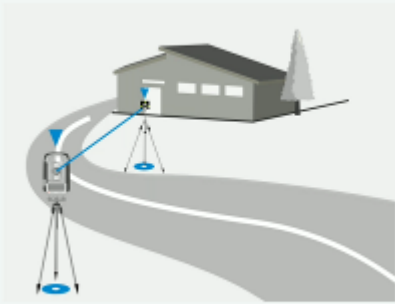
The screenshot displays two screens from the Android Total Station Series User Manual. The top screen, titled 'Project', shows the 'Current project' as 'Unnamed' with a folder icon, a 'View Info' link, and storage information: 'Available: 22.36G Total: 23.19G'. Below this, there are options for 'Previous Projects' (sorted by opening time), 'Project Path', and 'Local storage'. A blue circular button with a white plus sign is visible on the right. The bottom screen, titled 'New Project', contains input fields for 'Name' (2026-05-11), 'Creator', and 'Remarks'. It also has a checkbox for 'Control Job' and a 'Ground Code' field set to 'PRESET_EN'. At the bottom of this screen are buttons for 'OK', 'Back', and several other unlabeled buttons.

III. Station Establishment

The software supports users in station setting through methods such as station back-stationing, elevation transfer, back-station intersection, and point-to-line station setting. This section illustrates the process using coordinate-oriented station back-stationing as an example.

1. The total station is set up at the known point A and aligned with the known point B.
2. Click [Station] -- [STN Setup], and select "Known backsight point" as the orientation method. Enter the coordinates of known point A for the survey station setup, and the coordinates of known point B for the post-view point. Correctly input the instrument height and target height.
3. Select the back sight point and click "Meas.". A check box for measuring the residual will appear. If the user determines that the difference falls within the acceptable range, click "Apply" to complete the station back sight; if the difference exceeds the limit, click "Back" to repeat coordinate orientation.

Select setup method



Setup method
☒ Known BackSight Point
☐ Set Azimuth
☐ CAD
Setup point is known, measure to a known target point to set orientation.

Next
Back

Choose Station Point

Station
ct0

IH.
Auto Calculate Instrument Height
1.5000
m

N
0.0000
m

E
0.0000
m

Z
0.0000
m

Next
Back

Choose Backsight Poi...

Backsight
pt2

Target H
0.0000
m

Calculate azimuth
264°27'53"

Calculate horizontal distance
5.0583
m

Horizontal distance residual
-0.0000
m

Elevation residual
0.0000
m

Meas.
Apply
Back

IV. Collection

The software supports various measurement procedures, including coordinate measurement, eccentricity measurement, opposite-side measurement, elevation measurement, line and extension point measurement, as well as line and angle point measurement. This section illustrates the most fundamental coordinate measurement method as an example.

1. Click [Collection] -- [Measure] or [Measurement] -- [Measure] to enter the

coordinate measurement interface.



2. Align with the target point, enter the point name, legend code, and target elevation, then click [Meas.] → [Record] or directly click [Meas&Store] to measure and save the point to the total station database.

V. Data Export

Export the information of measurement points, layout points, control points, and traverse points in the project to different formats. All export formats fall into two categories: Other exports and Custom exports. If files with the same name exist in the export directory, a message will display "File with the same name already exists." You can select "Overwrite" to replace the existing data or enter a new file name.

Click the top bar to enter [Point Data], select the point type you want to export, and click the floating button [Export] to open the export interface. (To access the export interface for wirepoint information, first select the corresponding wire by clicking [Point Data] → [Wirepoint], choose the wire you wish to export, click [View], and finally click the floating button [Export] to open the wirepoint export interface.)



←

Point Data

GRAPH

...

All Point

Please enter search point name

Pt Name	N	E	Z	Code	Description
pt1	-4.4739	3.5340	2.0732		
pt2	-0.4879	-5.0347	3.5100		

No more data

Select the desired export format, click [Export], enter the file name, set the export path, and click [Export] again to save the total station data to its internal storage.

1 .OtherExports

Other non-custom export format types that can export data from each point.

Other export formats for measurement points include: H-TF format, Text format, Excel format, Southern Cass 7.0 format, DXF format, GSI-8 format, GSI-16 format, and GT7 format. For DXF and GT7 formats, you can click the settings button on the right to configure export parameters. 

Other export formats for survey points: Excel format.

Other export formats for control points: Excel format.

Other export formats for conductor points: Southern Adjustment Format.

2.Custom Export

Customize the default export templates for initial built-in measurement points, layout points, and control points. These default templates cannot be deleted or edited. Additionally, users can click the [New Template] floating button to create custom templates for point data.

The measurement point can be created with a suffix of.txt perhaps . The CSV export template allows you to create layout points, control points, and traverse points.txt export template.

Basic Measurement

This chapter introduces:

- Coordinate Measurement
- Coordinate Layout

Coordinate Measurement

Access via Click [Collection] -- [Measure] or [Measurement] -- [Measure].

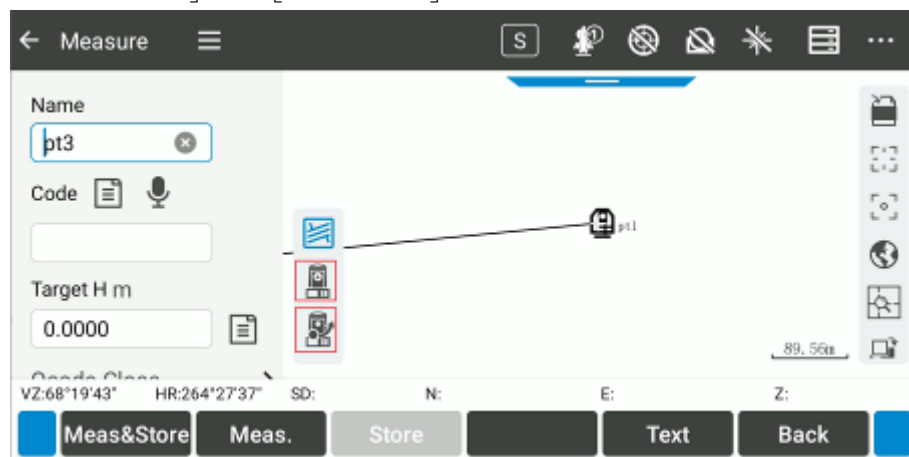


"Name": Measure names, automatically accumulated by default.

"Code": A description of the measurement point, which can be entered manually or selected by clicking the button next to the input field.

"Target H m": Measure the prism height at the measurement point.

[Graphic]: Switch the measurement interface display mode. Click to switch to the [Coaxial Camera] or [AR Camera] interface.



The following buttons are universal across all data collection and layout interfaces. After this explanation, they will not be repeated elsewhere.

[Meas&Store]: While measuring the target point, save its information to the total stations point database.

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

[Store]: Once the coordinates of the target point have been measured, click Record to save the target point information to the measurement point

database.

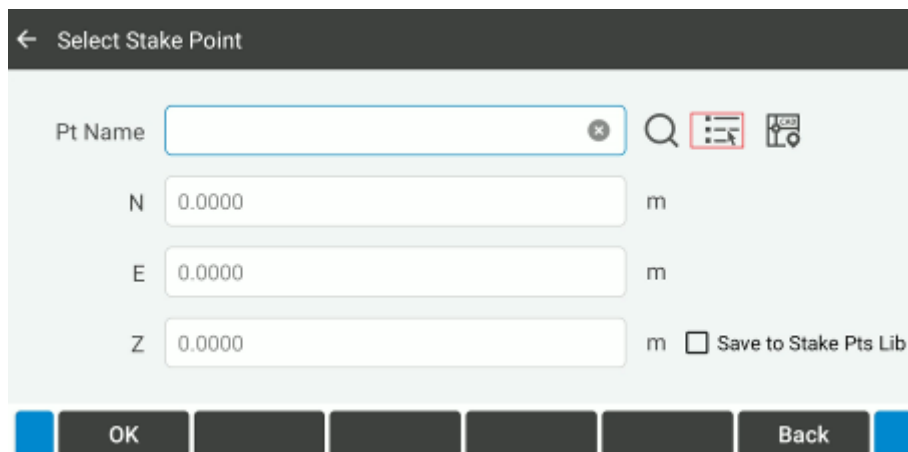
Coordinate Layout

Access it via Click [Stake out] -- [Point S.O] or [Measurement] -- [Point S.O].



Select stake point: Enter the layout point settings interface.

You can select layout points through manual input, named search, or list selection.

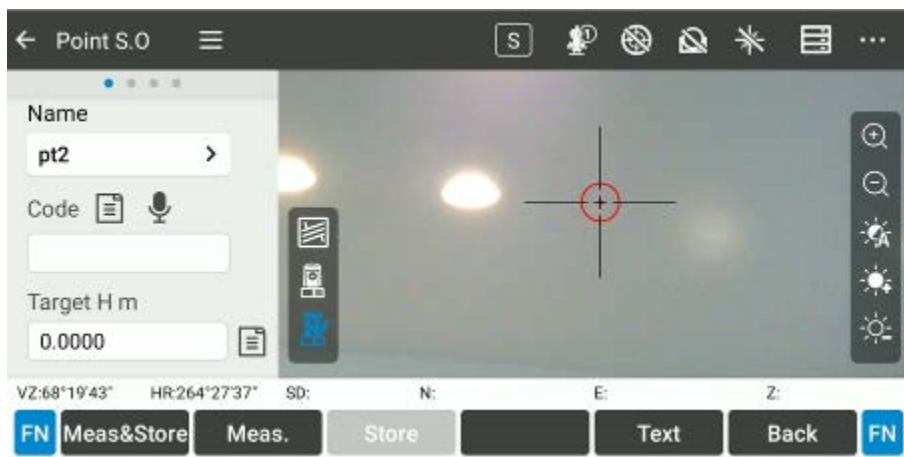
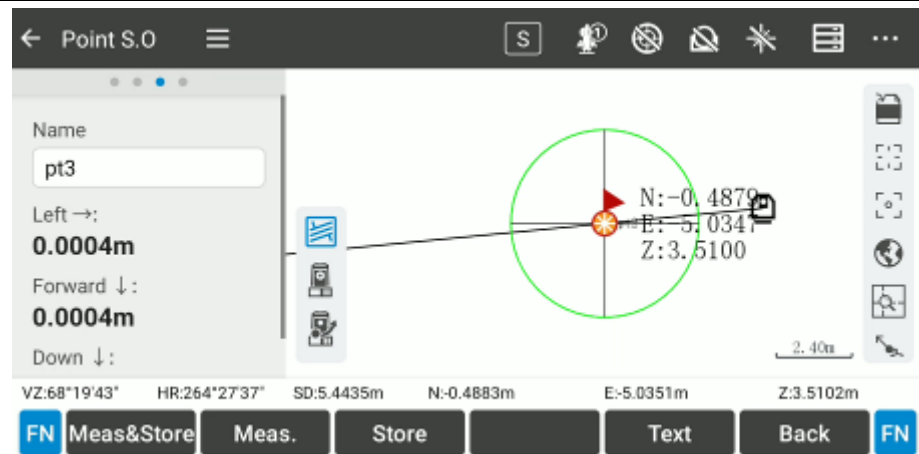


By Name Search: Perform an exact search using the entered name.

Select point from list: Go to the point library and select points from each library.

"Save to stake Pts Lib": If checked, the current layout points will be saved to the layout point database.

After selecting the layout points, click OK. The user can then switch to graphical mode, where the camera guidance for layout point positions (red dots) will appear on the coaxial camera/AR camera interface.



configuration

This chapter introduces:

- meas.
- Display
- unit
- Control
- sound
- key
- image
- Communication
- Info.
- register
- reset
- update
- about
- Total Station Calibration

To configure the total station, click [Configuration] - [TS Configuration] to enter the settings or view the following parameters:

measure

Users can click [Configuration] → [TS Configuration] → [Meas.] to access this interface and configure the ranging mode, reflector, prism constant, atmospheric correction, atmospheric refraction coefficient, grid factor, point number accumulation step size, and duplicate detection prompt.

← TS Configuration	
Meas. >	Dist Mode Single measure(S) >
Display >	Reflector Default No Prism >
Unit >	PPM 0.000ppm >
Control >	Refraction(K) 0.14 >
Sound >	Grid Scale 1.000000 >
Key >	Pt Name Increment 1 >

Dist Mode

Available ranging modes include: single precision measurement, multiple precision measurements (with more than 0 measurements), continuous precision measurement, and tracking measurement. For continuous precision measurement and tracking measurement, click "Stop" to halt the measurement.

← TS Configuration	
Meas. >	Dist Mode Single measure(S) >
Display >	Reflector Default No Prism >
Unit >	PPM 0.000ppm >
Control >	Refraction(K) 0.14 >
Sound >	Grid Scale 1.000000 >
Key >	Pt Name Increment 1 >

Single measure(S)	✓
Multiple measure(M)	
Continuous measure(C)	
Tracking measure(T)	

reflector

Available reflectors include: prism-free, prism, and reflective sheet. Note that the selected reflector must match the actual reflector; otherwise, accuracy may be affected or measurements

may fail.

← Reflection Target Template				
Name	Absolute Constant	Type	Creator	
Hi-Target 360° Prism	-7.00 mm	Prism		
Default	0.00 mm	Prism		
Leica HDS target	0.00 mm	Sheet		
Leica reflective tape	0.00 mm	Sheet		
Default No Prism	0.00 mm	No prism		
OK Add Edit Delete Back				

PPM

Atmospheric correction can be configured by setting temperature and pressure values.

Manual setting: Enter temperature and air pressure manually; the software will automatically calculate the atmospheric correction coefficient.

← TS Configuration	
Meas. >	Temp. 20.000°C >
Display >	Press. 1013.000hPa >
Unit >	Result
Control >	PPM 0.000ppm
Sound >	
Key >	Meas.

Measurement: Click the [Meas.] button to automatically measure the ambient temperature and air pressure using the total stations internal sensors.

Refraction(K)

The optional atmospheric refraction coefficients are 0, 0.14, and 0.2.

← TS Configuration	
Meas. >	Dist Mode Single measure(S) >
Display >	Reflector Default No Prism >
Unit >	PPM 0.000ppm >

0

0.14 ✓

0.2

Grid Scale

The grid factor defaults to 1 and can be determined using the scale factor and average elevation.

The screenshot shows the 'TS Configuration' menu. On the left is a list of menu items: Meas., Display, Unit, Control, Sound, and Key, each with a right-pointing arrow. On the right, the 'Altitude' is set to 0.0000m. Below that, the 'Scale' is set to 1.000000. Under a 'Result' header, the 'Grid Scale' is set to 1.000000. At the bottom of the right panel is a blue button labeled 'Default'.

Default value: Click the [Default] button to restore the average elevation, scale factor, and grid factor to their default values.

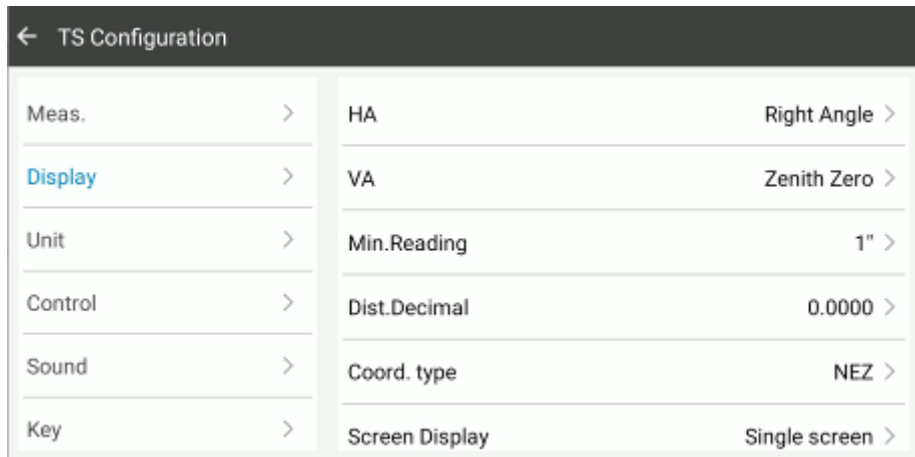
Pt Name increment

Each time a measurement point is saved, the point number increments automatically. This setting specifies the increment step for the point numbering.

The screenshot shows the 'TS Configuration' menu with a 'Step' dialog box open over the 'Pt Name Increment' setting. The dialog box has a title bar 'Step', a text input field containing the number '1', a close button (X), and 'Cancel' and 'OK' buttons at the bottom. In the background, the 'TS Configuration' menu is visible, showing settings for Dist Mode (Single measure(S)), Default No Prism, 0.000ppm, 0.14, Grid Scale (1.000000), and Pt Name Increment (1).

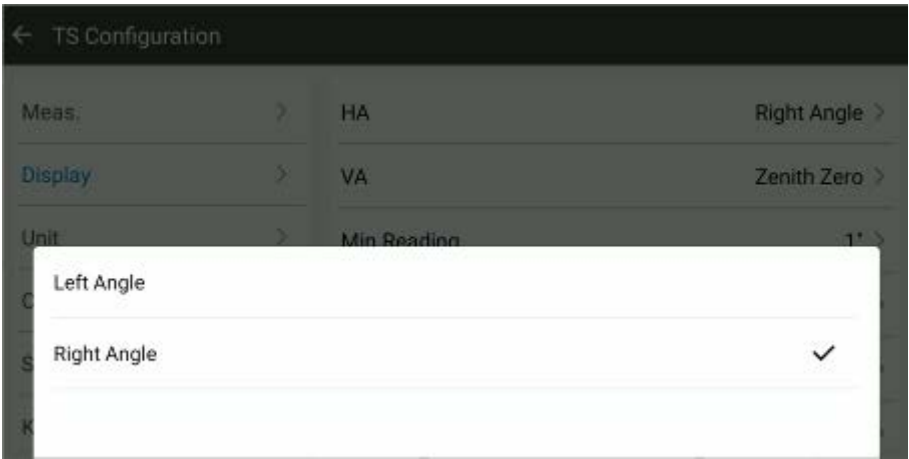
Display

Users can click [Configuration] → [TS Configuration] → [Display] to access this interface and adjust settings for horizontal angles, vertical angles, angle readings, distance readings, coordinate order, and screen display.



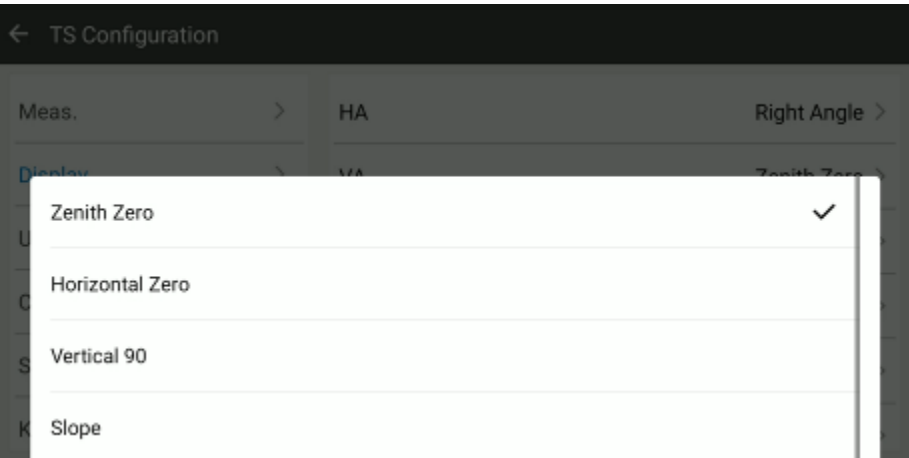
HA

Used to set the horizontal angle display format for the measurement interface.



VA

Used to set the vertical angle display mode for the measurement interface.



Min. reading

Used to set the accuracy of displaying measurement interface angles.



Dist.Decimal

Used to set the accuracy of displaying measurement interface distances.

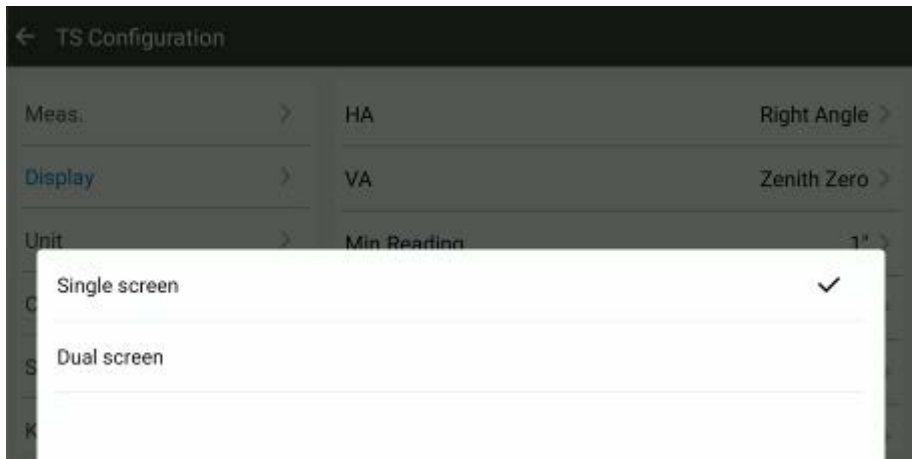


Coord. type

Used to set the NEZ display order on the interface.



screen display



"Single-screen ": The screen on one side is lit while the other screen is off.

"Dual Screen ": Both screens remain constantly lit.

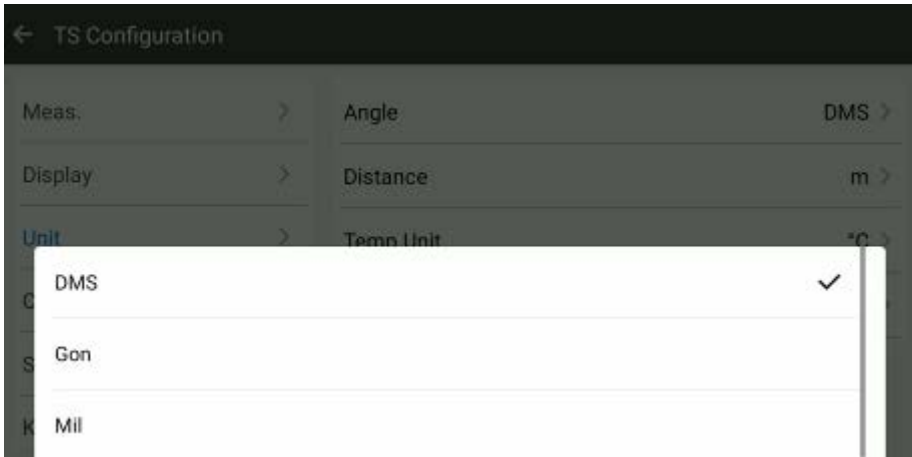
unit

Users can click [Configuration] - [TS Configuration] - [Unit] to access this interface and configure angle units, distance units, temperature units, and pressure units.



Angle

The unit used to set input fields for software angles and the displayed angle values.



Distance

Used to set input fields for software lengths and distance display units.



Temp. Unit

Used to set temperature units, primarily for atmospheric correction.



Press. unit

Used to set atmospheric pressure units, primarily for atmospheric correction.



Control

Users can click [Configuration] → [TS Configuration] → [Control] to access this interface and adjust parameters such as laser direction, signal strength, guide light, setting time, and compensation range.

laser Pointer

This option allows you to turn the laser beam on or off. When the laser is on, do not look directly at the beam with your eyes or point it at others.



Warning: Clicking this option briefly activates the ranging laser beam. Ensure the total station is not pointed at others to avoid injury.

signal Strength

Click this option to measure the range signal strength reflected from the current target in real time.

Guide lights

Click this option to turn the guide light on/off.

compensator range

Click this option to set the instrument compensators compensation range to 4' or 6'.

sound

Users can click [Configure] - [Total Station Configuration] - [Sound] to access this interface and adjust measurement alert sounds and button sounds.

Meas. Beep

When this option is enabled, the total station will emit an audible notification upon successful measurement.

keypad Beep

Enable this option to activate the button sound for the total stations physical buttons.

key

Users can click [Configuration] - [Total Station Configuration] - [Buttons] to access this interface and configure the soft keyboard and shortcut measurement keys.

soft -keypad

[Full Keyboard]: A soft keyboard appears when a number or text input field is selected.

[Text Only]: The soft keyboard appears only when a text input field is selected.

Meas. Button

The total station features a red quick-measurement button (a physical button) on its side. This setting allows you to specify whether pressing the button triggers a measurement operation or a save operation.

This configuration is not displayed when installing non-total station equipment.

image

Users can click [Configuration] - [TS Configuration] - [Image] to access this interface and configure the image function. (This feature is available only on certain supported devices.)

[Auto Take Photo]: When activated, the coordinate measurement interface records points while saving corresponding point note photos.

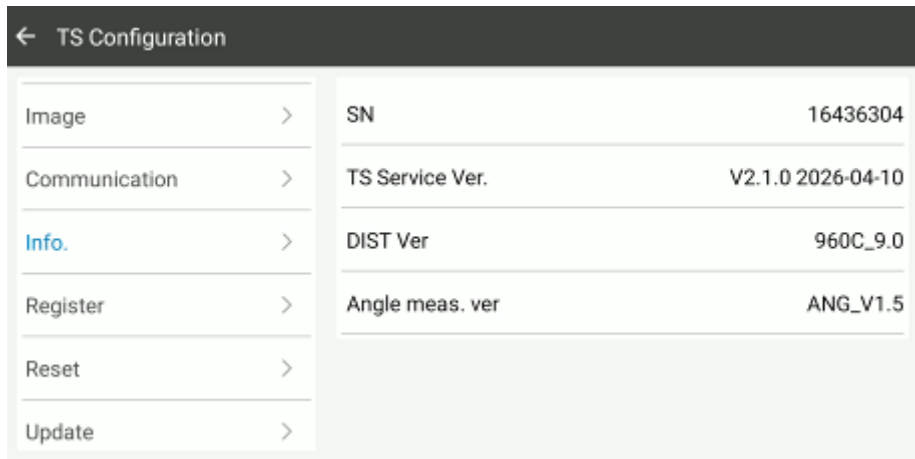
[Manually take photo and write annotation informat...]: Can be used in coordinate measurement interfaces for rough aiming at target points using images.



Note: 1. The virtual crosshair has an optimal alignment distance of approximately 100 meters. When the distance is too close, using the virtual crosshair for auxiliary aiming may result in misalignment with the actual target—a normal occurrence.
2 . The Point Note feature is not applicable to the double-sided measurement module.

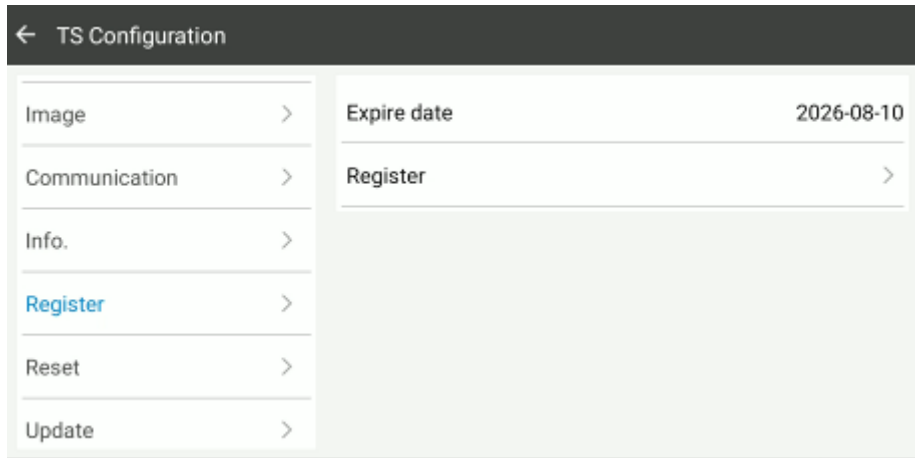
Total Station Information

Users can click [Configuration] → [TS Configuration] → [Info.] to view the total station details, which include the model, serial number, service version, ranging and angle measurement modules, motor, STR firmware, STR system, radio firmware, horizontal electronic adjustment, and vertical electronic adjustment version.



register

Users can click [Configure] - [TS Configuration] - [Register] to check the expiration date of the total station.



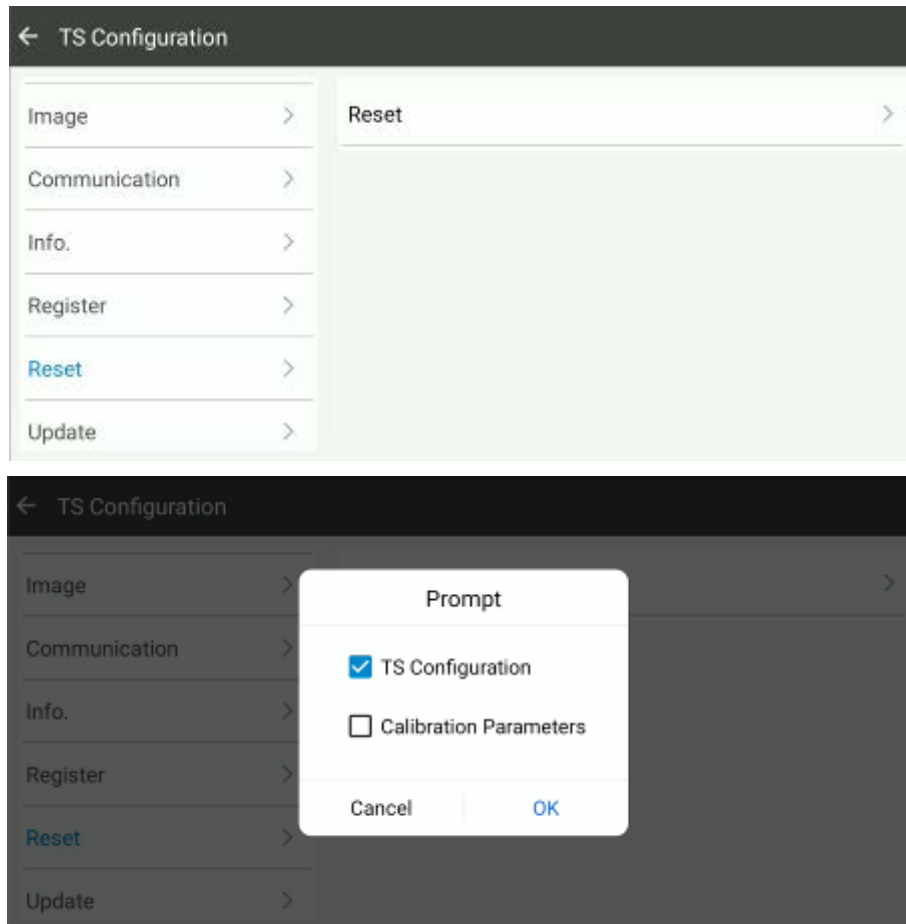
Click the [Register] button to enter the registration code and register the total station.

reset

You can select "Total Configuration" or "Calibration Parameters" to reset. resetting "TS Configuration" restores the default configuration, while resetting "Calibration Parameters" restores the factory calibration parameters.

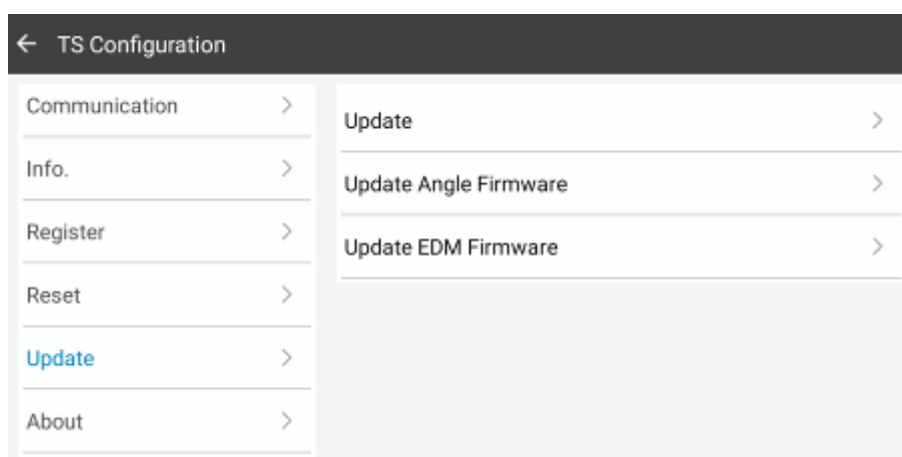


Note: Correction parameters affect measurement accuracy. Before resetting them, consult your after-sales service provider or technical hotline.



update

Selecting this option displays total station services, update information for the T-Survey software, and allows manual updates to the total stations angle and distance measurement firmware.



When connected to the network, click "Check Update." If a new version of the software is detected on the server, the system will display a pop-up window based on the server information.

When manually updating the angle and distance measurement firmware of the total station, select the corresponding button, choose the file to upgrade, and click "OK".

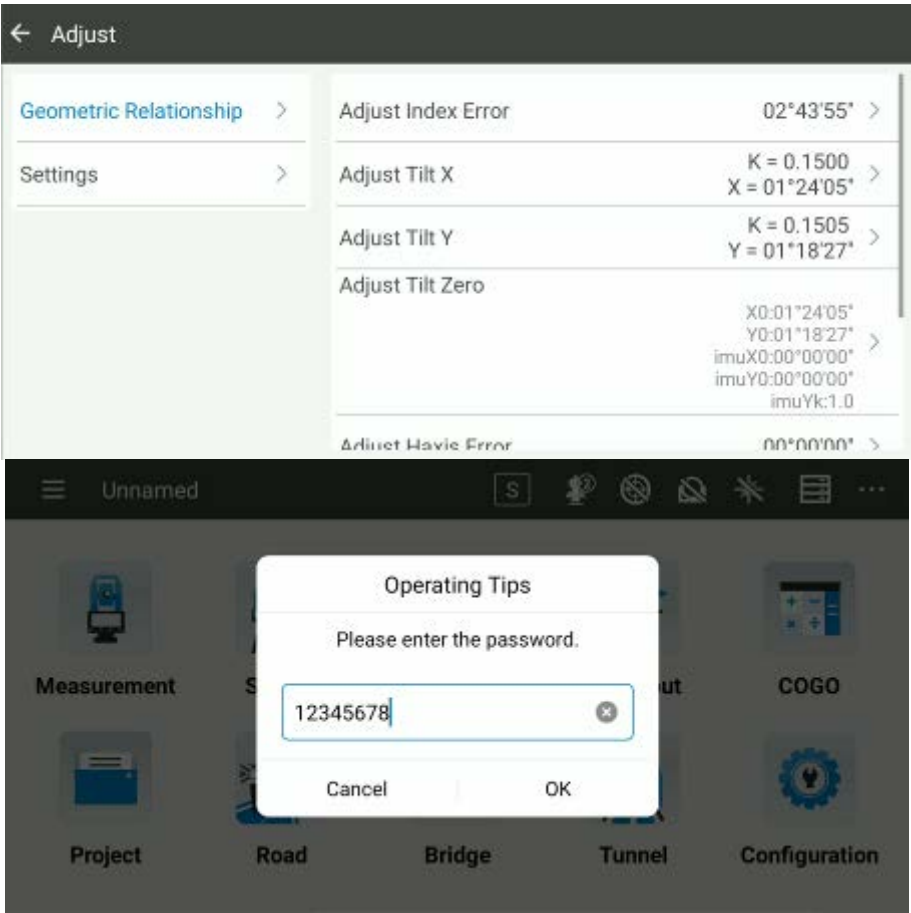
about

Show the software version information.



Total Station Adjust

Total station adjust is generally used to adjust various parameters of the total station. Before calibration, enter the password: 12345678.

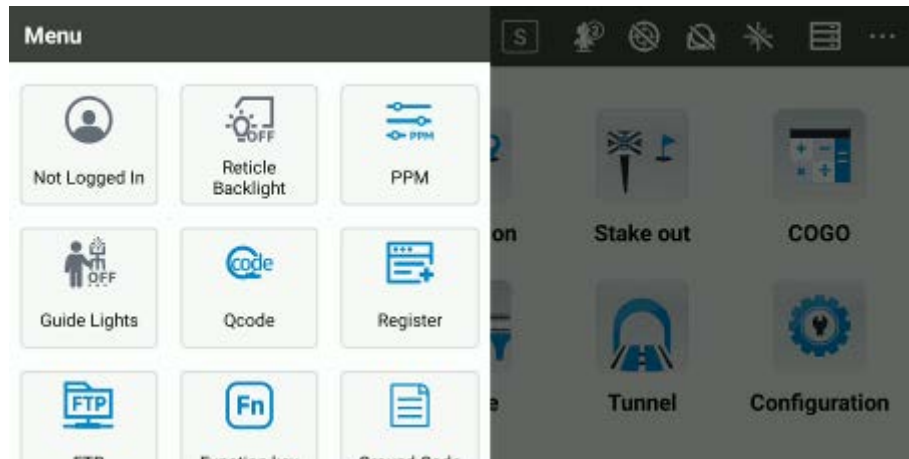


shortcut menu

This chapter introduces:

- Not Logged In
- Reticle Backlight
- Guide Lights
- QCode
- Register
- FTP
- Function key
- Export Logs

The shortcut menu can be opened by clicking the top bar, which is the left swipe bar. The full configuration is displayed when installed on a total station, while only partial configurations appear on other Android devices. 



Not Logged In

Used to log in to the collaborative workspace for data sharing.

Recticle backlight

Set the partition lighting level for aiming during nighttime measurements.

Guidelight

Set the direction light on/off.

QCode

Set a shortcut key for legend code.

Register

Enter the total station registration interface.

FTP

Enter the total station FTP transfer configuration interface.

Function Key

These parameters are used to configure the shortcut navigation settings for the total stations physical buttons, as shown in the figure below.

Export LogS

Go to the total station log export interface, click "OK" to export the log with one click, and it will be saved by default in the root directory ZHD/Out.

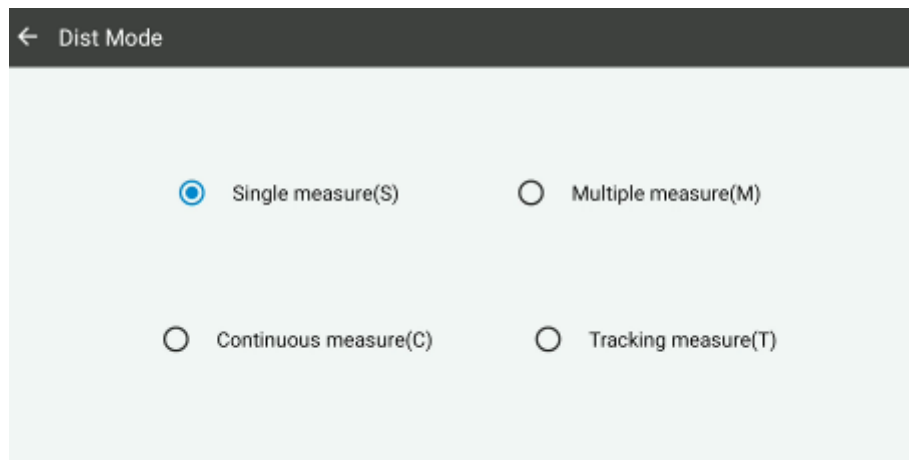
Top Quick Access

This chapter introduces:

- Dist Mode
- Compensator
- Reflection target template
- laser alignment
- Point Data
- more

Dist Mode

Click the top bar to set the ranging mode. The available modes are as follows. 



Compensator

Click the top bar to compensate for angular reading errors caused by the instruments vertical axis tilting in the X and Y directions. The software supports the following compensation settings: enable XY dual-axis compensation, enable X-axis single-compensation, or disable compensation entirely. 

Users can choose whether to enable tilt compensation based on their specific usage scenarios. To ensure accurate angle measurements, it is generally recommended to use a tilt sensor, whose display also facilitates better leveling of the instrument. If "compensation exceeded" occurs, it indicates that the instrument has surpassed the automatic compensation range and requires adjustment using the foot screw for leveling.

Reflection target template

Click the top bar to switch the reflector type to prism, prism-free, or reflective sheet. When selecting a prism reflector, you can set the prism constant. 

laser alignment

Click the top bar to turn on or off the objective lens alignment laser. 

Point Data

Click the top bar to access the point library, where you can view measurement points, layout points, control points, and traverse points. 

more

Click the top bar to expand the configuration options, as shown below. 

Inspection and Correction

This chapter introduces:

- Leveling tube
- circular level
- Telescope reticle
- Perpendicularity between the sight axis and the horizontal axis
- Automatic zero-point compensation for vertical disk indicators
- Poor vertical chart indicators and zero point settings for vertical charts
- To the Chinese Instrument
- Instrument plus constant (K)
- Parallelism between the sight axis and the electro-optical emission axis
- Non-prism ranging

Leveling tube

- **checkout**

For details, refer to the section "Using a Pipe Level to Precisely Level Instruments" in this book.

- **check**

1. During inspection, if the bubble on the tube level deviates from the center, first adjust using the foot screw parallel to the tube level to move the bubble toward the center by half of the deviation. For the remaining half, adjust by turning the leveling screw (located 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 bubble is centered. If the bubble remains off-center, repeat Step 1 until the bubble is centered.

3. Rotate the instrument 90° and use the third foot screw to center the bubble.

- Repeat the inspection and adjustment steps until the bubble is centered in any direction when the alignment section is rotated.

circular level

- **checkout**

After calibrating the horizontal level, no further adjustment is required if the bubble in the circular level is also centered.

- **check**

If the bubble is not centered, use a correction needle or an internal hex wrench to adjust the correction screw below the bubble until it is centered. During adjustment, first loosen the correction screws (1 or 2) opposite the direction of bubble displacement, then tighten the remaining screws in that direction to center the bubble. When the bubble is centered, the tightening force applied to all three correction screws should be consistent.

Telescope reticle

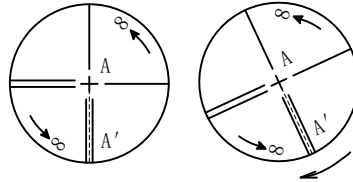
- **checkout**

1. After leveling the instrument, select a target point A along the telescopes line of sight. Align the crosshair center on the reticle with point A, then secure the horizontal and vertical adjustment handwheels.

2. Turn the vertical micro-adjustment wheel of the telescope to move point A to the edge of

the field of view (point A').

3. If point A moves along the vertical thread of the crosshair—meaning point A' remains within the vertical thread, as shown in the left figure—the crosshair remains level and requires no adjustment. If point A' deviates from the center of the vertical thread, as shown in the right figure, the crosshair becomes tilted and the micrometer plate must be adjusted.



graph 17-1

- check

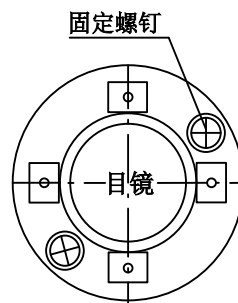
1. First, remove the cover of the reticle base located between the telescope eyepiece and the focus knob; you will then see the four reticle bases securely fixed in place.

Screw (see attached drawing).

2. Use a screwdriver to evenly loosen the three fixing screws, then rotate the indexing plate base around the alignment axis until point A' aligns with the vertical thread position.

3. Tighten the fixing screws evenly, then verify the calibration results using the aforementioned method.

4. Install the protective cover back in its original position.



graph 17-2

Perpendicularity between the optical axis and the horizontal axis

- checkout

1. Position Target A approximately 100 meters away from the instrument, ensuring the vertical angle of the target is within $\pm 3^\circ$. Precisely level the instrument and turn on the power supply.

2. At the left side of the field, align the telescope with target A and

measure the horizontal angle.

Example: Horizontal angle $L = 10^{\circ} \ 13' \ 10''$

3. Release the vertical and horizontal stop wheels, rotate the telescope, and turn the sight dial to aim at the same target A. Before aiming, tighten the horizontal and vertical stop wheels and measure the horizontal angle.

Example: Horizontal angle $R = 190^{\circ} \ 13' \ 40''$

4. $2C = L - (R \pm 180^{\circ}) = -30'' \pm 20''$; correction is required.

- **check**

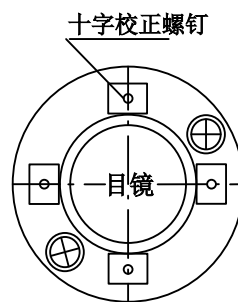
1. Use the horizontal micrometer handwheel to adjust the horizontal angle reading to the correct value after eliminating C:

$$R + C = 190^{\circ} \ 13' \ 40'' - 15'' = 190^{\circ} \ 13' \ 25'' .$$

2. Remove the protective cover of the reticle base located between the telescope eyepiece and the focus knob. Adjust the two horizontal crosshair adjustment screws on the reticle—loosen one screw first, then tighten the other. Move the reticle until the crosshair center aligns with target A.

3. Repeat the inspection steps until the correction meets the requirement: $|2C| < 10''$.

4. Tighten the adjustment screws and install the cover back in its original position.



graph 17-3

Note: After calibration, check the photoelectric coaxiality.

Automatic zero-point compensation for the vertical axis indicator

- **checkout**

1. After positioning and leveling the instrument, align the telescopes orientation and instrument center with the line connecting any two spiral X points, then tighten the horizontal adjustment handwheel.

2. After powering on, ensure the vertical indicator returns to zero; tighten the vertical locking wheel, and the instrument will display the current vertical angle value pointed by the telescope.

3. When slowly rotating the foot screw in one direction until the circumferential distance reaches approximately 10 mm, the displayed vertical angle will gradually change until the "Compensation Exceeds!" message appears, indicating that the instruments vertical axis tilt has exceeded 3', surpassing the design range of the vertical compensator. Upon rotating the foot screw in the opposite direction to restore the original position, the instrument will regain its vertical alignment. Repeated testing at the critical position will demonstrate consistent behavior, confirming normal operation of the vertical compensator.

- **check**

If the instruments compensation fails or exhibits abnormalities, it should be sent to the manufacturer for maintenance.

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

- **checkout**

1. After positioning and leveling the instrument, turn it on and aim the telescope at any clear target A to obtain the left reading L on the vertical angle dial.

2. Turn the telescope and its sight mechanism, then align with the right reading R on the vertical angle dial labeled A.

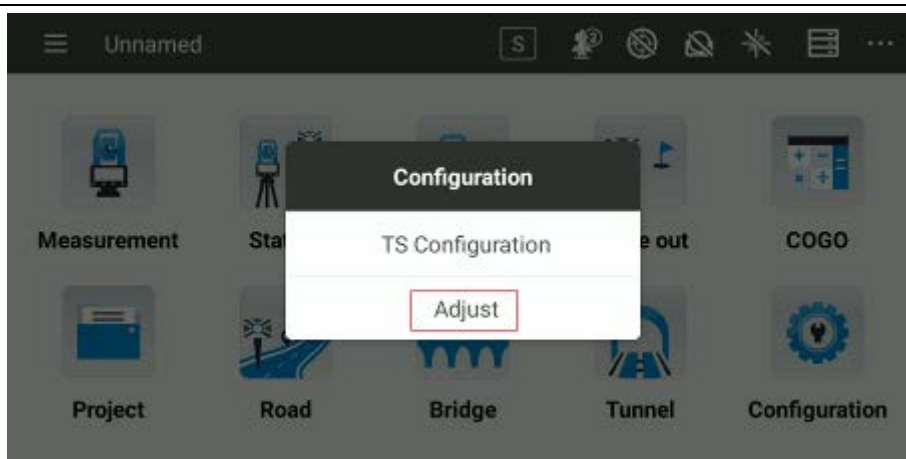
3. If the vertical angle of the zenith is 0° , then $i = (L + R - 360^\circ)/2$; if the vertical angle of the horizon is 0° .

Then $i = (L + R - 180^\circ)/2$ or $(L + R - 540^\circ)/2$.

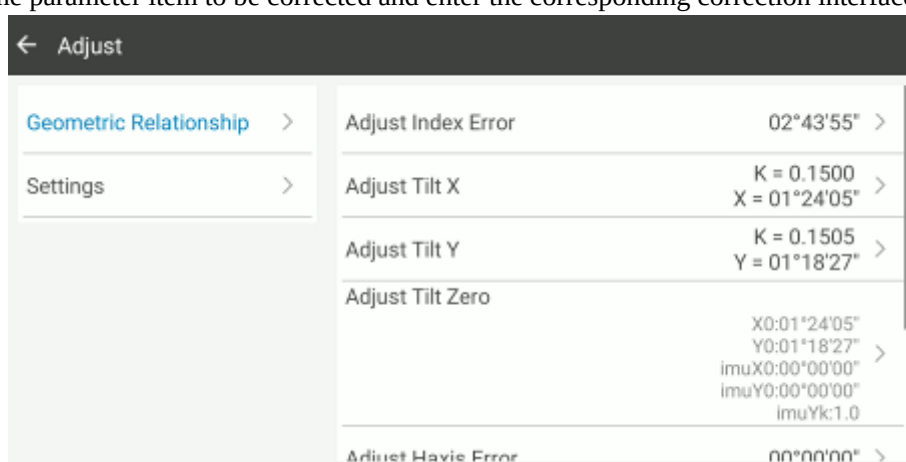
4. If $|i| \geq 10''$, the zero point of the vertical dial indicator must be reset.

5. The operating procedure is as follows:

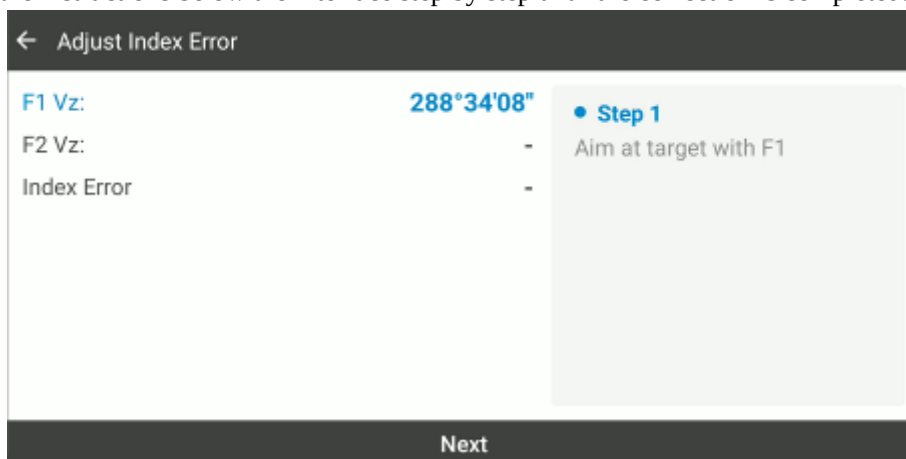
1) Install the total station on the calibration table, center and level it, then click "Adjust" and enter the password: 12345678 to access the calibration interface.



2) Select the parameter item to be corrected and enter the corresponding correction interface:



3) Follow the instructions below the interface step by step until the correction is completed:



Note: 1. Repeat the testing procedure to re-measure the index difference (angle i). If the difference still fails to meet requirements, verify the accuracy of the zero-point calibration steps (the vertical angle displayed during calibration is an uncompensated value for reference only) and the precision of the target alignment, then reconfigure the parameters as specified.

6. If the device still fails to meet requirements after repeated operations,

it should be sent to the factory for maintenance.

Central Device

- **checkout**

1. Mount the instrument on a tripod, draw a cross on a white sheet of paper, and place it directly beneath the instrument on the ground.

2. After adjusting the focal length of the centering device (for an optical centering device) or activating the laser centering device, move the white paper so that the crosshair aligns with the center of the field of view (or the laser spot).

3. Turn the foot screw until the center mark of the alignment device aligns with the cross intersection point.

4. Rotate the aiming mechanism by 90° each time, and observe the alignment accuracy between the central mark at the center point and the intersection point of the crosshair.

5. If the center mark of the optical centering device remains aligned with the cross intersection point throughout the rotation of the alignment unit, no correction is required. Otherwise, correction should be performed according to the following method.

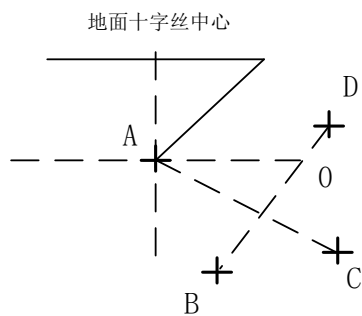
- **check**

1. Remove the protective cover of the adjustment screw between the optical centering eyepiece and the focus adjustment handwheel.

2. Secure the cross-shaped white paper and mark on it the positions where the center marker of the alignment device falls when the instrument rotates 90° , as indicated by points A, B, C, and D in the figure.

3. Connect the diagonal points A C and B D with straight lines; the intersection point of these two lines is O.

4. Use the alignment needle to adjust the four calibration screws of the centering device until the central mark aligns with point O.



graph 17-6

5. Repeat Step 4 to verify that the correction meets the requirements.
6. For laser point alignment, unscrew the laser cover and use a No.1 hex key to adjust the three screws by tightening and loosening alternately until the laser spot is precisely aligned at the zero point.
7. Install the protective cover back in its original position.

Instrument constant (K)

The instrument constants were verified upon factory delivery and internally calibrated to ensure $K=0$. Although the instrument constants remain largely stable, we recommend performing this verification once or twice annually. The inspection should be conducted on the standard baseline or alternatively using the simplified method described below.

- **checkout**

1. Select a flat area, position and level the instrument at point A. Using vertical lines, carefully mark points A and B, as well as points B and C, on the ground in a straight line at intervals of approximately 50 meters, and accurately center the reflective prism on the ground.

2. After configuring the temperature and air pressure data on the instrument, the horizontal distances of AB and AC were accurately measured.

3. Install the instrument at point B and center it accurately to measure the horizontal distance BC precisely.

4. The instruments ranging constant can be determined:

$$K = AC - (AB + BC)$$

K should be close to zero; if $|K| > 5 \text{ mm}$, the sample should be submitted to the standard baseline field for rigorous testing, followed by correction based on the test results.

- **check**

Strict verification confirms that the instrument constant K has deviated from zero. If calibration is required, set the instrument according to the updated constant value K. For example: if the measured K value using the above method is -5, and the original instrument constant was -20, the new value to be set is $-20 - (-5) = -15$.

- Use the vertical wire of the instrument for orientation, ensuring that points A, B, and C lie strictly on the same straight line. The ground at point B must have a sturdy and clearly visible reference mark.

- The alignment of the prism center at point B with the instrument center is critical for ensuring measurement accuracy. Therefore, it is advisable to use a tripod and a universal base at point B. When replacing the three-claw prism connector and its base, keep the tripod and base stationary while replacing only the prism and the upper portion of the instrument base to minimize misalignment errors.

Parallelism between the optical axis and the electro-optical emission axis

- checkout

1. Place the reflective prism 50 meters away from the instrument.
2. Use the telescopes crosshair to precisely align with the center of the reflective prism.
3. Check whether the center of the telescopes crosshair aligns with the optical axis alignment center; if they are essentially aligned, the instrument is considered qualified.

- check

If there is a significant deviation between the center of the telescopes crosshair and the center of the electro-optical axis, the device must be sent to a specialized repair facility for calibration.

Non-prism ranging

The red laser beam, coaxial with the telescope and used for non-prism ranging, is emitted by the telescope. If the instrument is properly calibrated, the red laser beam will coincide with the line of sight. External factors such as vibration or significant temperature fluctuations may cause the laser beam to deviate from the line of sight.

● Before performing precise ranging, verify that the laser beams alignment is coaxial; any deviation may result in inaccurate measurements.

warn :

Direct exposure to laser radiation is generally hazardous.

prevent :

Do not look directly at the laser beam or aim it at others. Measurement results may also be obtained through reflected light from the human body.

- **check up :**

Align the gray side of the reflective plate toward the instrument and position it at 5 meters and 20 meters away. activate the laser targeting function. Use the telescopes crosshair center to aim at the center of the reflective plate, then observe the position of the red laser spot. Typically, telescopes are equipped with special filters that make the laser spot invisible to the naked eye; therefore, measure the deviation between the red laser spot and the crosshair center from above the telescope or along the side of the reflective plate. If the laser center coincides with the crosshair center, the adjustment has reached the required precision. If the spot deviates beyond the specified limit from the crosshair mark, the instrument should be sent to a professional maintenance department for adjustment.

● If the laser spot illuminates the reflective surface excessively brightly, use a white surface instead of a gray surface for inspection.

Appendix A: Symbol meanings

The meaning of symbols is illustrated by the following example.

Vz Azimut distance mode

V0 Vertical angle display mode where the telescopes horizontal position is set to 0 during normal viewing

Vh Vertical angle mode (0 for horizontal, positive for upward, negative for downward)

V% Slope Pattern

HR Horizontal Angle (Right Angle)

HL Horizontal Angle (Left Angle)

HD horizon range

VD Elevation Difference

SD slant-range

N Northern coordinate: dN represents the layout N coordinate difference.

E The eastern coordinate, dE, represents the E-coordinate deviation in layout.

Z Elevation coordinate: dZ represents the Z coordinate difference in layout.

m In meters

ft In feet

fi In feet and inches, the fraction before the decimal point is the foot, and the fraction after the decimal point is one percent of an inch.

X In point projection measurement, the numerical value along the baseline direction is positive from the starting point to the ending point.

Y The numerical value of the vertical deviation from the baseline direction in point projection measurement

Z The height of the target in point cloud measurement