ALPHA Y SERIES TOTAL STATION

User Manual(Ver1.0e)

How to read this manual

Symbol

 : Indicates the precautions and important contents that should be read before operating.

 : Indicates the name of the chapter to be read by reference.

 : Indicates a supplementary note.

 : A description that represents a particular term or operation.

: Indicates the keys on the operating keyboard of this instrument.

[ENT] etc.

: Indicates the software content displayed.

(Program)etc.

: Indicates the name of the screen tip.

<Program menu>etc.

Models

This manual is applicable to ALPHA Y series total station produced and sold by ALPHA Co., Ltd.

General precautions

Before using this instrument, it is important to check and confirm that all functions of the instrument are working properly.

Do not aim the instrument directly at the sun

Pointing the instrument directly at the sun can seriously injure the eyes. If the objective lens of the instrument is aimed directly at the sun, the instrument will also be damaged.

Set the instrument on a tripod

When setting up the instrument, use a wooden tripod if possible. The vibrations that may be caused when using a metal tripod can affect the measurement accuracy.

Install the tribrach

If the tribrach is not installed correctly, the measurement accuracy will also be affected. Always check the adjustment screw on the tribrach and make sure that the screw of the tribrach connecting to alidade is locked. The center fixation on the tribrach is screwed down.

Protect the instrument from vibration

When moving the instrument, it should be properly protected so that the impact of vibration on the instrument is minimal.

Tip pf the lifting the instrument

When lifting the instrument, be sure to grasp the handle of the instrument.

High temperature environment

Do not leave the instrument in a high-temperature environment for too long, otherwise this will affect the performance of the instrument.

Sudden changes in temperature

A sudden change in the temperature of the instrument or prism can cause a shortening of the range, like when the instrument is removed from a hot car, and the instrument should be left for a period of time to adapt to the ambient temperature before starting the measurement.

Battery check

Check the remaining battery capacity before working

Remove the battery

It is recommended not to remove the battery when the instrument is turned on. Otherwise, all stored data may be lost. Therefore, please install and remove the battery after the instrument is turned off.

Responsibility for in-memory data

ALPHA is not responsible for the loss of memory data caused by accidents.

Sound inside the instrument

When the EDM part of the instrument is working, the sound of the motor inside the instrument may be heard, which is a normal phenomenon and will not affect the operation of the instrument.

Safe Use Signs

To ensure safe operation and avoid personal injury or property damage, this manual uses "Warning" and "Caution" to indicate the terms to be followed. Before reading the main content of this manual, please understand the meaning of these tips.

Warning : Ignoring this tip and incorrect operation may result in serious injury or death of the operator.

Caution : Ignoring this tip and incorrect operation may result in injury to the operator or property damage.

Precautions for safe use

Warning

- If the instrument is disassembled or repaired without authorization, there is a risk of fire, electric shock, or damage to objects.

  Disassembly and repair can only be carried out by ALPHA and authorized dealers.
- It can cause damage to the eyes or blindness.

  Do not look at the sun with the instrument's telescope.
- High temperatures may cause fire.

  Do not cover the charger while charging.
- Risk of fire or electric shock.

  Do not use bad power cables, plugs, and outlets.
- Risk of fire or electric shock.

  Do not use wet batteries or chargers.
- Explosions may occur.

  Do not use the instrument close to burning gas and liquid, and do not use non-explosion-proof total stations in coal mines.
- The battery may cause an explosion or injury.

  Do not leave the battery in a fire or high temperature environment.
- Risk of fire or electric shock.

  Do not use chargers that are not specified by the manufacturer.
- Risk of fire.

  Do not use a power cable that is not specified by the manufacturer.
- A short circuit in the battery may cause a fire.
- Avoid short circuit when storing the battery.

Caution

- Do not disassemble and assemble the instrument with wet hands, otherwise there will be a risk of electric shock.
- Flipping the instrument case may damage the instrument. Do not stand or sit on the instrument case.
- Please note that the toes of the tripod may be dangerous, so be careful when erecting or transporting it.
- Falling the instrument or instrument case may damage the instrument. Do not use a case with broken straps, buckles, or hinges.
- Do not touch your skin or clothing with acids flowing out of the battery, if you accidentally touch it, please wash it with plenty of water and carry out medical treatment.
- Be sure to install the tribrach correctly, otherwise, if the tribrach falls, it will cause injury.
- If the instrument is dropped, it will cause serious consequences. Please check that the instrument is properly attached to the tripod.
- Falling tripods and instruments can have serious consequences. Please check that the spiral on the tripod is tightened.
- When packing, the clamp locked may damage the instrument. When packing, check whether the clamp has been loosened.

User

1） The product should only be used by professionals.
The user must have a sufficient level of measurement personnel or knowledge of measurement in order to understand the user manual and safety instructions before using, inspecting, and calibrating the instrument.

Disclaimer

1) The user of this product should use it in full accordance with the instruction manual and regularly check the performance of the instrument.

2) The factory and the representative office shall not be liable for any direct or indirect consequences and loss of profits caused by destructive or intentional improper use.

3) The factory and its representative office shall not be liable for any direct or indirect consequences and loss of profits caused by natural disasters (such as earthquakes, storms, floods, etc.), fires, accidents or third parties.

4) The factory and the representative office shall not be liable for the non-working of the

product due to the change, loss, and interference of the data.
5) The factory and the representative office shall not be liable for the consequences and loss of profits caused by the failure to operate in accordance with this instruction manual.
6) The factory and the representative office shall not be liable for the consequences and loss of profits caused by improper handling or connection with other products.

Safety standard for laser beam(ranging)

This series of total stations use a visible laser. This series of total stations is based on the "Performance Standards for Luminescent Products"（FD. BRH21CFR1060) and "Radiation Safety, Equipment Ratings, Requirements and User Guidelines for Laser Products" (IEC60825-1) which provide laser beam safety standards to manufacture and sell.
According to the above standards, this series of products are "Class I laser products" in prism or reflector mode, and "Class III laser products" only when in reflectorless ranging mode.
Once the instrument fails, do not disassemble the instrument by yourself. Please contact ALPHA or dealer.

Safety standard for laser beam(laser plummet)

This series of total stations use laser plummets which adopt visible laser. This series of total stations' laser plummets are based on the "Performance Standards for Luminescent Products" (FD. BRH21CFR1040) and "Radiation Safety, Equipment Ratings, Requirements and User Guidelines for Laser Products" (IEC60825-1) which provide laser beam safety standards to manufacture and sell.

According to the above standards, this series of products are "Class II laser product".

Once the instrument fails, do not disassemble the instrument by yourself. Please contact ALPHA or dealer.

Sign

The following signs on this series of instruments remind users to pay attention to the safety of the laser beam.

⚠Warning

Precautions for safe use of laser

● Follow the safety tips on the instructions or labels on the instrument to ensure safe use of this product.

● It is strictly forbidden to irradiate the laser beam into the eyes of others, otherwise it will cause serious injury.

● It is forbidden to look directly at the laser beam emitter to avoid permanent damage to the eyes.

● Do not stare at the laser beam to avoid permanent damage to the eyes.

● It is strictly forbidden to use optical instruments such as telescopes to view the laser beam, otherwise it will cause permanent damage to the eyes.

Content

Nomenclature

1 Keys description

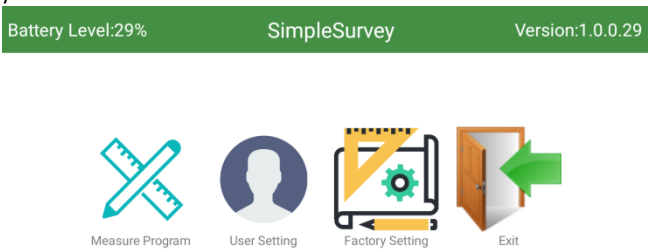
1.1 Panel keys

Key	Name	Function
⏻	Power	Controls the power on/off of the instrument
0-9	Digit	When entering a number, input the number corresponding to the key
-	Minus sign	Input minus sign
.	Dot key	Input dot/decimal point
★	Star key	Directly enter user settings page
BS	Backspace /Delete	Cursor backspace/Delete the last input character

2 Battery Usage

2.1 Battery capacity

Percentage of battery capacity is used to indicate the remaining battery capacity.



100%
↓
30% Measurement is available

↓

20% battery capacity is insufficient, please charge or replace battery.

↓

10% Measurement is unavailable, please charge or replace battery immediately

hint：

- The length of battery operation depends on many factors, such as the temperature around the instrument, the length of charging time, and the number of times it is charged and discharged. Just in case, it is advisable to charge the battery or prepare a number of fully charged spare batteries.
- The battery percentage indicates the battery level in the current measurement mode. The battery level displayed in the angle measurement mode is not suitable for distance measurement. Since the power consumption of ranging is greater than that of angle measurement, when the angle measurement mode is changed to the distance measurement mode, the operation of the instrument may be interrupted due to low battery power.
- When the observation mode is changed, the battery percentage icon may not immediately show a decrease or increase in battery level. The battery percentage indicator system is used to show the overall condition of the battery level, it does not reflect the instantaneous change in battery level.
- It is recommended to check the power status of the random battery and spare battery before setting off for field measurement.

2.2 Battery replacement

Note：

- The battery should be removed when the instrument is not in use.
- Be sure to turn off the power before removing the instrument.
- Before installing or removing the battery, please pay attention to prevent water droplets or dust from entering the main unit.
- Regularly wipe the host power contacts with a cleaning cloth to ensure the cleanliness of the contacts.

▶ Steps

1) Insert the guide block at the bottom of the battery into the battery guide hole on the instrument;

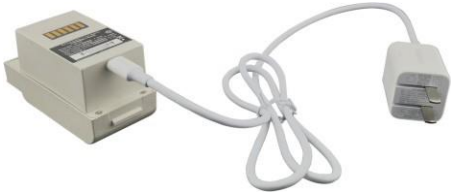
2) Tap inward on the top of the battery until you hear a click.

▶ Remove the battery

1) Press and hold the button on the battery and press down on the unlock button.

2) Remove the battery outward.

2.3 Charge the battery



As shown in the figure above, connect the charger to the battery, then connect the charger adapter plug to the 220V AC power supply, the blue indicator on the battery flashes, indicating that it is charging, and after 6~8 hours, the blue indicator lights are always on, indicating that the charging is complete.

Hint:

- A new battery (or a battery that has not been used in months) needs to go through several charging and discharging processes to achieve optimal performance, please

charge it for at least 3 hours.

● If the battery needs to be charged to its maximum capacity, it is recommended to continue charging it about 30 minutes after the blue light is on.

● Indicator Status: Flashing blue light -- Charging; Solid blue light -- Charging completed.

● If the battery does not flash or glow blue after being plugged in, please remove the charger from the AC power source and wait a while before reconnecting it to the AC power source.

3 Preparation for measurement

3.1 Center

▶Steps

Place the tripod

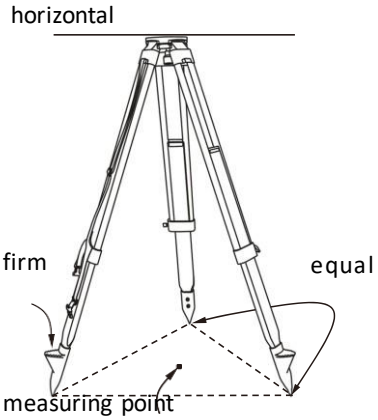
Make the tripod legs equal in length, the tripod head is on the measuring point and approximately horizontal, and the tripod legs are firmly supported on the ground.

Set up the instrument

Place the instrument on the head of the tripod, hold the instrument with one hand, and tighten the central screw with the other.

The position of the measuring point and the laser point

By turning on the laser plummet, observe its position with the measuring point, and adjust the relative position appropriately.



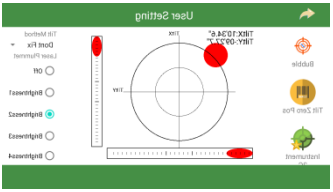
3.2 Level up the instrument using laser plummet

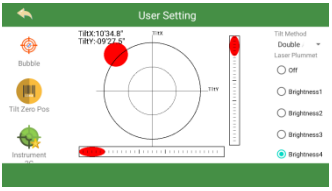
▶Steps

1)Power on

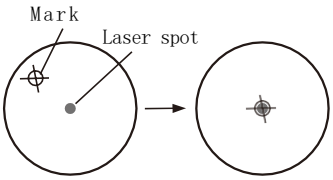
2)Press [★] to enter user settings

3)When the laser plummet on the right side is displayed as "off", it means that the laser is off, the brightness of 1~4 means that the laser is on, and the larger the number, the brighter the laser



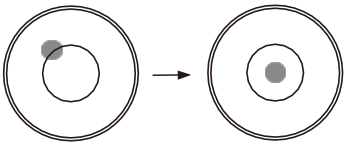


4) Adjust the laser plummet of the instrument so that it coincides with the ground mark



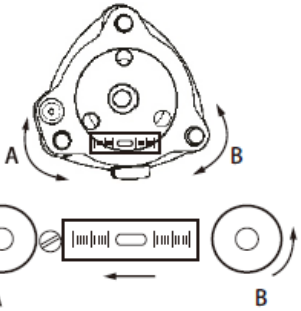
5) Center the circular level

Repeat this by shortening the tripod leg closest to the bubble, or extending the tripod leg furthest from the bubble so that the bubble is centered.



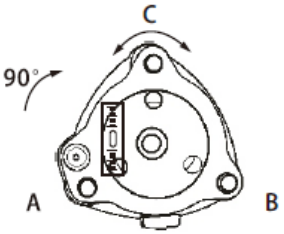
6) Center the plate level

Release the horizontal lock drive, rotate the alidade so that the plate level is parallel to the line of the footscrews A and B, and rotate the footscrews A and B to center the bubble, the bubble moves in the direction of the footscrew that rotates clockwise.



7) Rotate 90° to center the bubble

Rotate the alidade 90° so that the level axis is perpendicular to the line of footscrews A and B, and rotate the footscrew C to center the bubble.



8) Re-rotate 90° to check the bubble

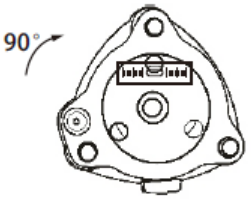
Rotate the alidade 90° again and check if the bubble is centered, if not, follow the steps below:

(1) Rotate the footscrews A and B in the opposite direction by the same amount,

so that the bubble moves half of the offset towards the center.

(2) Rotate the alidade 90° and rotate the footscew.

(3) Move the bubble towards the center by half of the offset.



Hint：

- If none of the above steps can center the bubble, please correct the plate level.

☞refer to chapter “7.2 Plate Level and Circular Level”

9) Check that the bubble is in the same position in any direction

Check that the bubble is in the same position in any direction, and if not, repeat the above steps for leveling.

10) Align the instrument with the measuring point

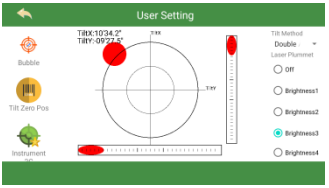
Loosen the center screw slightly, observe through the laser plummet, and carefully slide the instrument over the tripod head until the measuring point coincides with the laser point and tighten the center screw.

11) Check again to make sure that the bubble of the alidade is centered, if not, repeat steps after step (7).

3.3 Level up the instrument relying on the screen

▶Steps

1） Power on

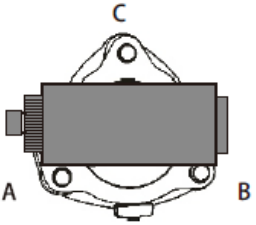


2） Press [★] to enter user settings

3） Electronic level displays

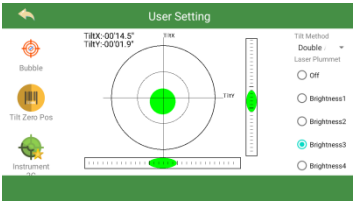
" ●" is the circular bubble of electronic level, the tilt range for inner and outer circles are respectively ±3′and ±6′. The tilt angles of X，Y directions are also displayed on the screen.

4） Center the bubble



☞Refer to steps 5）and 6）in chapter "3.2 levelup"

5） Turn the alidade of the instrument so that the telescope is parallel to the line of footscews A and B, and then tighten the horizontal lock drive.



6） Rotate the footscews A and B to make the tilt angle value of X direction "0", and rotate the footscrew C to make the tilt angle value of Y direction "0".

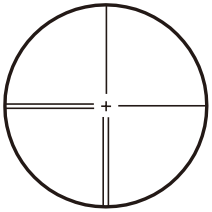
7） Press [ESC] to end.

3.4 Focus and collimate

▶Steps

1）Eyepiece focus

Use a telescope to look at a bright background. Rotate the eyepiece clockwise all the way down, and then slowly rotate it counterclockwise until the crosshair image is the clearest.



2）Collimate the target

Release the vertical and horizontal lock drives, aim the target with the optical sight and bring it into the field of view, and tighten two lock drives.

3）Objective focus

Rotate the telescope focusing ring until the target image is the clearest. Vertical and horizontal tangent screws are used to precisely align the crosshairs with the target. The final direction of rotation of the tangent screws should be clockwise.

4）Focus again till no parallax

Focus again until there is no parallax between the target image and the crosshairs.

Note：

- When observe changing the face position, use the crosshairs to collimate the target at the same position.

Parallax

When the observer's eyes move slightly in front of the eyepiece, the alignment error caused by the relative displacement between the target image and the crosshairs is called parallax.

Parallax can cause errors in the observation readings and should be eliminated before observation. Parallax can be eliminated with correct focusing.

4 User setting

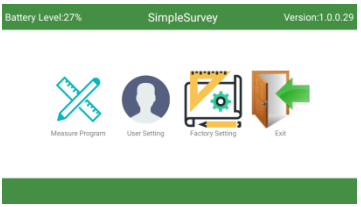
On this interface, you can set some functions commonly used by users.

▶Steps

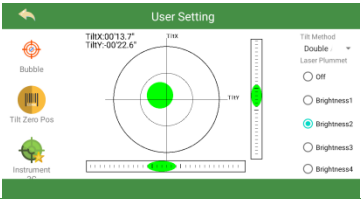
4.1 Enter user setting

1) Power on

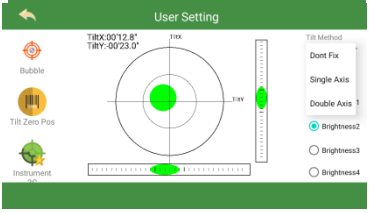
2) After the instrument automatically enters the SimpleSurvey interface, click the "User Setting" icon on the screen, or press the [★] button on any interface to enter the user setting interface



3) The electronic level is displayed on the screen, click the buttons under "Laser Plummet" on the right to turn on or off the plummet laser and adjust the brightness of the laser spot.

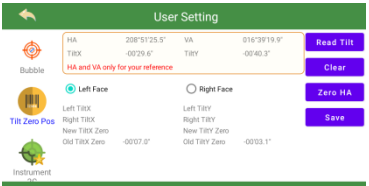


4) Click the [▼] button under "Tilt Method" on the upper right side to turn off or turn on the single-axis/dual-axis compensator.

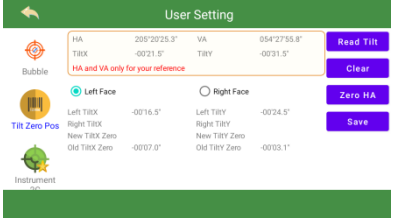


4.2 Correct the zero position of compensator

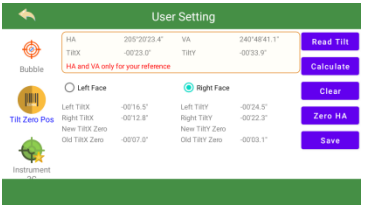
After the instrument enters the user setting interface, click the "Tilt Zero Pos" icon on the left side of the screen, and the instrument enters the tilt zero position correction interface



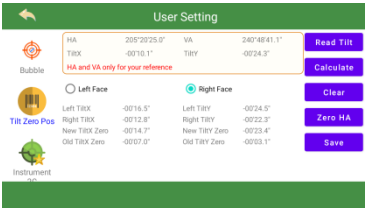
After collimating the reference point at face left, click the "left face" on the screen, and then click the "Read Tilt" button on the right side.



After the instrument is rotated 180 degrees, collimate the reference point at face right, and then click the "right face" on the screen, and then click the "Read Tilt" button on the right side of the screen



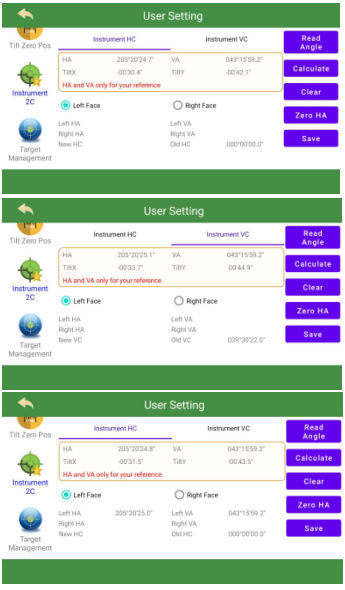
Click the "Calculate" button on the right side of the screen and the instrument calculates the new tilt zero position value.



Click the "Save" button on the right side of the screen, the instrument pops up a prompt box, click "OK" to save the new tilt zero position, or click "Cancel" to cancel the new value.

4.3 Calibrate the collimation error and index error

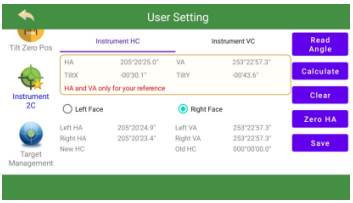
After the instrument enters the user setting interface, click the "Instrument 2C" icon on the left side of the screen to enter the instrument collimation correction interface.



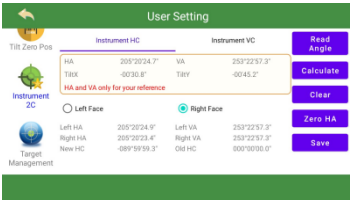
If you need to correct the instrument index error, click "Instrument VC " on the screen, and the method steps of two corrections are exactly the same.

After collimating the reference point at face left, click the "Left Face" on the screen, and then click the "Read Angle" button on the right.

After the instrument is rotated 180 degrees, and collimate the reference point at face right , click the "Right Face" on the screen, and then click the "Read Angle" button on the right side of the screen.



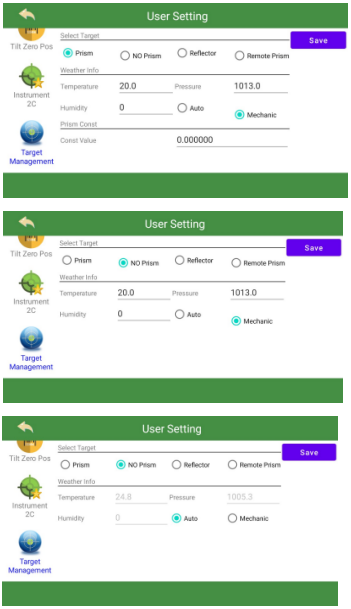
Click the "Calculate" button on the right side of the screen, and the instrument calculates a new collimation error/index error.



Click the "Save" button on the right side of the screen, the instrument pops up a prompt box, click "OK" to save the new collimation error/index error, or click "Cancel" to cancel the new values.

4.4 Target Management

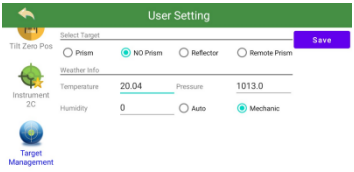
After the instrument enters the user setting interface, click the "Target Management" icon on the left side of the screen to enter the target management setting interface.



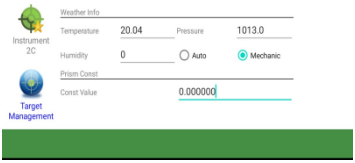
Click Prism/NO Prism /Reflector/Remote Prism under "Select Target" to change the type of target irradiated by the instrument.

The instrument is equipped with a temperature and barometric pressure sensor, click the [Auto/Mechanic] button under "Weather Info" to select the instrument to enter the temperature and barometric pressure automatically or manually.

If you need to enter manually, click the field to be entered, enter the required value in the pop-up soft keyboard, and then click the [V] button to confirm the input.



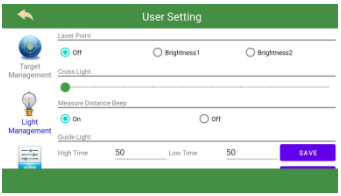
Click the constant value under "Prism Const" to change the prism constant value in the pop-up soft keyboard.



After all the settings are complete, click the [Save] button on the right to save the current settings.

4.5 Light Management

After the instrument enters the user setting interface, click the "Light Management" icon on the left side of the screen to enter the light management setting interface.

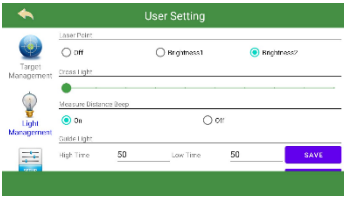


Click the button below "Laser Point" to turn on/off the laser pointer, where:

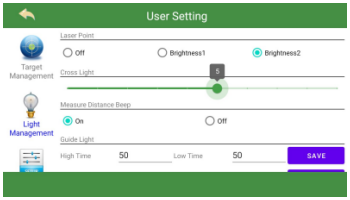
Off: Turn off the laser pointer

Brightness 1: turn on laser pointer by low brightness

Brightness 2: turn on laser pointer by high brightness

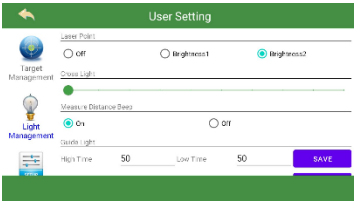


Slide the [●] button below "Cross Light " on the screen to adjust the illumination brightness of the telescope reticle crosshairs, where "0" means to turn off the illumination, and the larger the "1~9" number, the brighter the illumination.



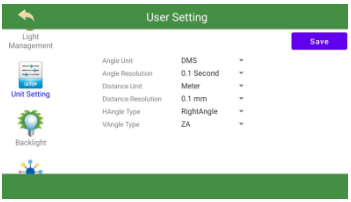
Click the [On/Off] button under "Measure Distance Beep" to turn on or off the prompt sound when the instrument is used for ranging.

After all the settings are complete, click the [SAVE] button on the right to save the current settings

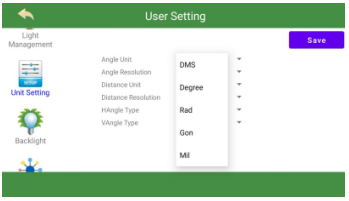


4.6 Unit Setting

After the instrument enters the user setting interface, click the "Unit Setting" icon on the left side of the screen to enter the unit setting interface.



Click the [▼] button to the right of the unit you want to set, and select the unit you want to set in the scroll down menu.



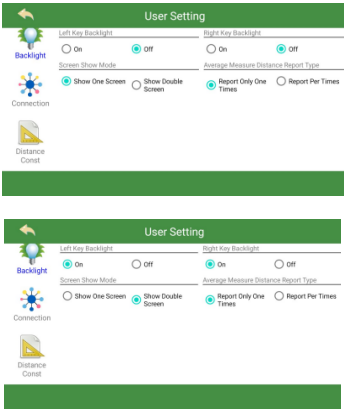
After all the settings are complete, click the [Save] button on the right to save the current settings.

Unit setting items （the marked with"*" is factory default）

Angle unit	DMS*， Degree， Rad， Gon， Mil
Angle resolution	1 second， 01 second*,001 second
Distance unit	Meter*， US-Feet， US-Inch， INT-Feet， INT-Inch
Distance resolution	1 mm， 01 mm *,001 mm
HAngle Type	RightAngle*， LeftAngle
VAngle Type	ZA*， VA， HLR90， GR

4.7 Backlight

After the instrument enters the user setting interface, click the "Backlight" icon on the left side of the screen to enter the backlight settings interface. Click button to turn on or off the left/right key backlight, as well as one-screen or double-screen display mode, where:



Left Key Backlight: The backlight of the keys at the bottom of the screen facing the user at face left will work

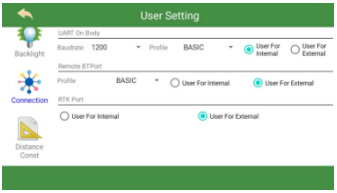
Right Key Backlight: The backlight of the keys at the bottom of the screen facing the user at face right will work

Show One Screen: The instrument only displays face-left screen, click to turn off the reverse side screen

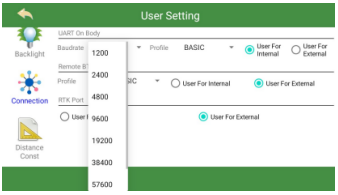
Show Double Screen: The screens on both sides of the instrument are always on at the same time

4.8 Connection

After the instrument enters the user setting interface, click the "Connection" icon on the left side of the screen to enter the connection management setting interface.



Click the [▼] button to the right of the required settings, and select the option you want to set in the scrolling menu.

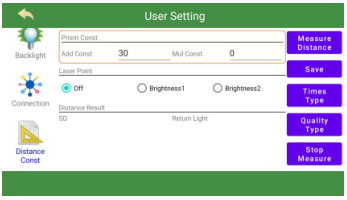


Connection setting items（ The marked with“ * ” is factory default）

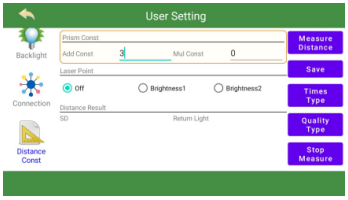
Baudrate of serial port	1200，2400,4800,9600,19200,38400,57600,115200*
Profile(Protocol) of serial port	BASIC，GEOCOM*
Use of serial port	Use For Internal *， Use For External
Remote BT Port Profile(Protocol)	BASIC*，GEOCOM
Use of Remote BT Port	Use For Internal， Use For External *
Use of RTK Port	Use For Internal，Use For External *

4.9 Distance Const

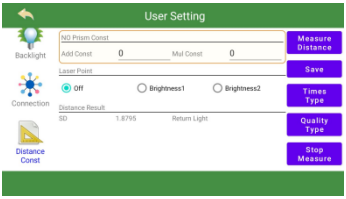
After the instrument enters the user setting interface, click the "Distance Const" icon on the left side of the screen to enter the distance constant setting interface



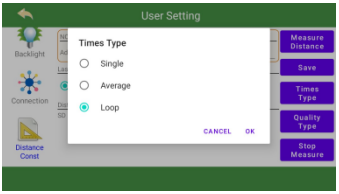
After Selecting Target Type, you can set the constant of the currently set target type, click the "_" box after add/mul const, and enter the new value in the pop-up soft keyboard.



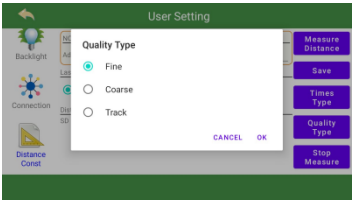
Click the [Measure Distance] button on the right side of the screen, the instrument can measure the current target, and the result is displayed at the bottom of the screen.



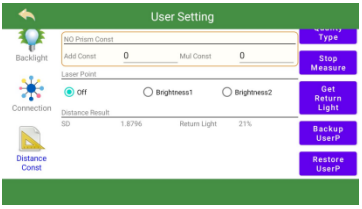
Tap the [Times Type] button on the right side of the screen to set the measuring times, and then click [OK] button when the setting is complete.



Tap the [Quality Type] button on the right side of the screen to set the quality type of the instrument, set the type to Fine /Coarse/Track, and then click [OK] button.



Click the [Get Return Light] button on the right side of the screen to view the return signal of the current instrument illuminating the target, and display the result at the "Return Light" at the bottom of the "Distance Result" column.

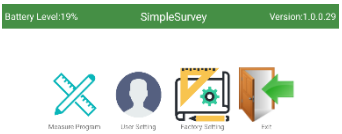


After all the settings are complete, click the [Save] button on the right to save the current settings.

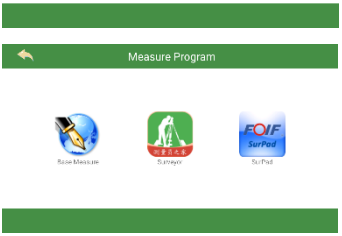
5. File management

5.1 Enter SurPad measurement program

Press the power button to turn it on.

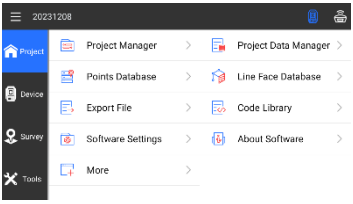


After the instrument automatically enters the SimpleSurvey interface, click the "Measure program" icon on the screen to appear the interface on the right.



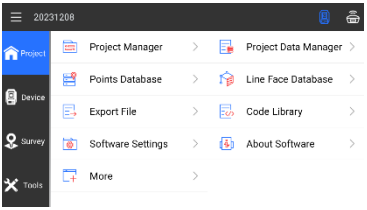
Click the SurPad icon on the screen, and the instrument will enter the startup interface, as shown in the right picture.

After the startup is complete, enter the right picture interface.

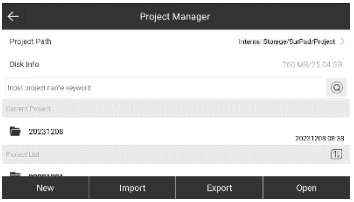


5.2 Project Management

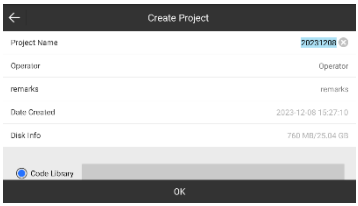
The instrument is in the SurPad measurement program, after clicking the "Project" icon on the left, tap "Project Manager" on the screen to enter.



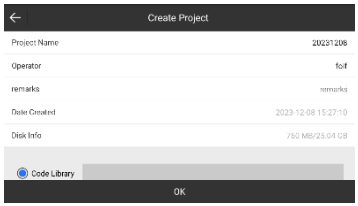
Under the Project Manager screen, tap the [New] button on the lower left side of the screen to create a new project.



Click the project name, in the pop-up keyboard the name of the project can be modified.

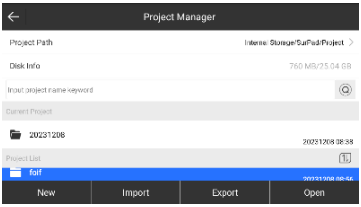


You can also enter the operator and remarks of the project as needed.

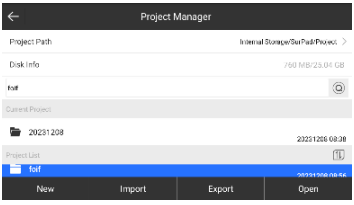


After sliding down the screen, you can select whether the current new project applies to the original project parameters. After completing the input, click [OK] button to confirm the new current project.

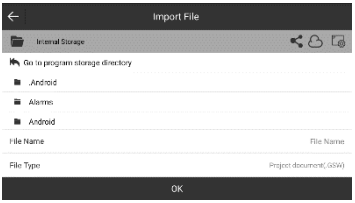
Select an item in the list of items on the screen, the item is shown in blue, click the [Open] button at the bottom of the screen, that is, the selected item is opened as the current instrument use item.



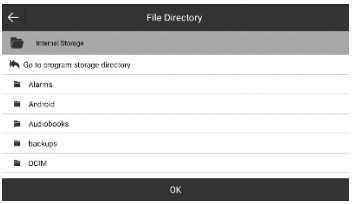
After entering the name of the item you want to find in the Find Item input box, click the [🔍]icon on the right side of the screen for item search, and the found item will be shown in blue below.



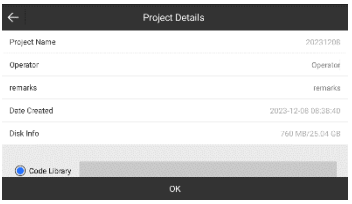
Click the [Import] button at the bottom of the screen to import items into the instrument from the specified path.



Click the Export button at the bottom of the screen to export the currently selected project file to the specified path.

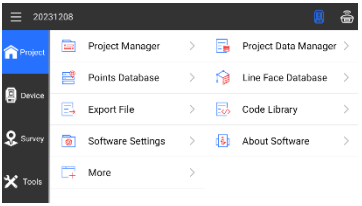


Click the [Details] button at the bottom of the screen to view the engineering project properties of the currently selected project.

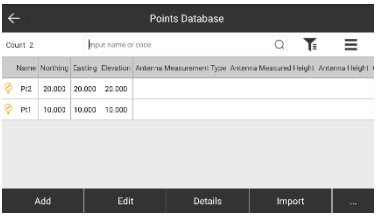


5.3 Coordinate points database

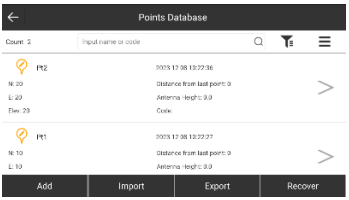
The instrument is in the SurPad measurement program, after clicking the "Project" icon on the left, click " Points Database " on the screen to enter.



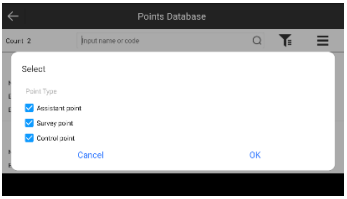
The instrument displays all coordinate points under the currently opened item.



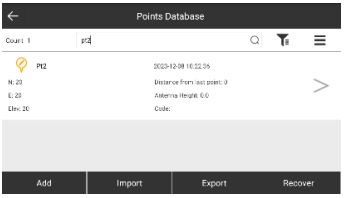
Click the icon [ ] in the top right corner of the screen to toggle the list of coordinates displayed.



Click the icon [ ] in the top right corner of the screen to filter the attributes of the list of coordinates displayed.

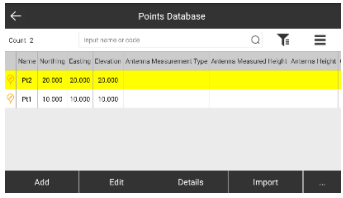


Enter the coordinate name you want to find in the Find items input box, click the [ ] icon on the right side of the screen to search for items, the found coordinate points are displayed below.



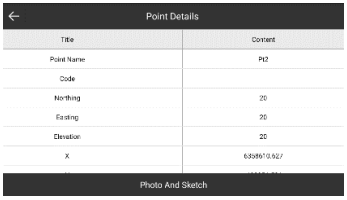
Click the [Add] button at the bottom of the screen to create a new coordinate point, enter the coordinate, code and property of the new point in the pop-up interface, and click the [OK] button at the bottom to confirm the adding.

Click a point in the list displayed, and the selected point will be displayed in yellow on the screen.

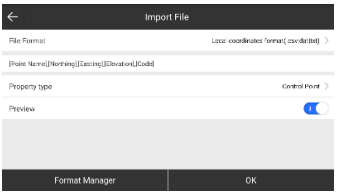


Click the [Edit] button at the bottom of the screen to edit the currently selected coordinate point, after editing, click the [OK] button at the bottom to confirm the modification.

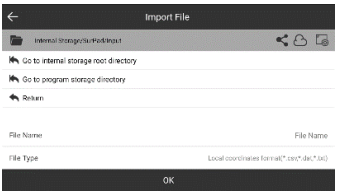
Click the [Details] button at the bottom of the screen to view the details of the currently selected coordinate point.



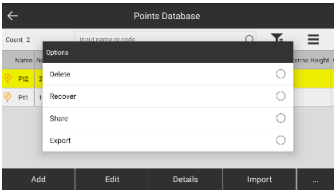
Click the [Import] button at the bottom of the screen, you can import the coordinate data of other positions into the current project of the instrument.



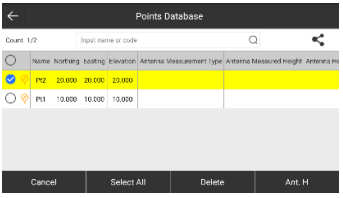
After selecting the format and storage location of the imported coordinate file, click the [OK] button below, and the coordinate data in the selected file will be imported into the current project of the instrument.



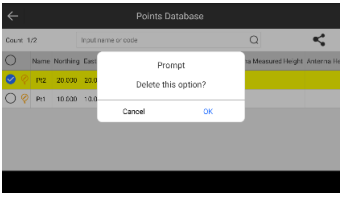
Click the [...] button at the bottom of the screen, select the "Delete" option in the pop-up option box, you can delete the coordinate points in the current project.



Select the point you want to delete in the display list, and click the [Delete] button at the bottom of the screen when the selection is complete.

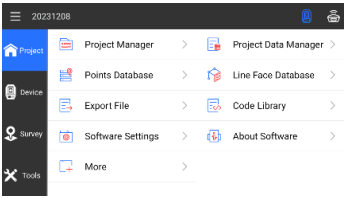


Click the [OK] button to confirm the deletion of the currently selected coordinate point, and click the [Cancel] button to cancel the deletion.

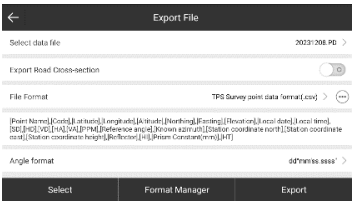


5.4 Export file

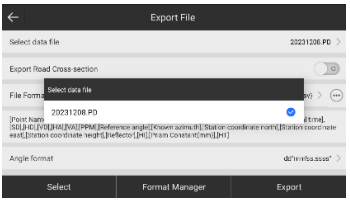
The instrument is in the SurPad measurement program, after clicking the "Project" icon on the left, click " Export File " on the screen to enter.



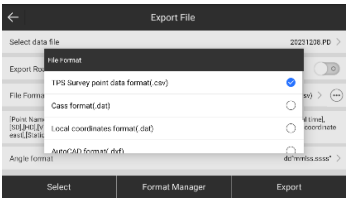
Click "Select Data File" to replace the data file you want to export.



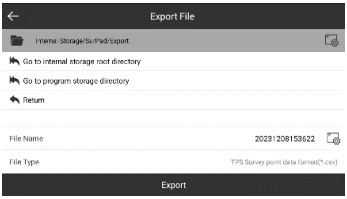
Select the data file you want to export in the list display that pops up.



Click the [Format Manager] button at the bottom of the screen to select the data format of the exported file.



Click the [Export] button at the bottom of the screen, after selecting the storage location of the exported data, click the [Export] button at the bottom again, and the selected data file is exported to the specified location.

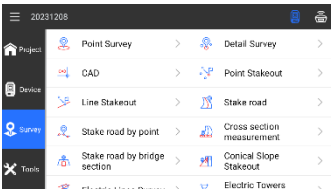


6 Survey

6.1 Detail Survey

Steps

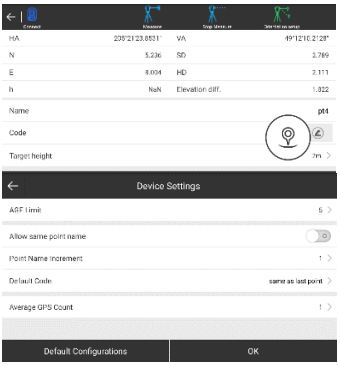
The instrument is in the SurPad measurement program, and the orientation setting has been finished, click “Survey” icon and “Detail Survey” to enter.



Click Orientation Setup to enter, click “Set backsight” option.

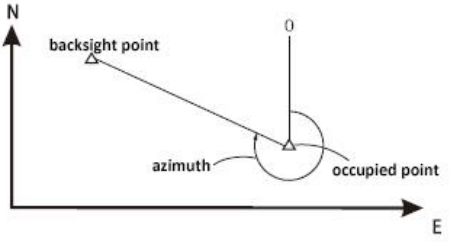
Select Coordinate Type in the pop-up option box.

Click the [ ] icon to the right of Occupy Pt and Backsight Pt to select the coordinate point inside the database for calling.



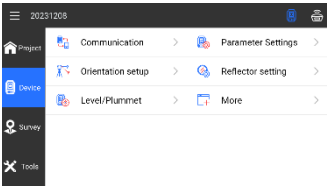
6.2 Coordinates for orientation setup

The backsight orientation azimuth can be calculated by occupied point coordinate and backsight point coordinate.



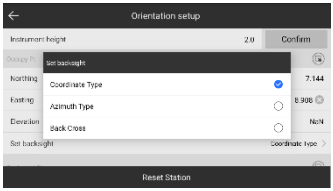
▶ Steps

The instrument is in the SurPad measurement program, after clicking the "Device" icon on the left, tap "Orientation Setup" on the screen to enter.

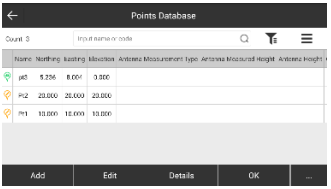


Once you are in the orientation setup screen, click on the "Set backsight" column on the screen.

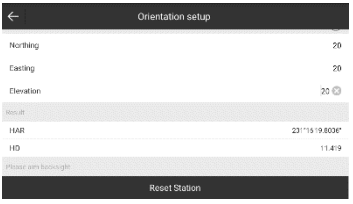
Select the "Coordinate Type" option inside the option box that pops up.



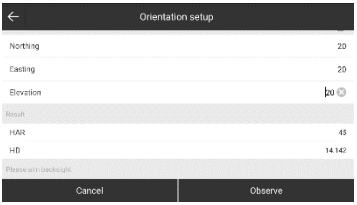
Click the [ ] icon to the right of Occupy Pt and Backsight Pt to select the coordinate point inside the database for calling.



After entering or calling coordinate data of the occupied point or backsight point, click the [Calculate] button below.

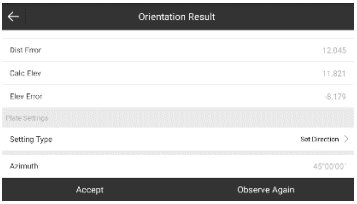


At face left rotate the instrument to collimate the backsight point and click the [Observe] button.

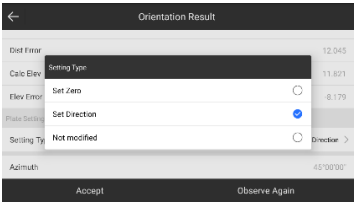


The instrument displays the orientation measurement result. Slide down the screen to view the measurement data. If the data is wrong, you can re-observe the correct backsight point and then click the [Observe Again] button below to measure again.

If the measurement is correct, click the display bar of "Setting Type" on the screen.



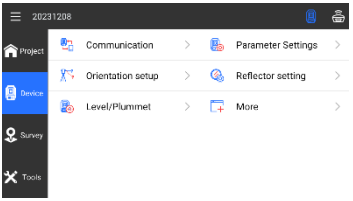
Select the option of "Set Direction" in the pop-up option box, click the [Accept] button at the bottom of the screen, and the orientation setup of the station is completed.



6.3 Azimuth for orientation setup

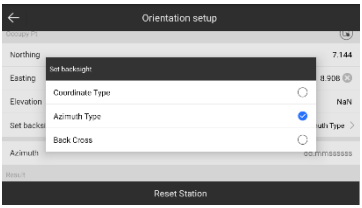
▶ Steps

The instrument is in the SurPad measurement program, after clicking the "Device" icon on the left, tap "Orientation Setup" on the screen to enter.

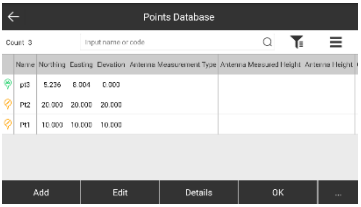


Once you are in the orientation setup screen, click the "Set backsight" section on the screen.

Select the "Azimuth Type" option inside the option box that pops up.



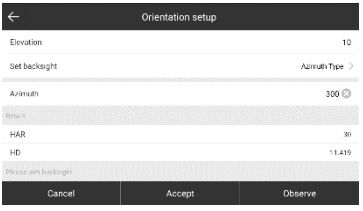
Click the [ ] icon to the right of Occupy Pt to select the coordinate point inside the database for calling



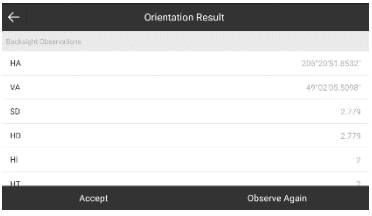
After entering or calling the coordinate data of the occupied point and the azimuth to the backsight point, click the [Reset station] button below.

To enter 120°47 '23 ", please input 120.4723.

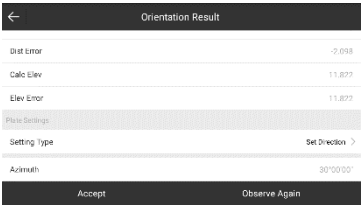
At face left rotate the instrument to collimate the backsight point and click the [Observe] button.



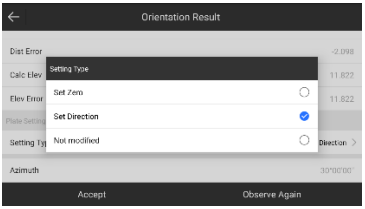
The instrument displays the orientation measurement result. Slide down the screen to view the measurement data. If the data is wrong, you can re-observe the correct backsight point and then click the [Observe Again] button below to measure again.



If the measurement is correct, click the display bar of "Setting Type" on the screen.

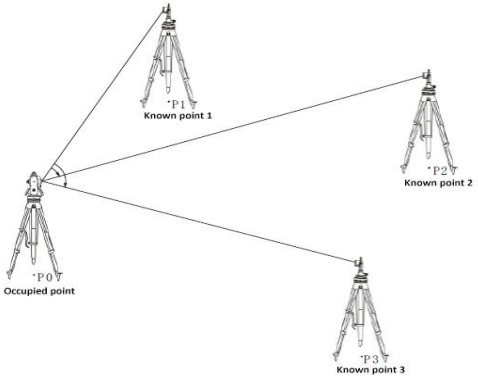


Select the option of "Set Direction" in the pop-up option box, click the [Accept] button at the bottom of the screen, and the orientation setting of the station is completed.



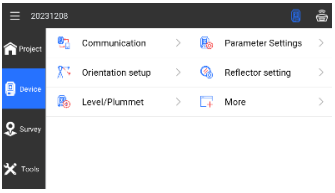
6.4 Resection

Install the instrument on the selected new site, calculate the new coordinates with the coordinates of up to 3 known points and the measurement data of these points, the known coordinate data entered during the measurement of resection and the calculated occupied point data can be stored in the current project.

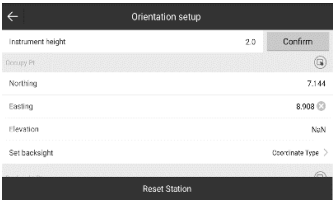


▶Steps

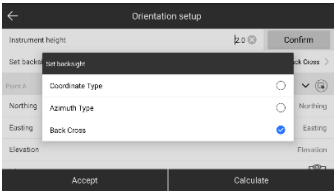
The instrument is in the SurPad measurement program, after clicking the "Device" icon on the left, tap "Orientation Setup" on the screen to enter.



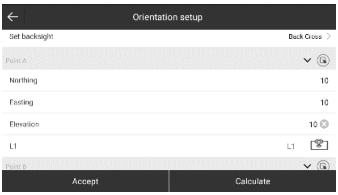
Once you are in the orientation setup screen, click on the "Set backsight" column on the screen.



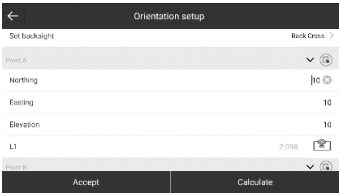
Select the "Back Cross" option inside the option box that pops up.



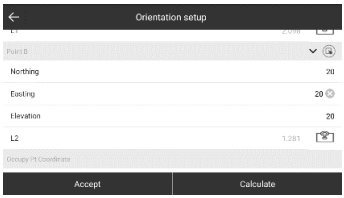
After directly inputting or calling coordinate data of coordinate point A, at face left rotate the instrument to collimate coordinate point A, click the [ ]button on the right side of L1 column on the screen,



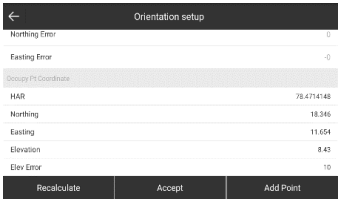
After the measurement is finished, the measurement value will be displayed in L1 column.



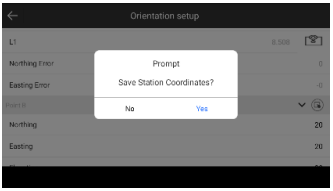
After inputting the coordinate data of coordinate point B in the same way, proceed to measure the coordinate point B.



After the measurement is completed, click the [Calculate] button at the bottom of the screen, the instrument will automatically calculate the coordinate data of the occupied point. If you need to add the measurement point, click the [Add point] button, if not, click the [accept] button.



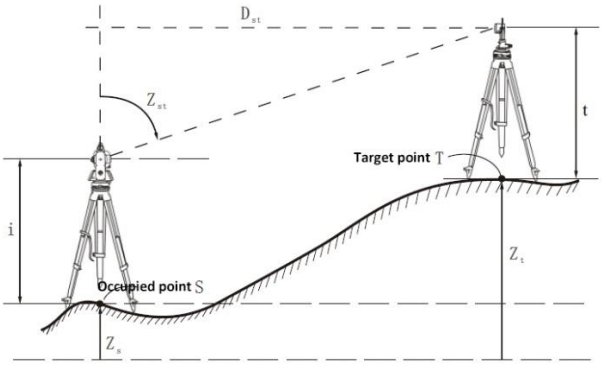
Click the [OK] button to store the current coordinate data of the occupied point into the coordinate point database



After entering the point name and code data of the new occupied point, click the [OK] button below, the resection setting is completed, and the instrument will automatically return to the menu display.

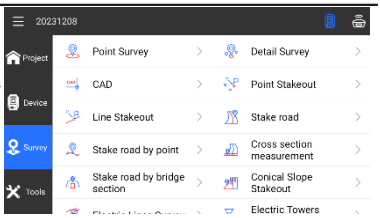
6.5 Point survey

After the orientation setup completed, you can measure the three-dimensional coordinate of the target point.

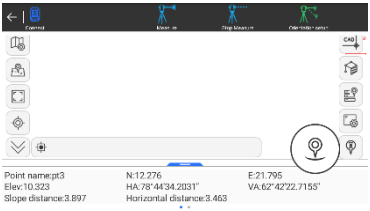


▶ Steps

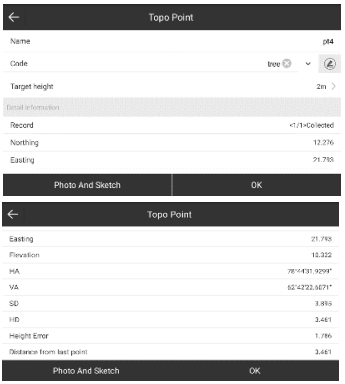
After the instrument is in the SurPad measurement program and the orientation setting has been completed, tap "Point survey" on the screen to enter after clicking the "Survey" icon.



After turning the instrument to look into the point to be measured, press the [MEAS] measurement key on the side of the instrument or the [ ]button on the screen to measure.



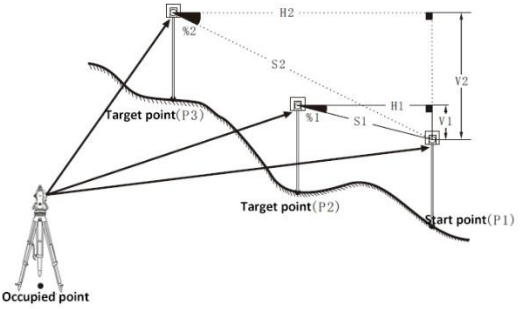
After the measurement is completed, the instrument displays the measurement data of the measurement point.



Slide down to check and confirm all the measurement data of the measuring point are correct, click [OK] button to save the point data to the coordinate point database.

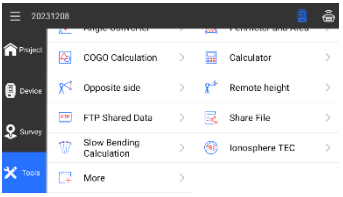
6.6 Radial opposite side measurement

The radial opposite side measurement is the direct measurement of the slope distance, horizontal distance and vertical distance between multiple target points and a certain starting point without moving the instrument.



▶ Steps

The instrument is in the SurPad measurement program, after clicking on the "Tools" icon on the left, click on "Opposite Side " on the screen to enter.



Collimate the starting point, click Observe to start measuring, then it will show the measurement result

Look at the target point and click the [opposite] button to measure the target point. The screen displays the measured values as follows:

Slope distance: the slope distance between the target point and the starting point.

Height Error: The height error between the target point and the starting point.

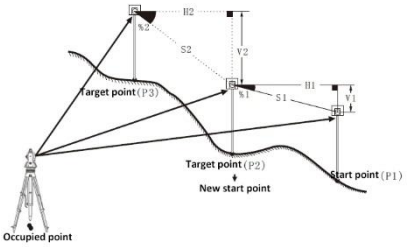
Horizontal distance: The horizontal distance between the target point and the starting point.

Slope: The slope between the target point and the start point.

Look at the next target point and click the [opposite] button to measure the target point. Measure the slope distance, horizontal distance, height difference and slope between multiple target points and the starting point in the same way.

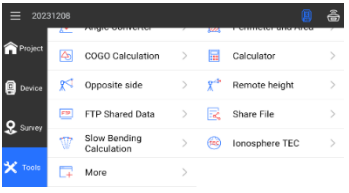
6.7 Adjacent opposite side measurement

The target point of the last measurement can be set as the starting point of the subsequent measurement.

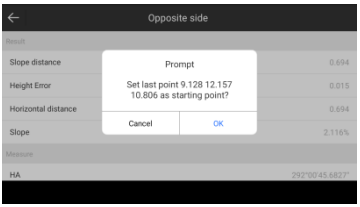


Steps

The instrument is in the SurPad measurement program, after clicking on the "Tools" icon on the left, click on "Opposite Side" on the screen to enter.



Collimate the starting point, click “Observe” to start measuring, the instrument shows the measurement result.



Look at the target point and click the [opposite side] button to measure the target point. The screen displays the measured values as follows:

Slope distance: the slope distance between the target point and the starting point.

Height error: The height error between the target point and the starting point.

Horizontal distance: The horizontal distance between the target point and the starting point.

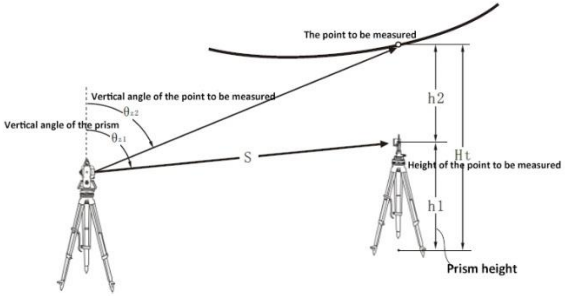
Slope: The slope between the target point and the start point.

Look at the next target point and click [New station] button, the instrument will eject a prompt box asking whether to change the starting point, click [OK] button, the current target point has been set as the starting point of the subsequent measurement.

Look at the new target point, click the [opposite] button to start the measurement, repeat the above steps to continue the opposite side measurement.

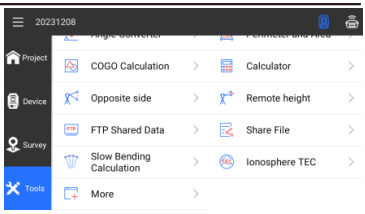
6.8 Remote height measurement with prism

There is a remote height measurement with prism for objects on which prism cannot be set, such as high voltage transmission lines, suspended cables, bridges, etc.



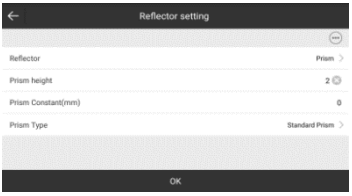
Steps

The instrument is in the SurPad measurement program, after clicking the "Tools" icon on the left, click "Remote Height" on the screen to enter, and set up the prism directly below the point to be measured.

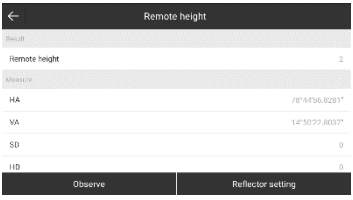


Under the remote height measurement interface, click the [Reflector Setting] button in the lower right corner of the screen to set the prism.

After setting the reflector to "Prism" and entering the parameters for currently erect prism, click the [OK] button.



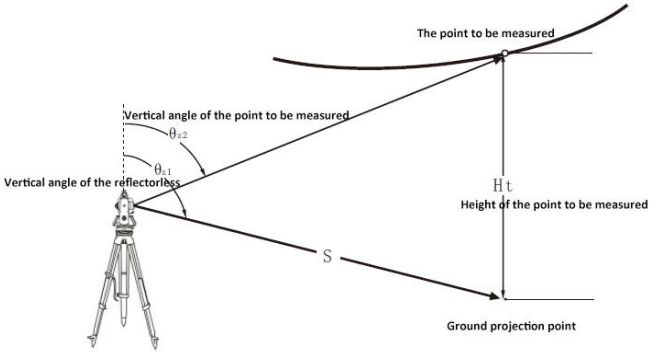
Look at the prism, click the [Observe] button to start the measurement, the measurement is completed and the measurement result is displayed.



Turn the instrument to look at the point to be measured and click the [Remote height] button. After the measurement is completed, the screen will display the height of the point to be measured.

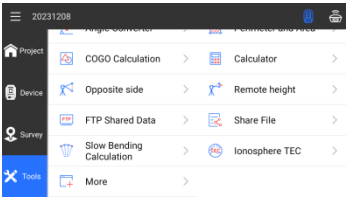
6.9 Remote height measurement with reflectorless

Remote height measurement with reflectorless is used to directly measure the height from the ground projection point of the measured object to this measured point.



▶ Steps

The instrument is in the SurPad measurement program, after clicking the "Tools" icon on the left, tap "Remote height" on the screen to enter.

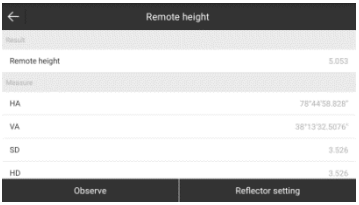


Under the remote height measurement interface, click the [Reflector Setting] button in the lower right corner of the screen to set the target.

After setting the reflector to "Reflectorless" and setting the reflector height to "0", click the [OK] button.

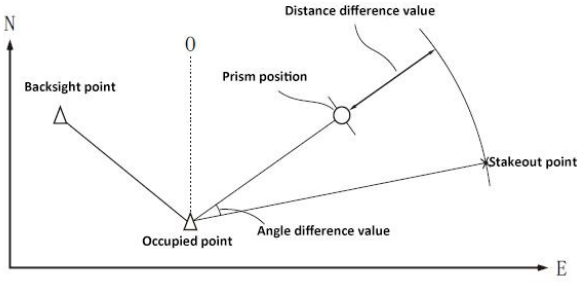
Look at the projection point on the ground directly below the point to be measured, click the [Observe] button to start the measurement, and the measurement result will be displayed after the measurement is completed.

Turn the instrument to look at the point to be measured, click [Remote height] button, after the measurement is completed, the screen will display the height of the point to be measured.



6.10 Point stakeout

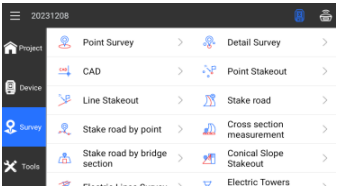
After the coordinates of the stakeout point are given, the instrument automatically calculates the angle and distance values of the stakeout, and the position of the stakeout point can be measured by using the angle and distance stakeout function.



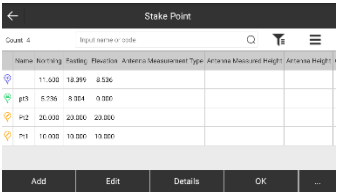
In order to determine the Z coordinate, the target is set on an object such as a measuring rod at the same height.

▶ Steps

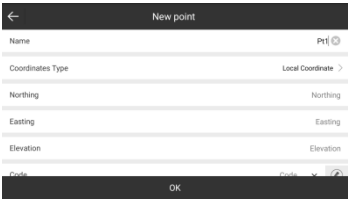
After the instrument is in the SurPad measurement program and has completed the orientation setting, click the "Survey" icon on the left and click the "Point stakeout" on the screen to enter.



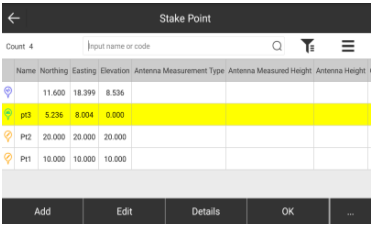
The instrument enters point selection list and click on the stakeout point to be selected. If you do not have the required stakeout point coordinates in the list, click the [Add] button at the bottom left of the screen.



Enter the coordinates of the staked out point on the New point page, and then click the [OK] button at the bottom.

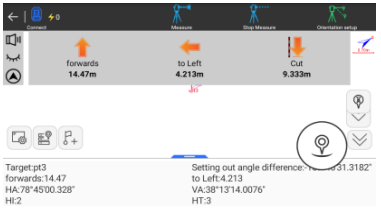


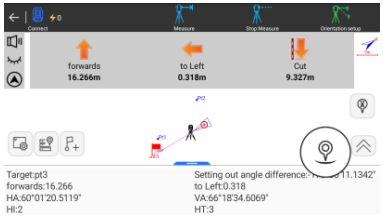
After selecting a stakeout point, the status bar of the point is displayed in yellow, and click the [OK] button at the bottom right of the screen to perform the stakeout step of the selected point.



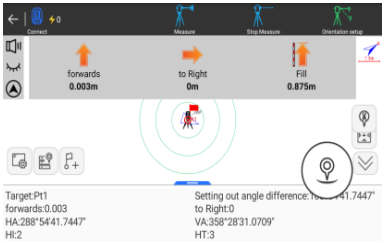
Turn the alidade of the instrument so that the displayed "Setting out angle difference" value is "0° 00 ' 00", and set the prism to the collimated direction. Click the "Measure" button at the top of the screen to start measuring. The difference between the measured distance and the stakeout(setout) value is displayed on the screen, where:

Backwards : Move the prism towards the station
Forwards : Move the prism away from the station
To left : Move the prism to the left
To right : Moves the prism to the right
Cut : indicates higher than the stakeout elevation
Fill : indicates lower than the stakeout elevation



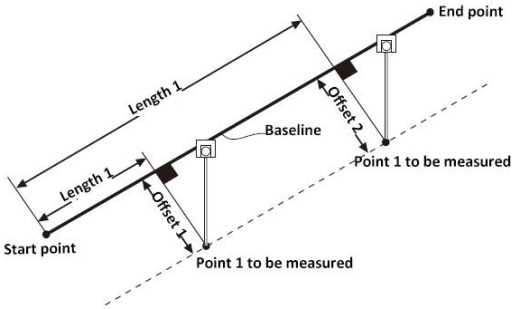


When you command the prism to be placed by left and right, front and back, cut and fill until the allowable error for angular difference values, the setout of the current stakeout point is completed. Click the Next Point button on the right side of the screen to continue the measurement of the next stakeout point, and click the Points database on the left side of the screen to return to the list of Points database. Click the Add stakeout Point button to add the coordinates of the stakeout points that are not available in the coordinate points stakeout.



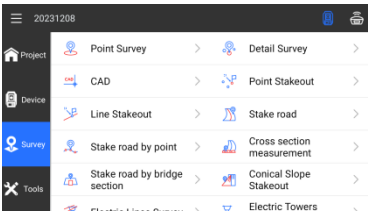
6.11 Line stakeout

Line stakeout is used to stake out the points where the distances from the determined baseline are known, and can also be used to calculate the distance from the measured point to the baseline.



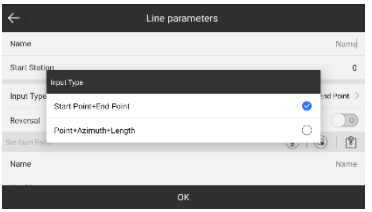
Steps

After the instrument is in the SurPad measurement program and the orientation setting has been completed, click the "Survey" icon on the left and click "Line stakeout" on the screen to enter.

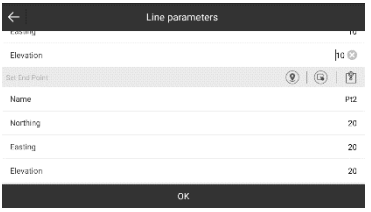


The instrument enters the list of lines database, and please click on the bottom left of the screen [Add] button to enter the straight line parameter input interface.

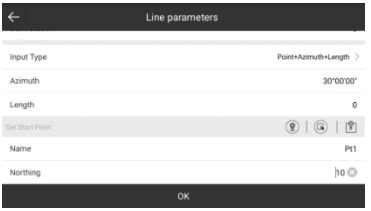
After entering the name of the line and the start station mileage, select the input method of the line in the pop-up window in the input method field.



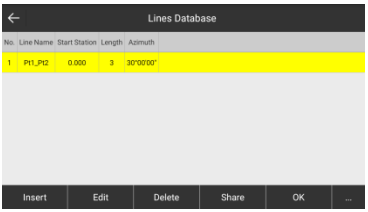
When you select the "Start point + End point" input method, scroll down the screen to enter the coordinates of the start and end points directly or select the start and end points from the list, and then click the [OK] button at the bottom.



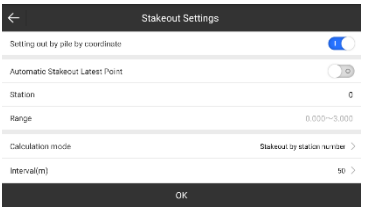
When you select the "Point + Azimuth+ Length" input method, scroll down the screen to directly enter or select the coordinates of the starting point, the azimuth angle and length of the line, and then click the [OK] button at the bottom.



The instrument returns to the line database, click to select the line you just entered, and then click the [OK] button at the bottom right of the screen.



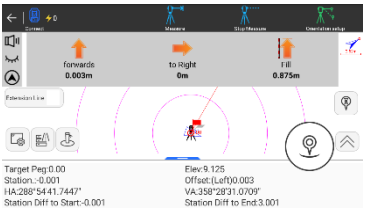
Enter the stakeout settings interface, select the stakeout interval and other parameters as needed, and then click the [OK] button at the bottom of the screen



At this time, the deviation of the measured point from the baseline is displayed on the screen, collimate the prism and click the "Measure" icon at the top of the screen, then the screen will update the deviation value from the measured point to the baseline, where:

Backwards : Indicates that the measured point is in front of the baseline

Forwards : Indicates that the measured point is behind the baseline



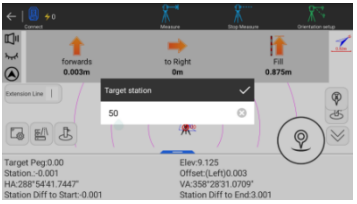
To left : Indicates that the measured point deviates from the baseline to the right

To right : Indicates that the measured point is left away from the baseline

Cut : Indicates that the measured point is above the baseline

Fill : Indicates that the measured point is located below the baseline

Click the Select Target button on the right side of the screen to enter a new stakeout station in the input box that pops up.

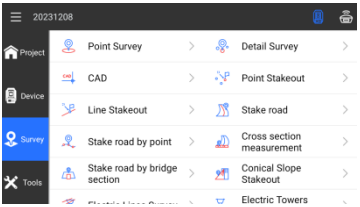


6.12 CAD

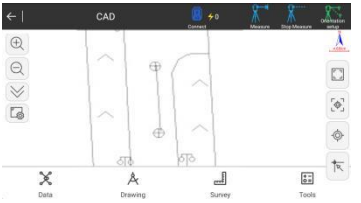
This is the function such as processing and stakeout for CAD drawings stored on the instrument

Steps

After the instrument is in the SurPad measurement program, click the "Survey" icon on the left and click "CAD" on the screen to enter. It will prompt whether to load the last CAD drawing, click OK to confirm or No to cancel.

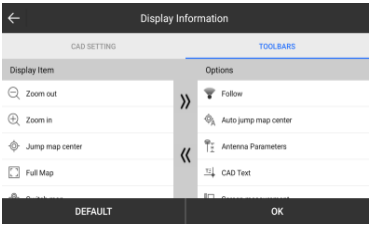


The instrument will display the loaded CAD drawing.

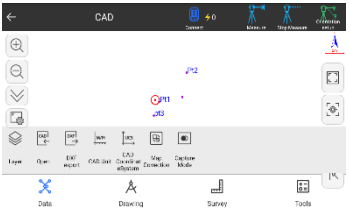


Click the zoom in or zoom out buttons to adjust the drawing display.

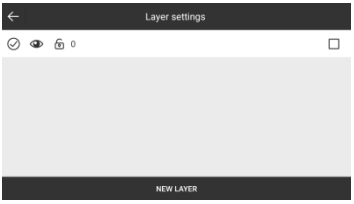
Click the button  to do settings for display information.



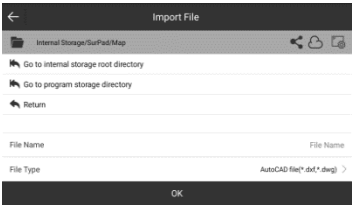
Click the [Data] button at the bottom left of the screen to edit the drawing.



Click the "Layer" button to set the layer of the drawing.

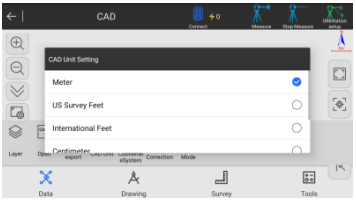


Click the "Open" button to select a storage location within the instrument to open a new CAD drawing.

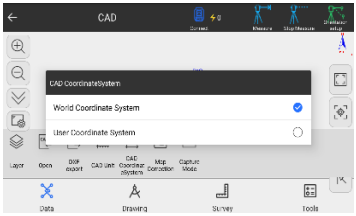


Click the "Export" button to export the currently opened drawing according to the settings.

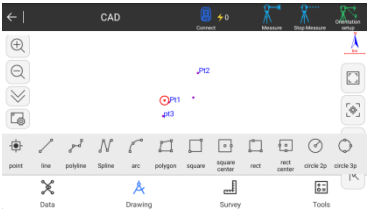
Click "CAD Unit" to set the drawing unit.



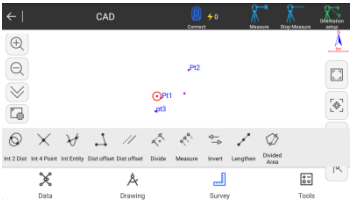
Click "CAD Coordinate System" to set the coordinate system of the drawing.



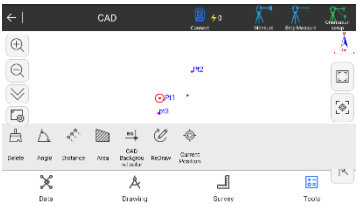
Click the [Drawing] button at the bottom of the screen to draw the current drawing.



Click the [Survey] button at the bottom of the screen to measure the object selected in the current drawing.

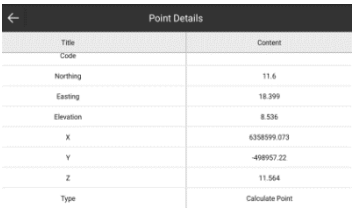


Click the [Tools] button at the bottom of the screen to edit the current drawing using the tools on the screen.

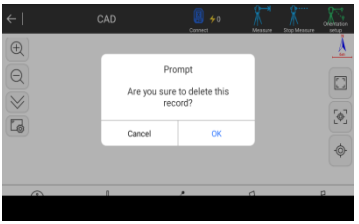


After clicking on the screen to select a point or block, the edit bar will pop up at the bottom of the screen, and you can edit the point or block accordingly as needed.

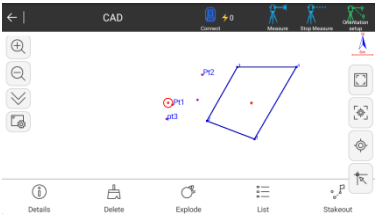
Click Details to view the feature information of that point.



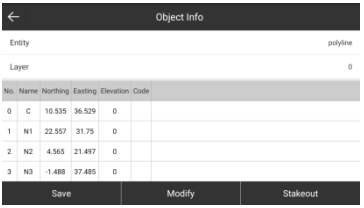
Click Delete to delete the point on the drawing



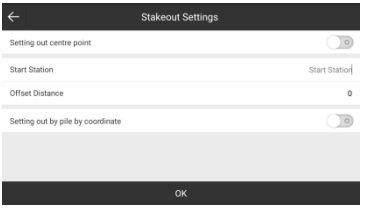
Click Explode to explode the selected block on the drawing



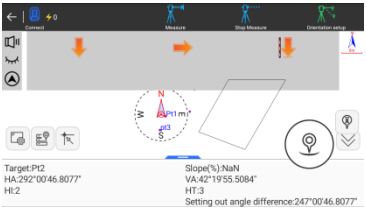
Click List to display the feature information of that point or block in the list.



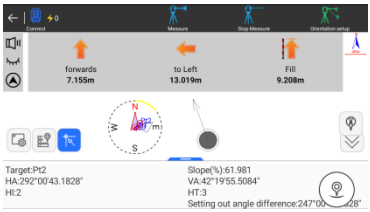
Click "Stakeout" to enter the stakeout settings, and click the [OK] button below to stake out the selected points after the settings are completed



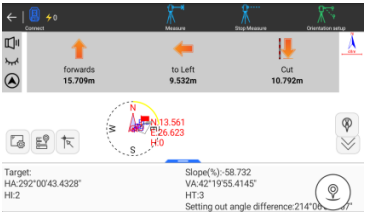
The instrument enters the stakeout interface, please refer to the specific operation steps of chapter **6. 10 Point stakeout**.



Click the "Capture" button on the right side of the screen, and the black dot and arrow shown on the right will appear on the screen.

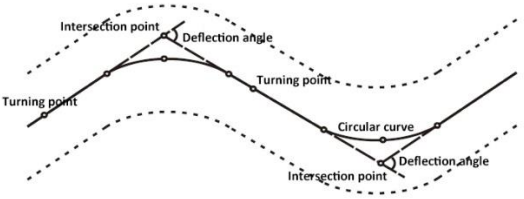


After dragging the origin point on the screen so that the arrow points to a point, the instrument displays the stakeout data of that point.



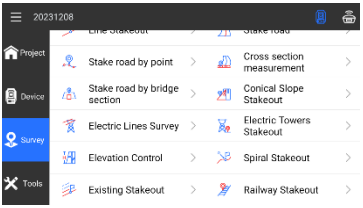
6.13 Stake road by point

By entering centerline, vertical profile, or various other elements on the instrument, the stakeout is carried out point by point according to the requirements through calculations

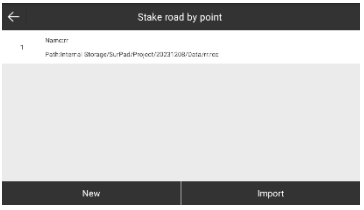


Steps

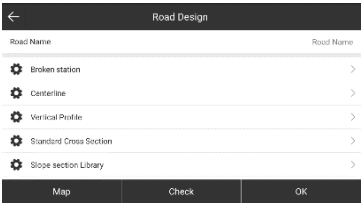
The instrument is in the SurPad measurement program, click the "Survey" icon on the left, tap "Stake road by point" on the screen to enter.



The instrument enters the interface of “Stake road by point”, and click the [New] button at the bottom left to create a new road.



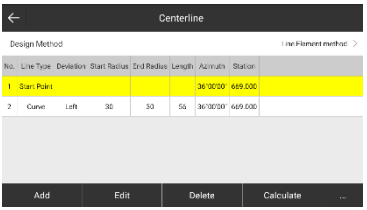
Enter the road design interface and click the " centerline" column.



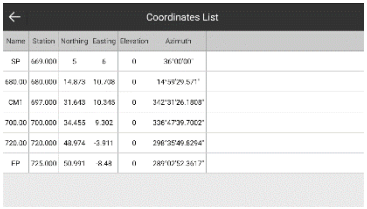
The instrument enters the centerline element input interface, and after confirming that the road design method is "line element method", click the [Add] button in the lower left corner.

Enter various centerline features as needed.

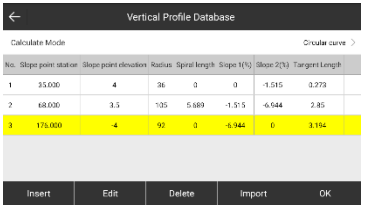
Until all centerline features have been entered.



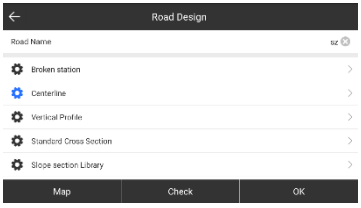
Click the [Calculate] button at the bottom of the screen to view the coordinates list of each pile on the road.



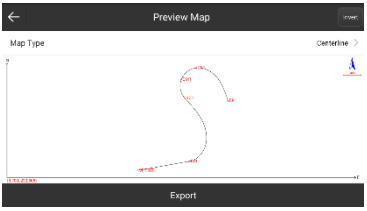
After entering all the vertical profile features using the same method as necessary, click the [OK] button.



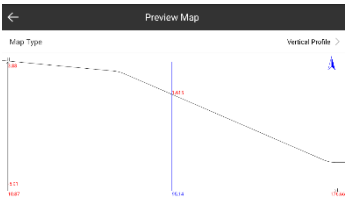
Enter a road name in the Road Name field.



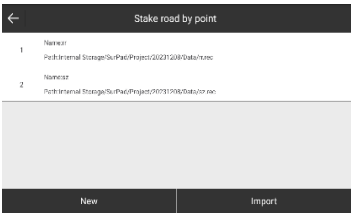
Click the [Map] button in the lower left corner to preview the centerline.



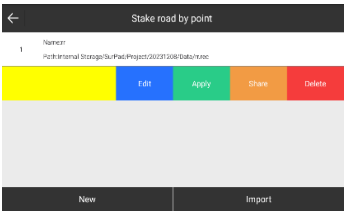
You can toggle to view a preview of the vertical profile.



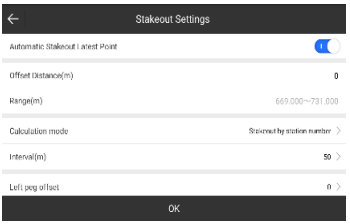
Click the [OK] button in the lower right corner of the road design interface, the instrument returns to the “Stake road by point” interface, and the newly created roads have been displayed on the screen



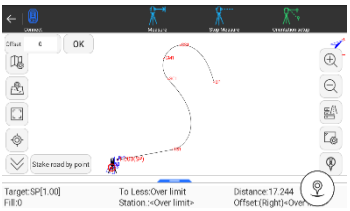
Tap the road on the screen and tap the Apply button.



The instrument enters the stakeout settings interface, and after the setting is completed, click the [OK] button at the bottom.



The instrument enters the stakeout interface, and then please collimate the prism and proceed with the stakeout operation. For more information, see also **chapter 6.10 point stakeout**.

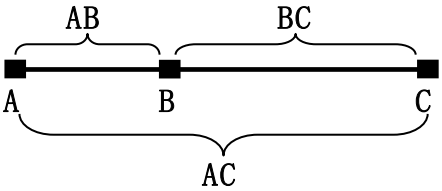


7. Check and Adjustment

7.1 The Instrument Constant

1) Check

It is suggested to observe and compare the instrument with a testing line which is set on stable ground with a particular accuracy, though error is not generally included in the instrument constant. If the testing line is unavailable, you can set it for 20 meters or so by yourselves, then check and compare it with your new instrument.



1. Select a point B on the approximately horizontal line AC with about 100 meters long. Measure the distances of lines AB , AC and BC .

2. The instrument constant can be calculated;

instrument constant =AB+BC-AC

3. If there is a difference between the instrument standard constant and the calculated value, colligate the measured constant and the prism constant to get a new value, then input the value into the instrument as a prism constant.

4. Compare length of the instrument's testing line again with a certain standard testing line.

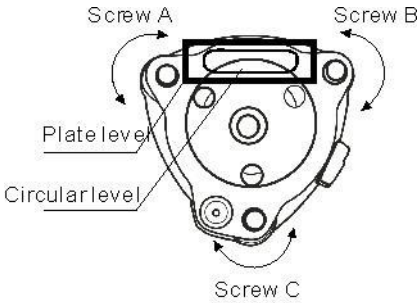
5. If the difference is over 5 mm after the preceding operations, it is necessary to reset the instrument constant.

2) Adjustment

About instrument constant setting, you must contact ALPHA distributor to do that.

7.2 Plate Level and Circular Level

7.2.1 Plate Level

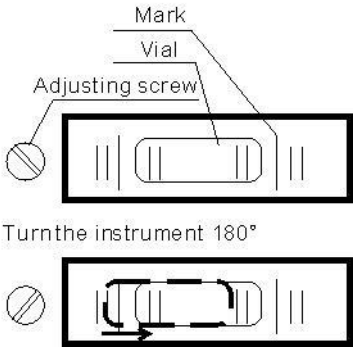


1) Check

1. Mount the instrument on a stable device (as tripod , adjusting device),and fix it.

2. Level the instrument until the plate level is parallel to a line linking leveling foot screws A and B, then adjust the two screws to center the air bubble.

3. Turn the instrument 180°, observe the moving direction of the bubble, if it is still centered, no adjustment is necessary, if not, you have to adjust it.



2) Adjustment

1. Mount the instrument on a stable device and fix it.

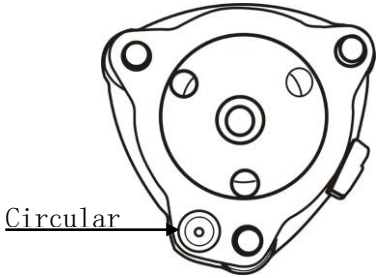
2. Level it roughly.

3. Turn the instrument and make the plate level be parallel to a line linking two leveling foot screws, then adjust the two screws to center the air bubble .

4. Turn the instrument 180°, adjust the Adj-screw with adjustment pin slightly to correct half of the bubble's displacement when it doesn't move,

5. Repeat the operation (3) and (4) until the air bubble remains centered in any position.

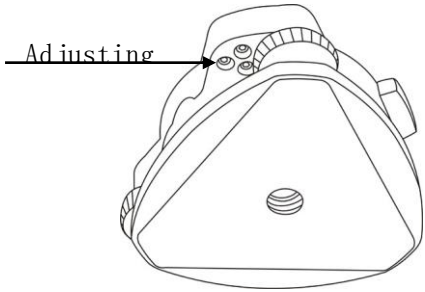
7.2.2 Circular Level



1) Check

1. Mount the instrument on a stable device and fix it.
2. Level it accurately by the plate level.
3. Observe the bubble of the circular level, if it is centered, no adjustment is necessary, if not, you have to adjust it.

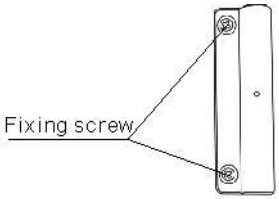
2) Adjustment



4. Mount the instrument on a stable device and fix it.
5. Level it accurately by the plate level.
6. Adjust the three adjusting screws to center the bubble by a wrench.

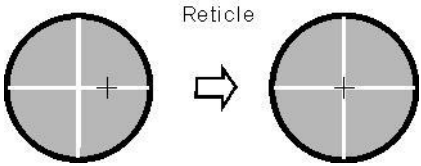
Note: Be careful when adjusting the three screws, and the tightening tension is identical for them.

7.3 The Optical Sight



Check

1. Mount the instrument on a tripod and fix it.
2. Set a cross mark target which apart from the instrument about 50m.
3. Take the telescope sight the cross mark.
4. Observe the optical sight collimator whether collimating the cross mark, if collimate the mark, adjustment is not necessary; if not, adjust it.



Adjustment

1. Mount the instrument at the tripod and fix it.
2. Set a cross mark target which apart from the instrument about 50m.
3. Take the telescope sight the cross mark.
4. Loosen two fixing screws, adjust the collimator, then fix the two screws again.

7.4 Laser Plummet

1) Check

(1)Set the instrument on stable device and fix it.

(2)Set a cross mark on the ground under the instrument.

(3)Turn the laser switch on and focus it accurately.

(4)Turn the three leveling screws until the instrument keeps leveling and the laser spot coincides with the cross mark on the ground.

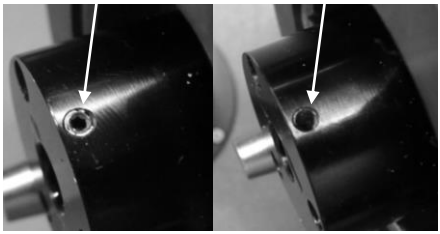
(5)Rotate the instrument 180°(200g) around and check the laser spot and cross mark， if they coincide, adjustment is not required. Otherwise, adjust it.

2) Adjustment

1. Setting up the instrument on the checking tool or tripod which is 1.5m apart from ground.

2. Turn on laser plummet, turn tribrach foot screws until laser spot coincide with cross mark. If you use tripod, make a cross mark on the laser spot directly.

3. Rotate instrument 180°around, if the laser spot is over 2mm apart from cross mark, remove the protecting cover firstly, adjust two screws with 1.5mm hexagon wrench to move laser spot to the cross mark, correct only one-half of the displacement in this manner. Adjusting details see attached figure.



4. Repeat steps 2 and 3 until laser spot coincides with cross mark always when rotate instrument.

Note: there are three screws amounted around laser plummet part, only two screws are used for laser accuracy adjustment.

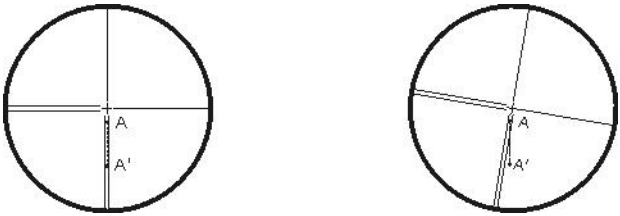
7.5 Vertical Cross-hair on Telescope

1) Check

(1) Set the instrument up the tripod and carefully level it.

(2) Set a point A front the instrument 50m apart;

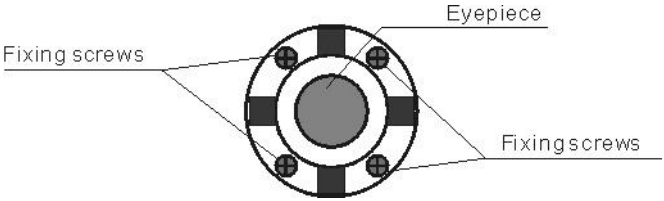
(3) Collimate the point A and adjust the vertical tangent screw; If the point appears to move continuously on the hair, adjustment is not required. Otherwise, adjust it.



2) Adjustment

(1) Set the instrument, and set the point A front the instrument 50m apart.

(2) Take off cover of telescope eyepiece, there are 4 screws for the reticle part.



(3) Loosen all four fixing screws slightly with the cross screw-drive.

(4)Revolve the eyepiece section so that the vertical cross-hair coincides to point A, finally, re-tighten the four screws.

(5) Repeat the checking and adjusting until there is no deviation.

NOTE:

1） After the adjustment of cross-hair, please check the collimation error and vertical index error.

7.6 Horizontal Collimation Error C

If the telescope's sight line isn't perpendicular to the horizontal axis, the collimation error will appear. The assembling, transportation and operation will cause this error.

If the collimation error isn't over the permitted range, with the program the instrument can correct this collimation error.

NOTE: After the program correction this deviation error is also on the instrument.

1) Check

(1) Set-up the instrument on tripod or adjustment platform and leveling accurately.

(2) Aim at the cross-hairs of collimator or the obvious target at a distance. Get the face left angle reading H1 and the face right angle reading Hr.

(3) Calculating the horizontal collimation error C according to C=（Hl-Hr±180°）/2,if C<8", no adjustment will be necessary. If C>8", proceed with the following adjustment.

2) Adjustment by program:

Please refer to chapter **4.3 Calibrate the collimation error and index error**

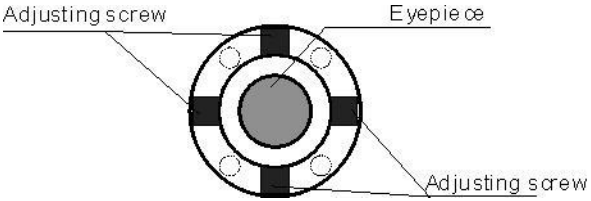
Note:

The adjustment can be performed by the program when C<30", if C>30", adjust the reticle.

Reticle Adjusting:

1. Rotate the instrument in face right position, turning horizontal tangent screw until Hr'=Hr+C.

2.Loosen the shield of telescope's reticle.



3. Adjusting two screws at left and at right until the vertical hairs of telescope's reticle coincides with the cross-hairs of collimator or target.

4. Repeat the check and adjustment procedure until the error is accepted.

NOTE:

1. When adjust the screws of reticle, firstly loosen the screw on the moving direction of reticle, secondly tighten another screw by the same mount, clockwise turning is for tightening, and anticlockwise turning is for loosening, the turning mount for tightening or loosening should be same.

2. After the reticle adjustment, it is necessary to adjust the vertical index error by program.

7.7 Vertical Index Error

The deviation between vertical circle zero position and horizontal direction is vertical index (i), it is necessary to concern this error when measure vertical angle. The instrument program applied a formula to remove this error. This correction can offer the index for the formula.

Warning: Before starting this operation, be sure to read manual carefully, otherwise it may cause data faulty.

Because of the close relationship between vertical index and compensator zero position, it is necessary to check and adjust compensator zero position when adjust the vertical circle, the value should be stable when reading.

1) Check:

Please adjust the reticle of telescope and correct the collimation error before this operation.

(1) Mount the instrument at the tripod or a stable device and level it accurately, then turn on the instrument.

(2) Aim at the cross-hairs of collimator or the obvious target at a distance, VA should be about ±10°. Read the face left angle Vl and face right angle Vr.

(3) Calculate the index error according to the formula below:

$$i = (Vl+Vr-360°)/2$$

(4)If I<10″ , no adjustment is necessary , or you have to adjust it .

2) Adjustment by program:

Please refer to chapter **4.3 Calibrate the collimation error and index error**

8 Specification

Telescope

Image	: Erect
Magnification	: 30×
Aperture	: 45mm
Resolution	: 3.75″
Field of view	: 1°30′
Minimum focus	: 1.0m

Angle measurement

Reading system	Absolute encoder
Circle diameter	: 79mm
Min. display	: 0.01″ / 0.1″ / 1″
Detecting way	: Double for H and V
Accuracy	: 2″

Distance measurement

Target		
No-prism	: 1km	
Reflector(60×60mm)	: 1km	
Prism	: 5km	
Accuracy	prism	: $\pm(2+2\times10^{-6}\cdot D)$mm
	Reflector	: $\pm(2+2\times10^{-6}\cdot D)$mm
	No-prism	: $\pm(2+2\times10^{-6}\cdot D)$mm
Measuring time		: Single fine 1.0s， tracking 0.3s
Meteorological corrections		: The input parameters realize correction or the sensors in the machine realize automatical correction

Correction for atmospheric refraction and Earth curvature: The input parameters realize correction K=0.14/0.2optional

The reflective prism constant correction :The input parameters realize correction

Level

Plate level	: 30″ / 2mm
Circular level	: 8′ / 2mm

Tilt correction

Type	: Automatic vertical and horizontal angles
Compensation method	: Liquid capacitive
Range	: ±3′
Resolution	: 1″

Plummet

Type	: Laser
Accuracy	: ±8mm/0.6～1.5m
Wavelength	: 635nm
Working range	: 0.5～80m
Safety level	: Class2
Max. output power	: 0.7～1.0mW

System

Type :ANDROID11.0(supports cloud update, APP update, etc.)

CPU

Type :Quad-core 2GHZ

Display

Type :Both-side 5.5 inch LCD 1280*720
Touch color capacitive display

Memory

Capacity :4GRAM+32GROM(8GRAM+128GROM optional)

Data transfer

Port :RS-232C,USB HOST,USB Type_C, Bluetooth, WIFI, SIM(optional)

Network

Type : Full netcom (4G optional)

Battery

Power	：Lithium battery
Voltage	：DC 7.2V
Capacity	：5.2Ah 37.44Wh
Working hours	：＞8h（angle and distance measurements every 30S at 25℃）
	：＞12h（only angle measurement at 25℃）

Environment

Operating	：－20℃～＋50℃
Protection grade	：IP55

Size & weight

Size	：185mm×230mm×360mm（including handle）
Weight	：＜5.5kg（including handle, battery and tribrach）

Appendix 1 :Atmospheric Correction Formula and Atmospheric Correction Diagram (for reference only)

Standard values for instrument settings:

temperature 20℃, air pressure 1013hpa, 0ppm

Atmospheric correction value is：

$$Kpt = 278.960 - 0.2902 * p/(1 + 0.0036 * t)$$

where ：

p-- air pressure value(hpa)

t-- temperature (℃)

Kpt-- Atmospheric correction value (ppm)

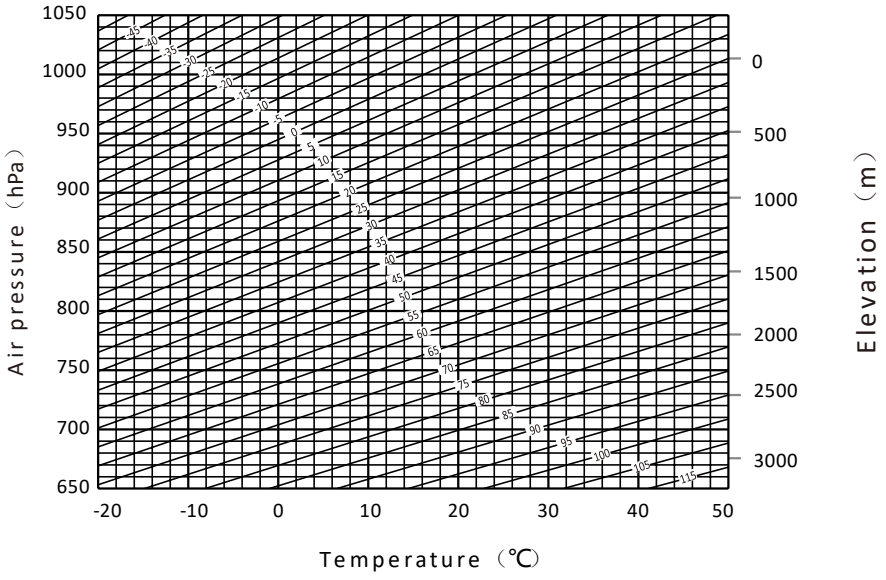
example:

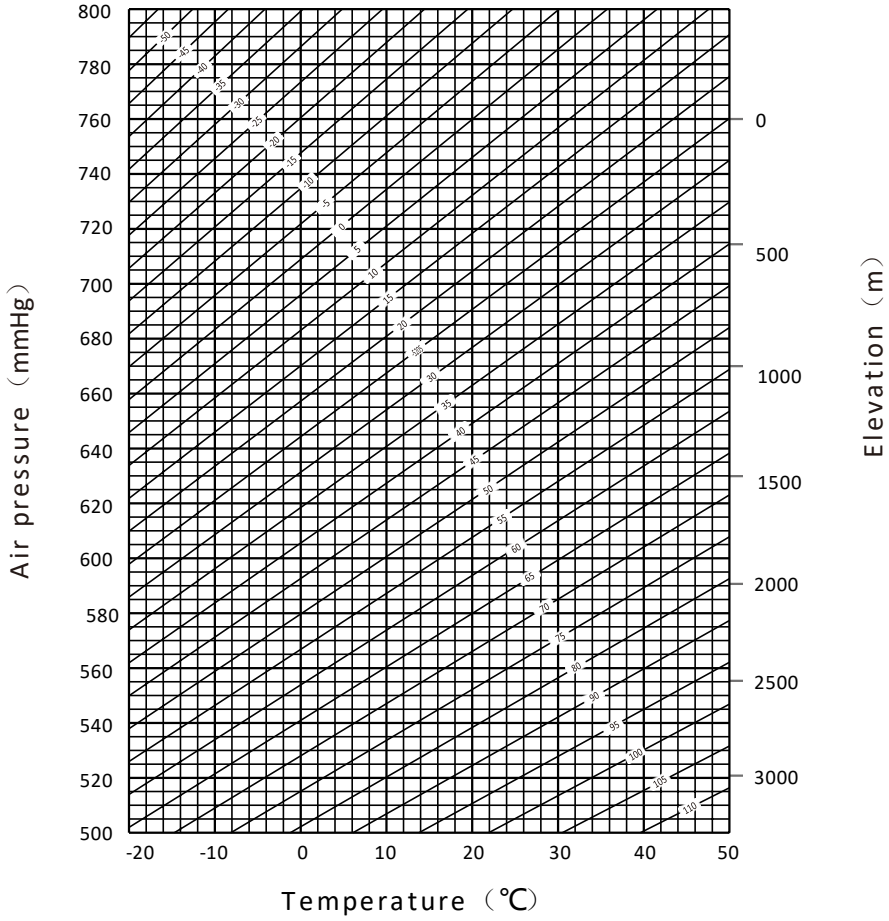
t=20℃，p=1013hpa，L0=1000m.

Then：Kpt=4ppm

$L = L0(1 + Kpt) = 1000 \times (1 + 4 \times 10^{-6}) = 1000.004m$

The atmospheric value is obtained easily with the atmospheric correction chart. Find the measured temperature in horizontal axis, and pressure in vertical axis on the chart.
Read the value from the diagonal line, which is the required atmospheric correction value.




Air pressure（mmHg）
800
780
760
740
720
700
680
660
640
620
600
580
560
540
520
500
-20
-10
0
10
20
30
40
50
Temperature（℃）
Elevation（m）
0
500
1000
1500
2000
2500
3000

Appendix 2 :Corrections for atmospheric refraction and the curvature of the Earth

Considering the ranging error caused by atmospheric refraction and the curvature of the earth, the instrument calculates the slope distance, horizontal distance and elevation difference according to the following formula, and automatically adds the earth curvature difference and the average atmospheric refractive correction (K= 0 . 14 or 0 . 20). The average calculation is relative to the occupied station elevation, not the prism station elevation.

$SD=D_0\times(1+ppm\times10^{-6})+mm$

SD--displayed slope distance（m）

D_0-- uncorrected distance（m）

ppm--Proportional correction factor(mm/km)

mm-- prism constant（mm）

$HD=Y-A\times X\times Y$

$VD= X + B \times Y^2$

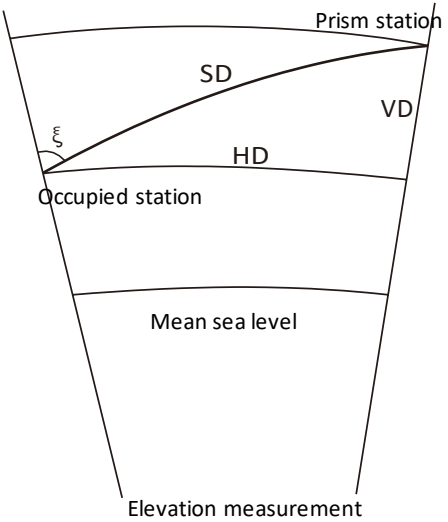
HD--horizontal distance（mm）

VD—height difference（mm）

$Y = SD*|Sin| \xi$

$X = SD*Cos\xi$

ξ — — zenith reading



$$A = \frac{1-K/2}{R}$$

$$B = \frac{1-K/2}{2R}$$

K = 0.142 or 0.20

$R = 6.37 \times 10^6$（m）

If the ranging error caused by atmospheric refraction and the curvature of the earth is not considered, the formula for calculating the horizontal distance HD and the vertical distance VD is as follows:

HD=SD*Cosξ VD=SD*lSinl ξ

Note: The atmospheric refractive coefficient of the instrument has been set to 0.142 before leaving the factory.

Appendix 3 :Disassembly of the tribrach

By loosening or tightening the lock lever knob, the instrument can be easily removed from the tribrach or mounted onto the tribrach.

- Dismount the instrument

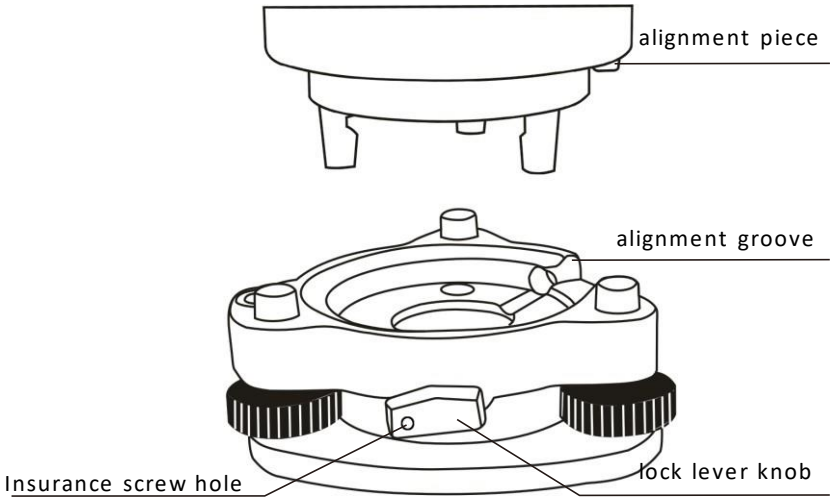
  (1) Rotate the tribrach knob in a counterclockwise direction to loosen the lock lever.

  (2) Hold the instrument handle with one hand and the tribrach with the other hand, and take out the instrument upwards.

- Mount the instrument

  (1) Hold the instrument handle with one hand and place the instrument on the tribrach, and align the lower alignment piece with the tribrach alignment groove.

  (2) Rotate the lock lever knob of tribrach clockwise to tighten the lock lever.



- Tighten the lock lever knob of tribrach

  The lock lever knob of tribrach can be locked to prevent it from being unscrewed inadvertently. This function is necessary if the upper part of the instrument does not need to be assembled and disassembled frequently. Simply use an accessory screwdriver to unscrew the insurance screw in the hole of the lock lever knob.

NOTE:
These designs, figures and specifications are subject to change without notice. We shall not be held liable for damages resulting from errors in this instruction manual.