RTS 350 Series

Total Station Instruction Manual

RTS352
RTS355

Version1.0e
English

Suzhou FOIF Co., Ltd.

Dear Customer:

Congratulations! We, FOIF are proud to present you with an RTS350 instrument. Your total station is a rugged and reliable instrument whose performance and design are not surpassed.

To fully appreciate and protect your investment, we suggest that you take the necessary time to read and fully understand this manual. We have a dedicated service organization. If the need arises, please don't hesitate to call us.

Thank you for your trust and confidence.

FCC Statement

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

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

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

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

NOTE:

Don’t collimate the sun directly

Avoid insolating the instrument, and don’t collimate the sun directly for protecting eyes and instrument.

Set up the instrument on the tripod

When using it please insure the connection between tripod and instrument is firm. It is better to work with wooden tripod for the measurement accuracy.

Assemble the tribrach on the instrument

The setting of tribrach would influence the accuracy. The tribrach should be check frequently, the screw which connects the tribrach and alidade must be locked tightly. And the central fixing screw should be tight.

Avoiding the librations on the instrument

When transporting, keep the instrument in the case and try your best to lighten librations.

Carry the instrument

When carrying， the instrument handle must be held tight.

High temperature condition

If put the instrument in high temperature condition for a long time, it is bad for the instrument performance.

Temperature changing sharply

The sharp temperature changing on the instrument or prism will shorten the distance measurement range, for example, after taking the instrument out from a warm car to a cold condition, wait for some time, it can be used when it adapts to the surrounding condition.

Check the battery power

Before using it, you should check the power whether it is enough.

Take out the battery

It is not suggested to take out the battery when the instrument is on, otherwise, the stored data may be lost, so it is better to replace the battery after power off the instrument.

Stored data responsibility

FOIF should not be held liability for the lost data because of wrong operation.

The noise from the instrument

When the instrument is working, it is normal if you hear the noise from instrument motor, it will not affect the instrument work.

Definition of Indication

For the safety of your product and prevention of injury to operators and other persons as well as prevention of property damage, items which should be observed are indicated by an exclamation point within a triangle used with WARNING and CAUTION statements in this manual.

The definitions of the indication are listed below. Be sure you understand them before reading the manual's main text.

⚠ WARNING:	Ignoring this indication and making an operation error could possibly result in death or serious injury to the operator.
⚠ CAUTION:	Ignoring this indication and making an operation error could possibly result in personal injury or property damage.

PRECAUTIONS FOR SAFE OPERATION

⚠ WARNING

●Only FOIF authorized distributors can disassemble or rebuilt the instrument.

●Do not collimate the sun directly. The eye injury or blind could result.

●Cover the charger maybe result fire when charging.

●If use defection power cable, socket or plug, there is danger of fire, or electronic shock.

●Using wet battery or charger maybe result fire, or electronic shock.

●Do not close the instrument to burning gas or liquid, and do not use the instrument in coal mine. Blast could be result.

●Do not put the battery in the fire or high temperature condition. Explosion, damage could result.

●If use the battery which is not specified by FOIF, there is a danger of fire, electric shock or burn.

●If use the power cable which is not specified by FOIF, there is a danger of fire.

●If short circuit of the battery, there is a danger of fire..

● When this product encounters disturbance of severe Electrostatic Discharge, perhaps it will have some degradation of performance like switching on/off automatically and so on.

⚠ CAUTION

- If touch the instrument with wet hand, there is danger of electric shock.
- Stand or seat on the carrying case, or turn over the carrying case arbitrarily, the instrument maybe damaged.
- Be careful of the tripod tiptoe when setup or move it.
- Drop the instrument or the carrying case, or use defective belt, agraffe or hinge, instrument damage could result.
- Do not touch liquid leaking from the instrument or battery. Harmful chemicals could cause burn or blisters.
- Please assemble the tribrach carefully, if the tribrach is not stable, series damage could result.
- Drop the instrument or tripod, series damage could result. Before use it, check the central screw is tight.

User

1) This product is for professional user only!
The user is required to be a qualified surveyor or have a good knowledge of surveying, in order to understand the user manual and safety instructions, before operating, inspecting or adjusting.
2) Wear the required protectors (safety shoes, helmet, etc.) when operating.

Exceptions from Responsibility

1) The user of this product is expected to follow all operating instructions and make periodic checks of the product's performance.
2) The manufacturer assumes no responsibility for results of a faulty or intentional usage or misuse including any direct, indirect, consequential damage, and loss of profits.
3) The manufacturer assumes no responsibility for consequential damage, and loss of profits by any disaster, (an earthquake, storms, floods etc.).
4) The manufacturer assumes no responsibility for any damage, and loss of profits due to a change of data, loss of data, an interruption of business etc., caused by using the product or an unusable product.
5) The manufacturer assumes no responsibility for any damage, and loss of profits caused by usage except for explained in the user manual.
6) The manufacturer assumes no responsibility for damage caused by wrong transport, or action due to connecting with other products.

Safety Standards for Laser(RTS series)

RTS350 series adopts the safe and visible laser on the basis of “Specification Standard of radiant products” (FDA CDRH.21CFR Part 1040.10 and 1040.11) and “Safety of laser products – parts 1: Equipment classification, requirements and user’s guide” (IEC 60825-1:2001).

According to above standards, RTS350 series is class ⅢIa/3R laser products. When the prism or reflective sheet is selected in Config mode as target, the output is equivalent to the safer class 1.

Once the instrument is damaged, do not disassemble it. You’d better contact FOIF or local dealer.

Labels

Follow the safety instructions on the labels as well as in this manual to ensure safe use .

Note for Safety

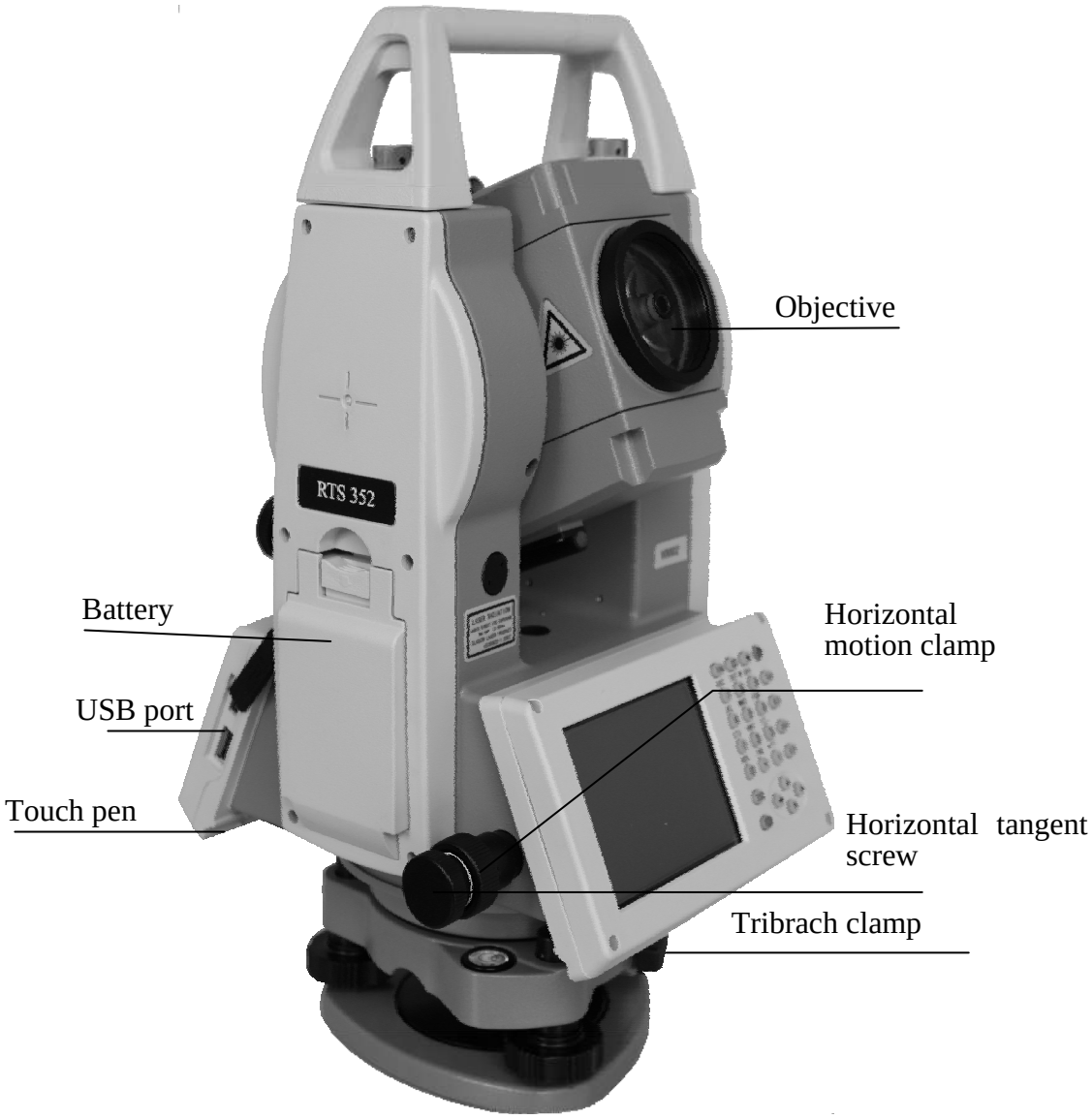
WARNING

- Never point the laser beam at other’s eyes, it could cause serious injury.
- Never look directly into the laser beam source, it could cause permanent eye damage.
- Never stare at the laser beam, it could cause permanent eye damage.
- Never look at the laser beam through a telescope or other optical devices, it could cause permanent eye damage.

CONTENT

1. Nomenclature and Functions

1.1 Nomenclature


Objective
RTS 352
Battery
Horizontal
motion clamp
USB port
Touch pen
Horizontal tangent
screw
Tribrach clamp

1.2 Keyboard

RTS350 series is equipped with two color touch screens and alphanumeric keypad, operation by both touching screen and pressing keyboard is possible.

Do not touch the screen with ball-pen, pencil or other sharp thing to avoid damage on instrument.

Keys	Name	Functions
0~9/ A~!	Alphanumeric keypad	Enter text and numerical values.
α	Shift key for character entry	The current entry method can shift among number, smaller letter and capital letter.
★	Star key	Normal configurations can be set here
Tab	Tab key	Move the cursor right or next position
BS	BackSpace key	Move the cursor left and delete one character
Ctrl	Ctrl key	Same with the Ctrl key of PC
Space	Space key	Enter the space
Enter	Enter key	Confirm an entry or selection
ESC	Escape key	Quit a screen or edit mode without saving changes. Return next higher level
FUNC	Function key	Perform variable functions defined by program screen
◄▲▼►	Navigation key	Control the focus bar within the screen and the entry bar within a field
①	Power key	Turn on/off the instrument

1.3 Main menu

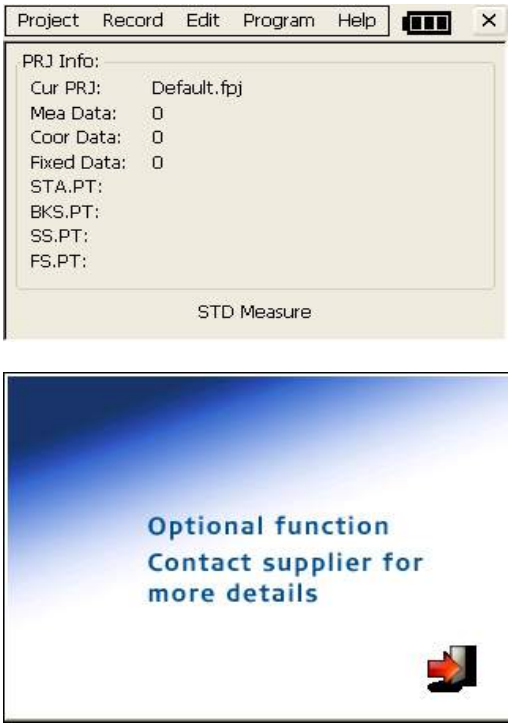
Function introduction	Display
After initiating the instrument the screen will go to present “Welcome Interface” which is shown right. FOIF AIOSurvey consists of several functions, that is, “BSC Measure（Basic Measurement）”, “STD Measure（Standard Measurement）”, “Engineering Surveying（FieldGenius）”, “INST Setup（Instrument Setup）” and “About（Relevant Information）”. FOIF AIOSurvey is applied for not only fundamental products like instruments of TS810 and RTS350 WINCE series total station, Gyroscope Station but also derivative products such as Robot Total Station, Imaging Total Station and Network Total Station(CAN/LAN).	

1.3.1 Basic Measurement

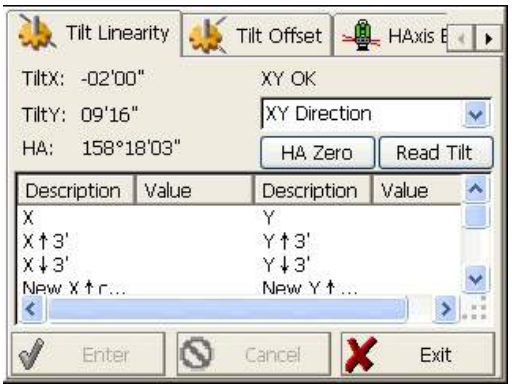
Function introduction	Display
Click “BSC Measure” key to activate basic measuring. This function is used for simple measuring and calculating, including angle measurement, distance measurement, coordinate measurement and parameter setting. Distance measurement mode underpins Remote Elevation Measurement and Line-height Measurement. Coordinate measurement mode includes Traverse Surveying, Angle Offset Measurement, Distance Offset Measurement, Plane Offset	

Measurement, and Column Offset Measurement. Besides, basic measurement is also used for performance testing for total station.	

1.3.2 STD Measurement(Optional)

Function introduction	Display
STD measurement function is used to resolve and calculate applied measurements during conventional surveying. It contains “project management”, “import/export”, “instrument station setup and orientation”, “foresight measurement”, “backsight measurement”, “side-looking measurement”, “cross-sectional measurement”, “setting out of point, bunch and alignment”, “road design”, “traverse adjustment”, “coordinate geometry”, “ batter board label”, “steel ruler connection survey”, “data query and editing” and so on. NOTE: This part is optional, it is normal to display as right figure.	

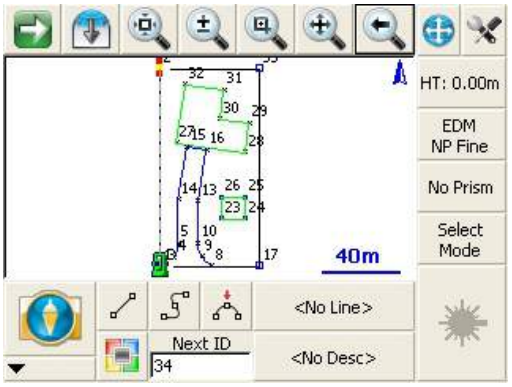
1.3.3 Instrument Setup

Function introduction	Display
Instrument setup function is mainly applied for instrument settings, instrument calibration and generation and management of instrument constant. It is made up of a series of functions such as “compensator linear correction”, “compensator zero correction”, “horizontal axis error correction”, “index correction”, “instrument settings”, “distance constant settings”, “communication port settings”, “configuration management”, etc.	

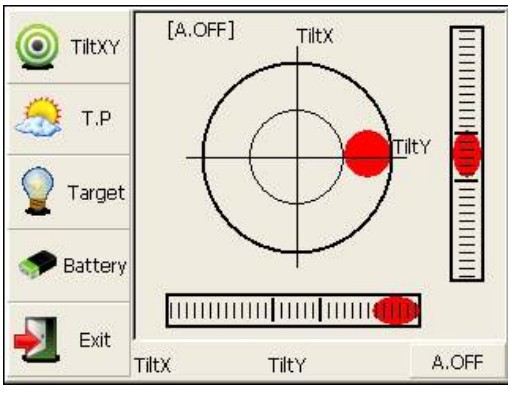
1.3.4 About

Function introduction	Display
The “About” function Offers information of manufacturer and software version.	

1.3.5 Professional field software

Function introduction	Display
RTS350 provides professional surveying and cartography program, such as “FOIF FieldGenius”. In fact, FOIF RTS350 supports more third-party softwares.	

1.3.6 Convenient panel

Function introduction	Display
Click 【★】 key to enter into convenient panel. Electronic bubble function on this panel is used for dynamic display of electronic bubble during leveling up.Furthermore,functions like settings of meteorological condition, observed object,illumination, prism constant and communication port are provided.	

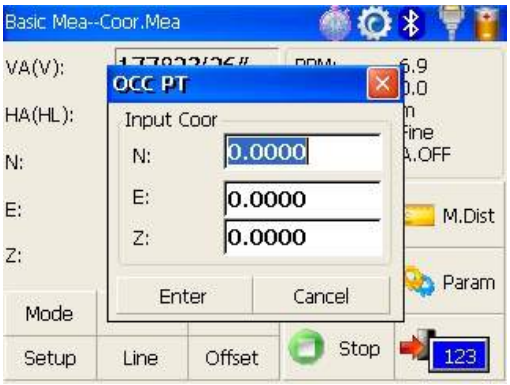
1.4 Shortcut key

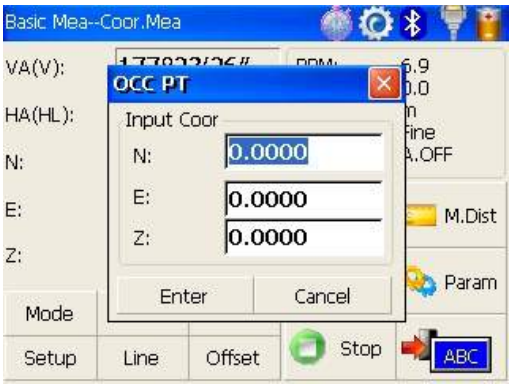
1)Some shortcut keys are applied in 350 series.

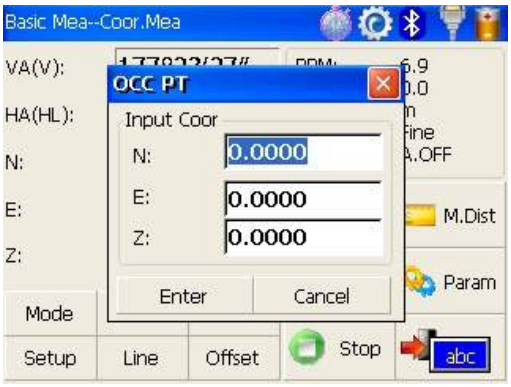
Key combination	Description
⊙	Power on/off
★	Enter into setting mode directly/turn on the electronic bubble
α	Shift among number, smaller letter and capital letter
FUNC+BS+⊙	Enter this combinition at the same time before starting up to backup all settings
FUNC+CTRL+⊙	Enter this combinition at the same time before starting up to restore all settings
FUNC+SP+⊙	Enter this combinition at the same time before starting up to erase all settings
FUNC+BS	Turn on/off backlight of key panel in face left position
FUNC+TAB	Turn on/off backlight of key panel in face right position
CTRL+ESC	Enter boot menu
CTRL+TAB	Start touch screen calibration
FUNC+CTRL	Turn on/off soft keyboards
FUNC+ ↑	Increase backlight brightness of LCD
FUNC+ ↓	Decrease backlight brightness of LCD
FUNC+←	Turn on/off LCD display in face left position
FUNC+→	Turn on/off LCD display in face right position

2) method for character entry switch

Press α key, current character entry mothod will be changed, on the lower right corner, the inputing method will display for a moment.

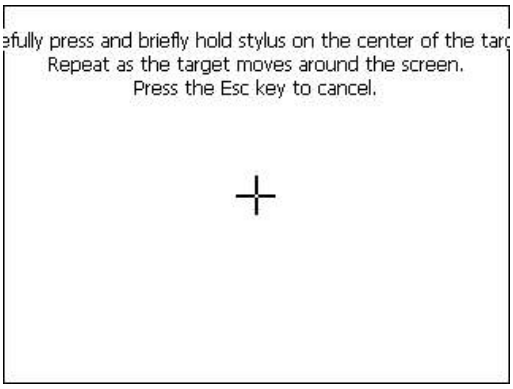




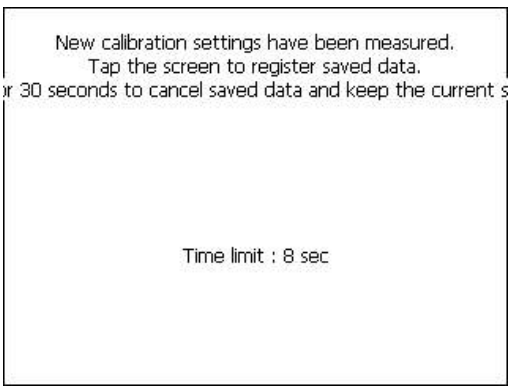


1.5 Touch screen calibration

When you operate on the screen, if your device isn't responding to you taps, you may need to recalibrate your screen. In any picture, press the combination key "CTRL+TAB" so as to enter into touch screen calibration. The calibration process is shown in the figure below.



1) Carefully press and briefly hold stylus on the center of the target. Repeat as the target moves around the screen.



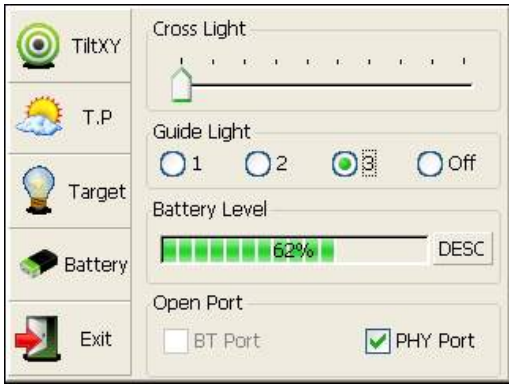
2) After all the targets are clicked, the screen will display as left, tap the screen to register saved data. The screen goes back to Stylus Properties menu.

1.6 Battery

1.6.1 Battery Power indicator

At any screen, press【★】key to open fast setting menu.

Select Battery, battery level will be seen following **Battery Level**.



NOTE:

1. The battery's working time will be affected by many factors, such as ambient temperature, recharging time, recharging and discharging times. So we suggest the users recharge the battery full or prepare several full batteries before operation.
2. The battery symbol only indicates power capability for current measurement mode. The power consumption in distance measurement mode is more than in angle mode, if the instrument enters into distance measurement mode from angle mode, the power maybe auto-off because of lower battery.
3. The symbol only indicates the supply power but not the instantaneous power change. And if the measurement mode changes, the symbol will not show the power's decrease or increase immediately.
4. It is suggested that user should check every battery power before field work.

1.6.2 Replace and mount battery

1.Replace battery

1）Press the button downward as shown left.

2）Remove the battery by pulling it toward you.

2.Mount battery

1. Insert the battery to the instrument.

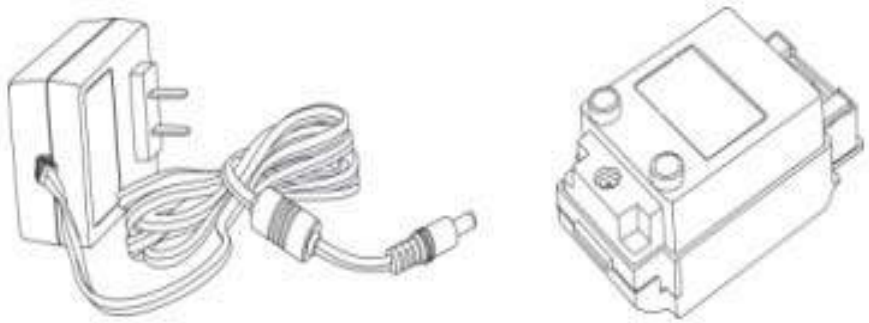
2. Press the top of the battery until you hear a Click.

1.6.3 Recharge battery

1)Connect the charger connector to the battery.

2)Plug the charger on 100V/240V power supply.The red lamp becomes lighting,which indicates recharging.If interval-time is longer,the connector isn't fixed well.

3) That the green lamp flashes means recharging is complete.



NOTE: 1) New battery (or battery does not used for several months) should be recharged for several times.Please recharge it more than 10 hours, and then the battery can attain best status.

2) Please recharge the battery continuously for another 1~2 hours after the light green,which is good for the battery.

1.7 USB connection

- The file in the instrument could be read through ActiveSync software by USB cable.
- External memory stick could be used by USB Host connector. The file in the external memory stick could be read in the instrument interface.

1）Open the cover of USB which behind the display panel；

2）Input external memory stick into USB Host connector；

3）The external memory stick could be recognized as hard disk automatically. It could be file copy etc.

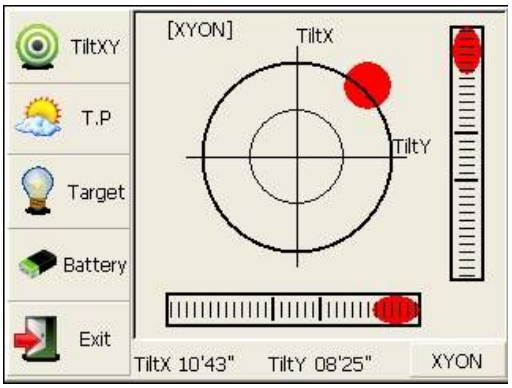
1.8 Guide light(Optional)

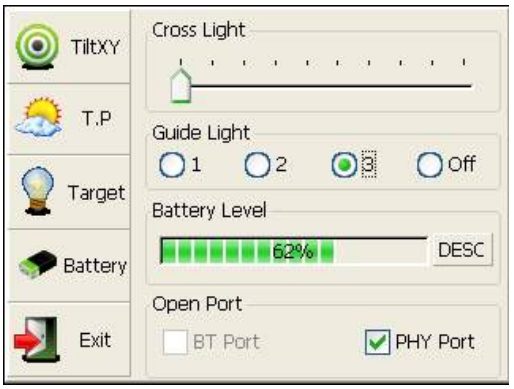
Guide light is optional in RTS350 series total station. It is mainly used to stake out. The Surveyor could adjust the position of prism and station through the guide light color. It will be faster to set the prism.

The guide light could be seen within 100M. The distance will be effective by atmospheric conditions and others.

Under the face left, the Surveyor should move to left direction when he only saw the green light or the light became bigger; If only saw the red light or red light became bigger, the surveyor should move to the right direction. The move direction will be contrary when the telescope is in face right.

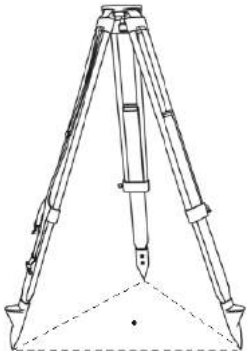
Guide light on/off: press【★】to open fast setting menu, select Battery, if the instrument is equipped with guide light module, 4 options for Guide light are active, ①②③ are for adjusting guide light intensity, select {Off} to turn off guide light.



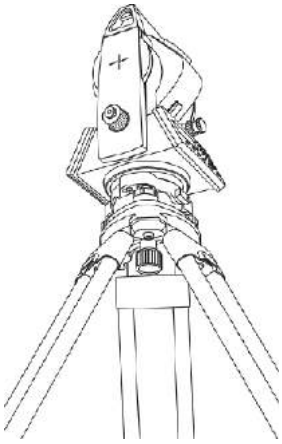


2. Preparation before Measurement

2.1 Setting up the instrument



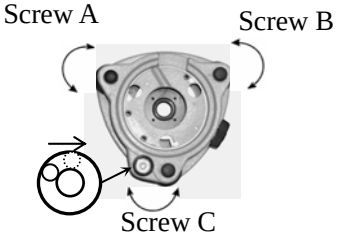
(1) Set up the tripod first: extend the extension legs to suitable lengths and tighten the screws on the legs.Make sure the legs are spaced at equal intervals and the head is approximately level. Set the tripod so that the head is positioned over the surveying point. Make sure the tripod shoes are firmly fixed in the ground.



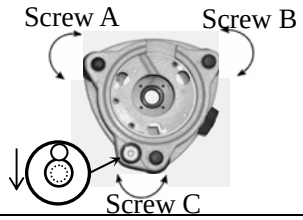
(2)Attaching the instrument on the tripod head: mount the instrument carefully on the tripod head. Supporting it with one hand, tighten the centering screw on the bottom of the unit to make sure it is secured to the tripod.

2.2 Levelling-Up

(1) Basic Levelling-Up with the circular level

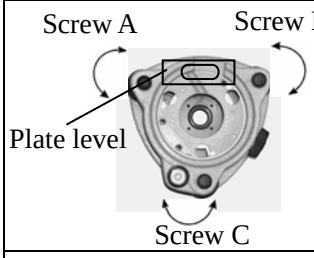
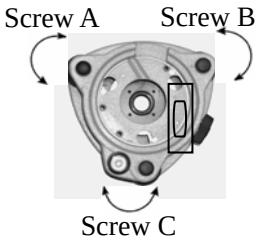


1. Move the foot screws A and B in opposite direction till the circular bubble is perpendicular to a line shaped with screw A and B. The direction of rotation in left thumb indicates the movement of the circular bubble.



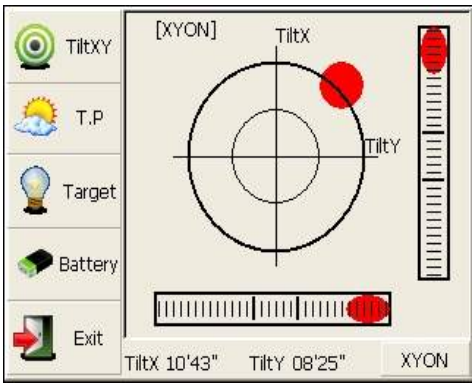
2. Move the bubble to the center of the circle by turning screw C.

(2) Accurate Levelling-Up with plate level

<table>
<tr>
<td> 
</td>
<td>1. Loosen the horizontal motion clamp, and turn the instrument till the plate level is parallel to a line shaped with screws A and B. Adjust the screws A and B to make the bubble in the center of the level.</td>
</tr>
<tr>
<td> 
</td>
<td>2. Loosen the horizontal motion clamp, and turn the instrument approximately 90°.Adjust the screw C until the bubble in the center of the level.</td>
</tr>
<tr>
<td></td>
<td>3. Repeat above steps until the bubble remains in the center of the plate level while the instrument is rotated to any position.</td>
</tr>
</table>

(3) Accurate Levelling-Up with Electronic Level on the screen

It is convenient for TS350 series to level-up with electronic level, especially when it is difficult to observe the circular level and plate level.



Firstly,press the key 【★】 to turn on the electronic bubble as shown in left figure.On the electronic bubble screen,five function keys are displayed in the left column,which is listed as follows:

【TiltXY】dynamic display of electronic bubble

【T.P】observation and setting of temperature and atmospheric pressure

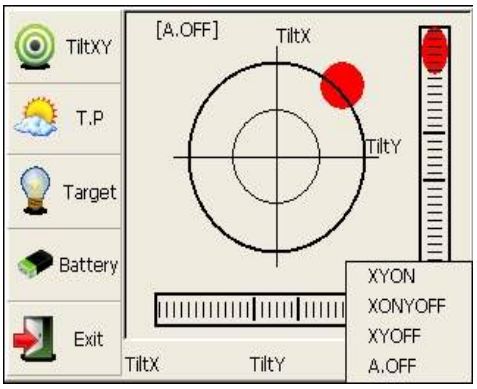
【Target】target condition of surveying

【Battery】dynamic display of battery level

【Exit】exit the electronic bubble screen

Secondly,level it by turning three foot screws and ensure the bubble is in the plate level.Make sure the red spot is in the center.

Note:



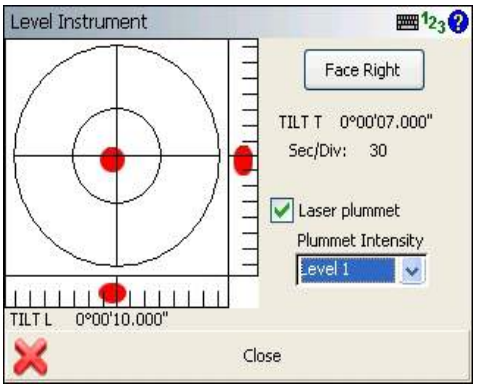
As shown,you can realize transformation of compensation options by pressing the lower right button.

【XYON】compensate horizontal angle and vertical angle at the same time

【XONYOFF】just compensate X axis

【XYOFF】don't compensate X axis and Y axis

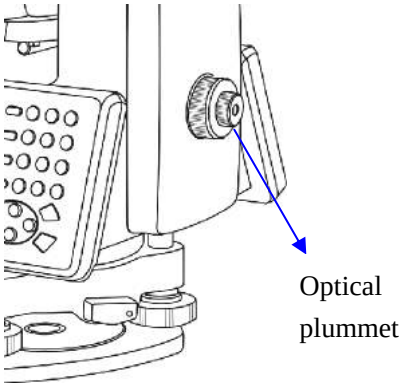
【A.OFF】don't compensate X axis and Y axis,and turn off the popup function of electronic bubble.

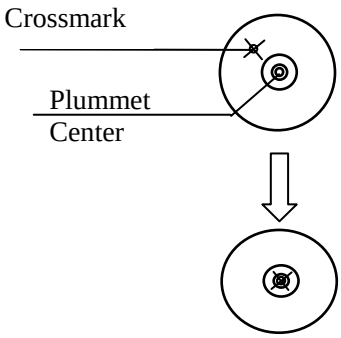


In FOIF FieldGenius software, the Level display is always shown as left figure.

2.3 Centering

2.3.1 Centering with Optical Plummet (Optional)

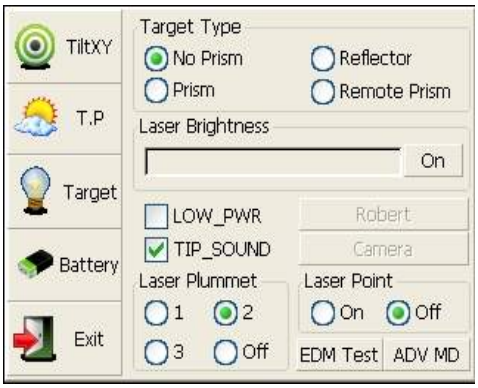




Turn the focusing ring of the optical plummet to focus the ground mark point. Then adjust three foot-screws to center the bubble of the circular level. If the plate level is not leveling-up, you can loosen the center screw of the tripod, and move the instrument to center the bubble of the plate level. At last tighten the center screw.Repeat above steps until the center of reticule always coincides with the mark point when rotating alidade of instrument.

Note: You'd better use the three leveling screws and tripod to center the instrument.

2.3.2 Centering with Laser Plummet



Press the key 【★】 to enter into the display as shown in the left figure.

Operation Steps:

①Click the "target" button,and you can turn on laser plummet and set it as three levels of brightness.Thus,that laser emits downwards can be seen.

② Loosen the center screw of tripod,and move the base plate on tripod head until the laser spot coincides with ground mark point.Then tighten the center screw.

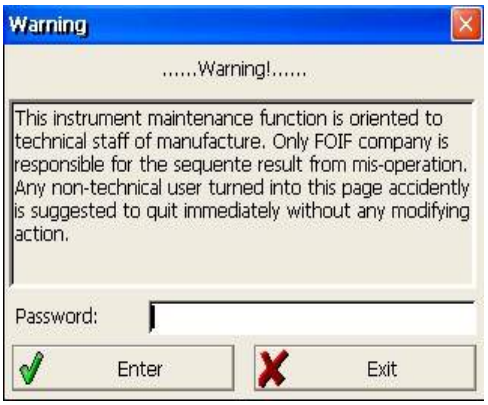
③Repeat leveling and two steps until the instrument keeps leveling and the laser spot coincides with ground mark point when rotating alidade of instrument in any direction.

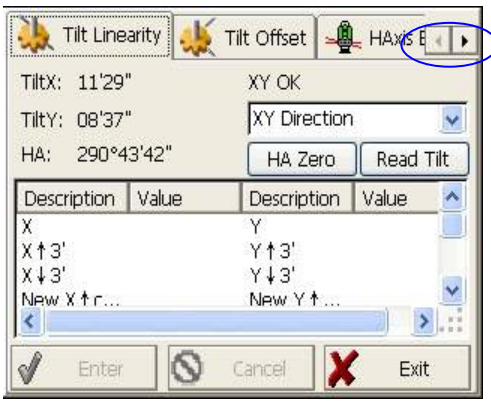
④After centering,please turn off laser plummet to save power.

3 Instrument settings

Instrument settings software is applied for settings and calibration of instrument,generation and management of instrument constant.It is made up of a serie of functions such as “compensator linear correction”, “compensator zero correction”, “horizontal axis error correction”, “index correction”, “instrument settings”, “distance constant settings”, “communication port settings”, “configuration management”,etc.

3.1 INST Setup





Tap ◄ or ► keys to display other settings

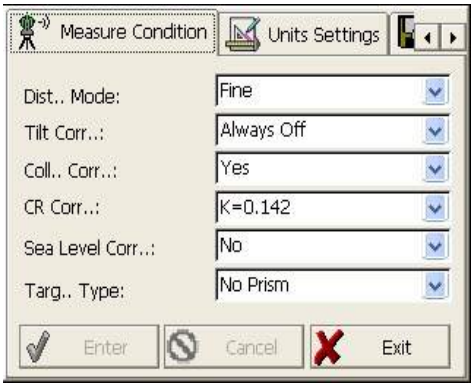
Enter “instrument settings” program by clicking “INST Setup” icon on the desktop.And then input the password “12345678” to display configuration settings screen.On the screen tap ◄ or ► keys, different setting screen can be shifted.

NOTE: This password is open for all users, current configuration settings can be checked here, but not be adjusted. If you want to adjust these settings, please contact local distributer or FOIF company.

3.1.1 Setting the measure condition

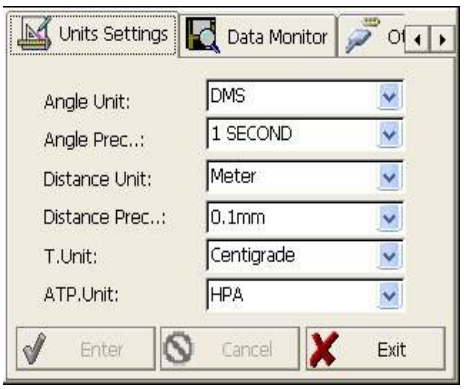
Opereation:

1. The distance measurement mode will be: Fine, Coarse, Repeat Fine, Average Fine, Tracking.



2. Tilt correction mode will be: HV, V, NO, Always off.
3. Collimator correction mode will be: Yes or No.
4. CR correction mode will be: K=0.142,K=0.2, No.
5. Sea Level correction mode will be: Yes or No.
6. Target Type mode will be: Prism, No Prism, Reflector.You could press “Enter” to keep the setting or press cancelled.

3.1.2 Setting the units

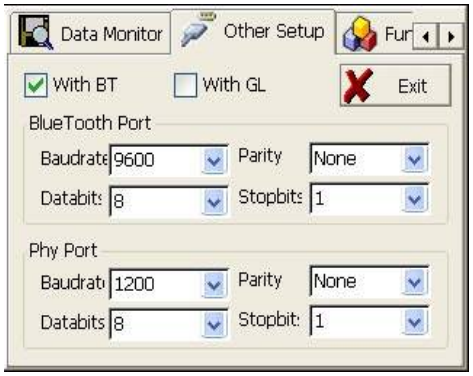


Operation:

1. Angle unit mode will be:DMS,GON,MIL.
2. Angle Precision mode will be: 1 second, 0.1 second or 0.5 second.
3. Distance Unit mode will be: Meter, US Feet, Feet.
4. Distance precision mode will be: 1mm or 0.1mm.

You could press “Enter” to keep the setting or press cancelled.

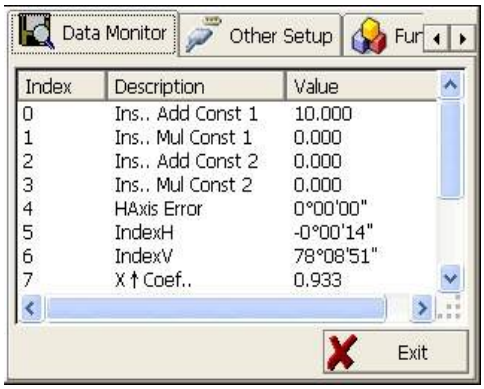
3.1.3 Setting parameters of communication ports



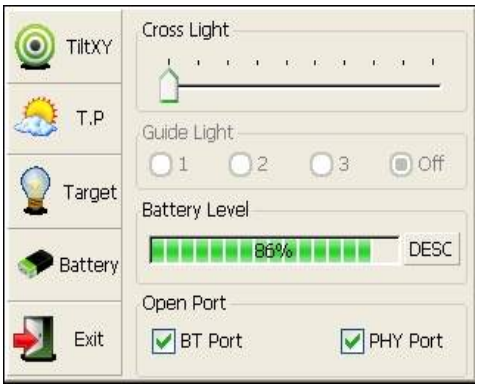
As left shows,click “Other Setup”,you can activate bluetooth(BT) and guidelight(GL),and set parameters of “Bluetooth Port” and “Phy Port”.

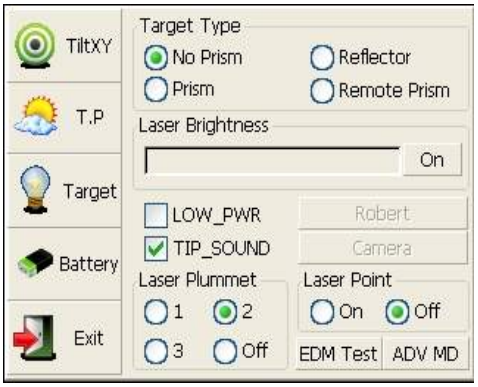
3.1.4 Instrument parameters review

Click “Data Monitor” used for reviewing the setting parameters.



3.2 Illumination settings





Press the【★】 button and click “Target” and “Battery” keys in order to go on with illumination settings including “Cross Light”, “Guide Light”,and“Laser Point”.

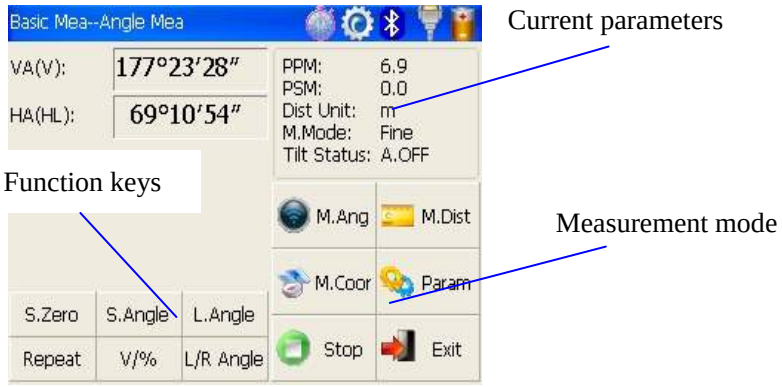
Cross Light: Click this item to turn on the reticle illumination, and move the slipping button to adjust reticle illumination.

Guide Light:Click “Battery” key,resulting in display on which guide light could be adjusted.

Laser Point: Tun on/off the laser flash before distance measurement.

4. Basic measurement program

4.1 Run the program “Basic Measurement”



4.2 Basic measurement screen introduction

The function keys display in the lower left corner of screen,and they vary from one measurement mode to another.There are some function keys under every measurement mode being listed in the following table.

Measurement mode	key	function
M.Ang	S.Zero	Set current horizontal angle as zero
	S.Angle	Set current horizontal angle
	L.Angle	Lock horizontal angle
	Repeat	Retest horizontal angle
	V/%	Switch between vertical angle and percent grade
	L/R Angle	Horizontal angle switch between left and right
M.Dist	Mode	Set Fine,N Fine,Loop Fine,Track measurement mode
	m/ft	Switch among meter,international feet and American feet in terms of distance unit
	Setout	Set out measurement mode
	REM	Start REM function
	MLM	Start MLM function
	LHM	Start LHM function
M.Coor	Mode	Set Fine,N Fine,Loop Fine,Track measurement mode
	OCC PT	Set the coordinate of instrument station
	S.BS	Set the coordinate of a backsight point

	Setup	Set instrument height and target height
	Line	Start traverse surveying
	Offset	Start offset measurement(ANG.Offset,DIST Offset,PLANE Offset,CYL.Offset) function
	Coor Order	Set displayed coordinate order as NEZ or ENZ
	Save Coor	Save coordinate of instrument station or not
	Ang.Unit	Set Ang.Unit as DMS,GON,MIL
	Dist Unit	Set Dist Unit as m,UsFeet,IntFeet
	Stop	Stop distance measurement
	Exit	Exit basic measurement program

4.3 Angle measurement mode

4.3.1 Horizontal angle(right angle) and vertical angle measurements

At first, make sure the operation is under angle measurement mode.

Operation steps	Keys	Display
① Collimate the first target A	Collimate A	

②Set horizontal angle as zero for target A.Click the “S.Zero” button,and choose “OK” in the popup dialog box.	【S.Zero】 【OK】	
③Collimate the second first target B,and the horizontal angle and vertical angle will display on the screen of instrument.	Collimate B	

4.3.2 Horizontal angle switch between right and left

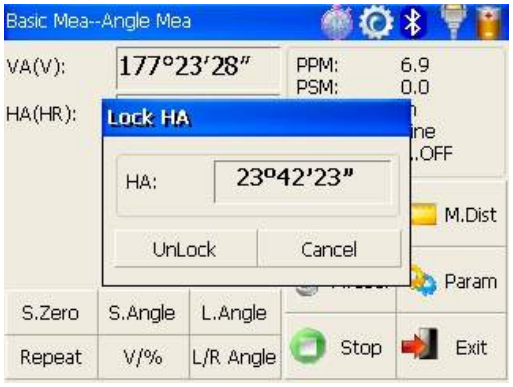
Make sure the operation is under angle measurement mode.

Operation steps	Keys	Display
①Make sure the operation is under angle measurement mode		

②switch horizontal angle between left and right by Clicking “L/R Angle” key ※1	【L/RAngle】	
※1 Left angle or right angle will be switched in turn every time you click the “L/R Angle” key.		

4.3.3 Setting horizontal angle with the “L.Angle” key

Make sure the operation is under angle measurement mode.

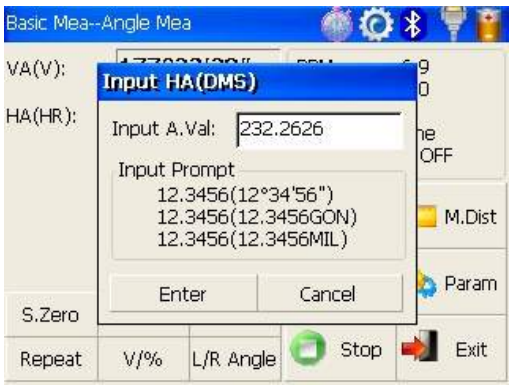
Operation steps	Keys	Display
①Turn horizontal circle unit in the needed direction with horizontal clamp and tangent part.		
②Click “L.Angle” key,and activate the function of locking horizontal angle.	【L.Angle】	

③Collimate target point used for Orientation. ※1		
④Click “unclock” key to deactivate the function of locking horizontal angle.Then the screen will return normal angle measurement mode,and meantime horizontal angle will be set as locked angle.	【Unlock】	
※1 Click “Cancel” key before it returns to Previous mode.		

4.3.4 Setting horizontal angle with the “S.Angle” key

Make sure the operation is under angle measurement mode.

Operation steps	Keys	Display
①Collimate target point used for Orientation.		

②Click “S.Angle” key, and a dialog box will be ejected, as is showed in the right figure. ③Input horizontal angle you need. ※ 1 Such as：232°26'26"	【S.Angle】 input horizontal angle	
④With data entry complete，click “Enter” key,and angle measurement after orientation will go on.	【Enter】	
※1 Data entry should be refered to the format shown in the dialog box.		

4.3.5 Setting “vertical angle and percent grade” mode with the “V/%” key

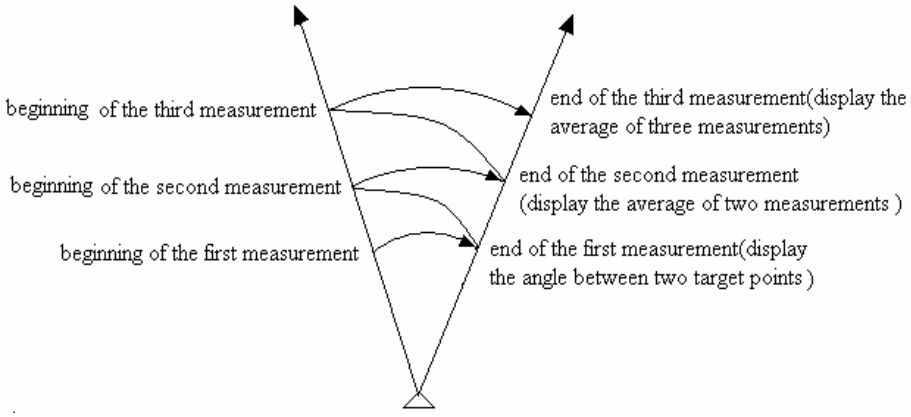
Make sure the operation is under angle measurement mode.

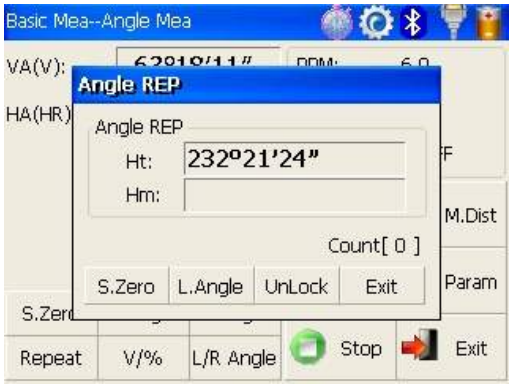
Operation steps	Keys	Display
①Make sure the operation is under angle measurement mode.		

②Click “V/%” key. ※1	【V/%】	
※1 Vertical angle and percent grade will be switched in turn every time you click “V/%” key.		

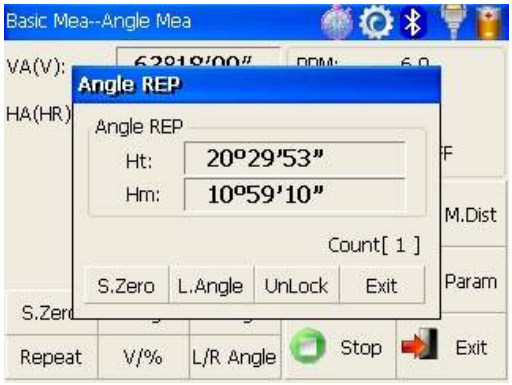
4.3.6 Carrying out angle retesting with the “Repeat” key

This program is applied for adding up angle retesting values，displaying the sum and the average of all observed values,and meantime recording the number of observations.



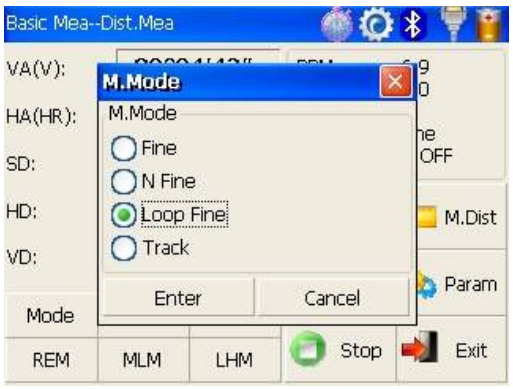
Operation steps	Keys	Display
①Click “Repeat” key,and activate angle retesting function.	【Repeat】	
②Collimate the first target A.	Collimate A	
③Click “S.Zero” key,and set horizontal angle as zero.	【S.Zero】	

④Collimate the second target B using horizontal clamp and tangent part.	Collimate B	
⑤Click "L.Angle" key.	【L.Angle】	
⑥Collimate the first target A again using horizontal clamp and tangent part. ⑦Click "Unlock" key.	Collimate A again 【Unlock】	

⑧Collimate the second target B again using horizontal clamp and tangent part. ⑨Click “L.Angle” key.And then the screen displays the sum and the average of all angles. ※1	Collimate B again 【L.Angle】	
⑩Repeat steps ⑥～⑨ according to the requirement,and carry out angle retesting. ※2		
※ 1 Click “Exit” key to finish angle retesting ※ 2 Ht:the sum of multiple observed values Hm: the average of multiple observed values		

4.4 Distance measurement mode

4.4.1 Distance measurement and measuring mode setting

Operation steps	Keys	Display
①Collimate the centre of prism.	Collimate	
②Click "M.Dist" key to enter distance measurement mode, and then the system will carry out measurement based on previous setting mode.	【M.Dist】	
③Click "Mode" key to activate setting function of distance measurement mode. Take "Loop Fine" as example here. **Fine**: single fine measuring mode **N Fine:** n times fine measuring mode **Loop Fine**: Continuous measuring mode **Track**: tracking measuring mode	【Mode】	

④Display the result of measurement. ※1～※2		
※ 1 Click "mode" key if you wanna change measurement mode,as step ③ shows. ※ 2 Click "M.Ang" key to return angle measurement mode.		

4.4.2 Fine/Tracking distance measurement

When you preset the measuring times, the instrument will carry out distance measurement and display the average distance according to the setting times. If you preset single observation, the average distance won't be displayed. In general, the factory default is set as single observation.

Operation steps	Keys	Display
①Under distance measurement mode,click "Mode" key to activate setting function of distance measurement mode. The default setting is "single observation".	【Mode】	

<table>
<tr>
<td>②Click “N Fine” key with stylus,and then input the number of needed observations in the upper right column of screen.</td>
<td>【N Fine】 input the number of observations</td>
<td> 
</td>
</tr>
<tr>
<td>③Click “Enter” key, collimate the centre of prism,and then the system will carry out measurement based on previous setting. ※1</td>
<td></td>
<td> 
</td>
</tr>
<tr>
<td colspan="3">※1 Click “M.Ang” key to return angle measurement mode.</td>
</tr>
</table>

4.4.3 Accurate Measurement and Track mode

Accurate Measurement mode:it's a normal measurement mode.
Track mode: Track mode takes less time than accurate measurement.It is mainly applied for setting-out survey and useful for tracking moving target.

Operation steps	Keys	Display
①Collimate the centre of prism.	Collimate prism	
②Click "Mode" key to activate setting function of distance measurement mode.And this mode is set as "Track".	【Mode】	
③Click "Enter" key,collimate the centre of prism,and the system will carry out measurement based on previous setting.	【Enter】	

4.4.4 Exchange of distance units

Change distance unit on the screen of distance observation.

Operation steps	Keys	Display
①Click “m/ft” key.	【m/ft】	
②Changed distance unit will display in the upper right corner. ※1		
※1 Distance unit will be exchanged among meter,american feet and international feet every time you click “m/ft” key.		

4.4.5 Distance stake out measurement

This function can display the difference between measured distance and preset distance.

Displayed Value=Observed Value – Standard(Preset) Distance

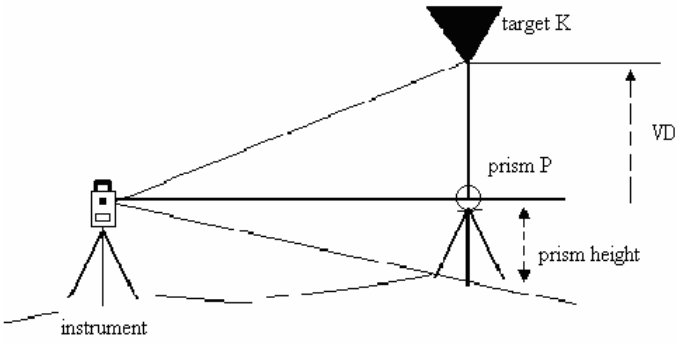
Setting out among all sorts of distance measurement modes(such as slope distance, horizontal distance and elevation difference) can be carried on.

Operation steps	Keys	Display
①Click “Setout” key under distance measurement mode.	【Setout】	
②Select distance measurement mode (SD,HD,VD)to be set out, input required data and then click “Enter” key. ※1		
③Start setting out.		
※1 First of all,a prompt that reminds you to input SD to be set out is displayed in the popup dialog box. Click “Enter” key to execute SD setting out after inputing data。If you want HD setting out,need to input zero in “SD dialog box”, click “Enter”,and the system will eject “HD dialog box” automatically. HD setting out can go on after HD data entry. If you want VD setting out,need to input zero in both “SD dialog box” and “HD dialog box”, thus the system will remind you to input elevation difference to be set out.		

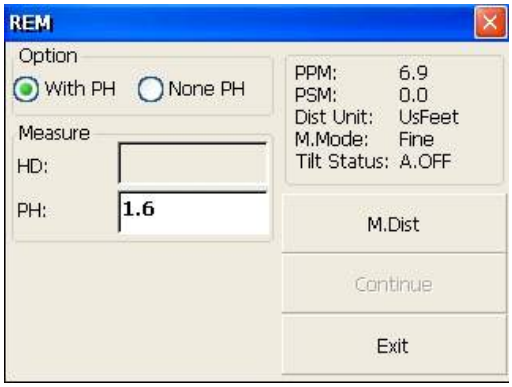
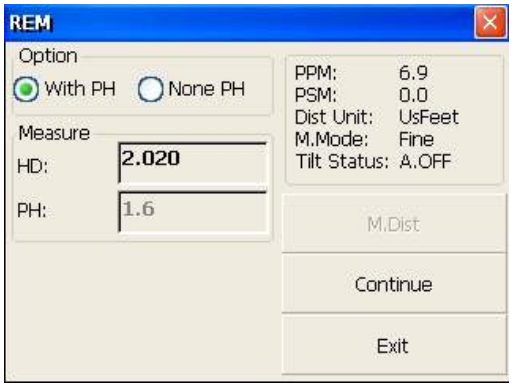
4.4.6 Remote Elevation Measurement（REM）

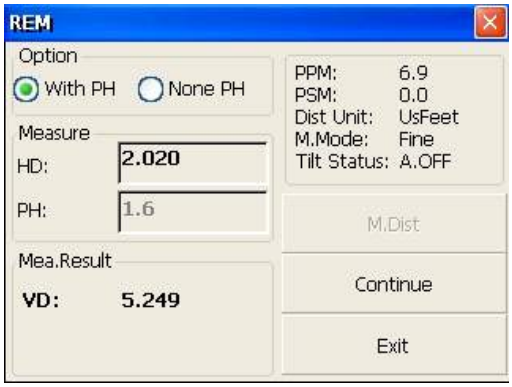
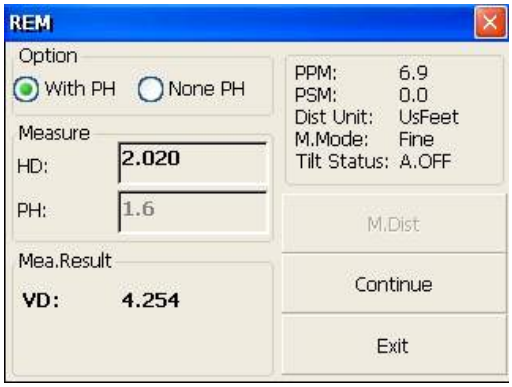
The Remote Elevation program calculates the vertical distance (VD) of a remote object relative to ground. When using a prism height, the remote elevation measurement will start from the prism (reference point). If no prism height is used, the remote elevation will start from any reference point in which the vertical angle is established. In both modes, the reference point should be perpendicular to the remote object.

1) With prism height (PH) input

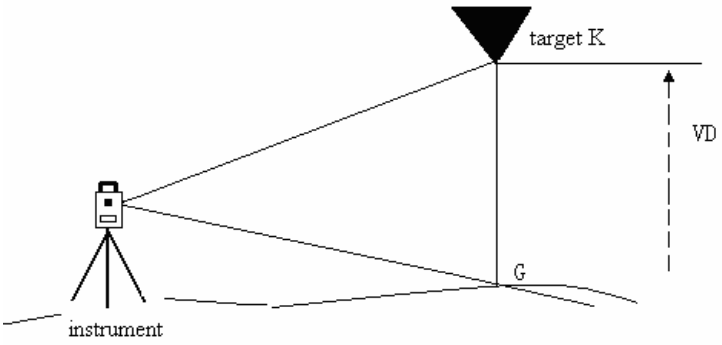


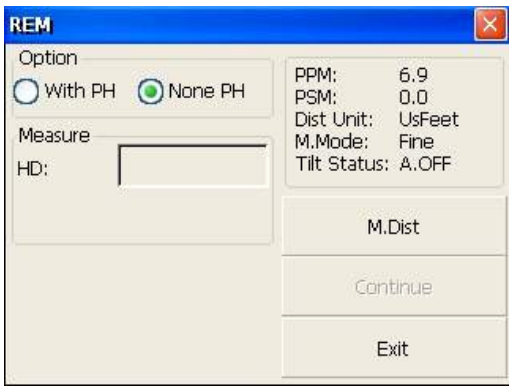
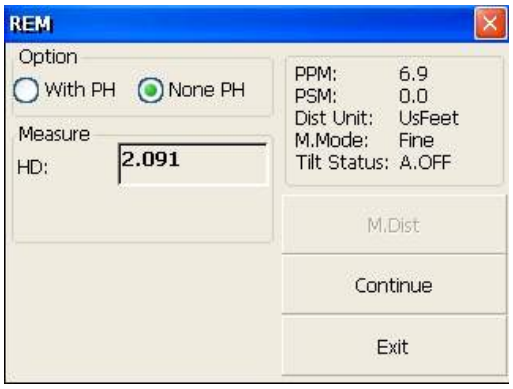
Operation steps	Keys	Display
①Under distance measurement mode, click “REM” key to activate remote elevation measurement.	【REM】	

②Select “with PH” button with stylus.	【with PH】	
③Input the prism height following PH.	Input prism height	
④Collimate the centre P of prism. ⑤Click “M.Dist” key to start measuring. ⑥Horizontal distance between instrument and prism will be shown.	Collimate prism 【M.Dist】	

⑦Click “Continue” key, and position of prism is locked, that means reference point is confirmed.	【Continue】	
⑧Collimate target K and click “Continue”, vertical distance (VD) will be shown. ※1)	【 Collimate K】	
※1)Click “Exit” key to finish REM.		

2)without prism height input



Operation steps	Keys	Display
①Select “None PH” button with stylus.	【None PH】	
②Collimate the ground point. ③Click “M.Dist” key to start observing. ④Horizontal distance between instrument and prism will be shown.	Collimate prism 【M.Dist】	
⑤Click “Continue” key, and position of ground point G is locked that means reference point is confirmed.	【Continue】	

⑥Click “Continue” key.	【Continue】	
⑦Collimate remote target K.Vertical distance(VD) will be shown. ※1)	Collimate target	
※1) Click “Exit” to finish REM.		