MENU

Thank you for choosing multi-functional theodolite NT-023.
Please read the user manual carefully before use.

1. PRECAUTIONS

a. Do not collimate the objective lens directly to the sunlight without a filter.
b. Do not store the instrument in extremely high or low temperature, to avoid the sudden or great change of temperature.
c. When the instrument is not in use, store it in the case and avoid shock, dust and humidity.
d. If there is great difference between the temperature in work site and that in store place, you should leave the instrument in the case till it adapts to the temperature of environment.
e. If the instrument has not been used for a long time, you should remove the battery for separate storage. The battery should be charged once a month.
f. When transporting the instrument should be placed in its carrying case, it is recommended that cushioned material should be used around the case for support.
g. For better accuracy, the instrument should be set up on a wooden tripod rather than an aluminum tripod.
h. Clean exposed optical parts with degreased cotton or less tissue only!
i. Clean the instrument surface with a woolen cloth after use. If it gets wet, dry it immediately.
j. Before turning on, inspect the power, functions and indications of the instrument as well as its initial setting and correction

parameters.

k. Unless the user is a maintenance specialist, do not attempt to disassemble the instrument by yourself even if you find the instrument abnormal.

l. Do not aim the laser beam to eyes.

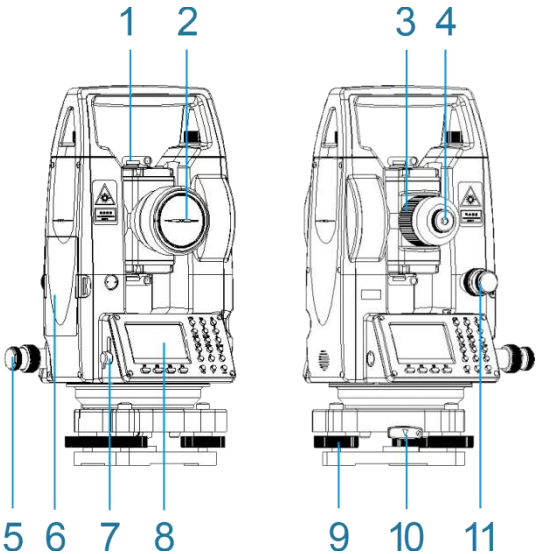
m. Keep the screen clean. Do not scratch the screen with sharp objects.

n. This product belongs to the Level II laser products. It fully meet the requirements of:

- IEC60825-1:2007
- GB 7247.1-2001

o. Don’t staring at the laser beam or aiming the others. The laser is harmful to the eyes.

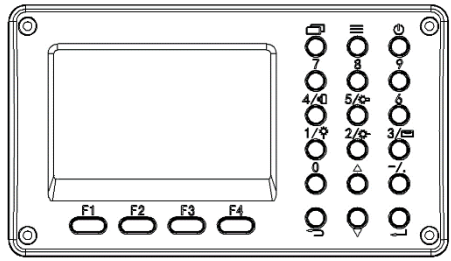
2. PART NAMES



1. Collimator	2. Objective Lens
3. Focusing Screw	4. Telescope Eyepiece
5. Horizontal Tangent Screw	6. Battery
7. RS232 Interface	8. Display Unit
9. Tribrach	10. Tribrach Lock
11. Vertical Tangent Screw	

3. OPERATION

3.1 Keys



Keys	Function
	Shift among 3 main functions (ANG/DIST/AXES)
	Menu
	Power
1	Number 1/ Shortcut to set the laser plummet
2	Number 2/ Shortcut to set the laser pointer
3	Number 3/ Shortcut to set the compensation on Axis X (N)
4	Number 4/ Shortcut to set distance measurement mode
5	Number 5/ Shortcut to set backlight and sound
6-9,0	Number 6, 7, 8, 9, 0
	ESC
	Enter
▲▼	Move up and down/ Turn page
-/.	Input – or .

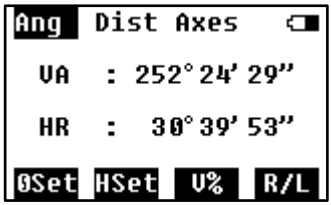
3.2 Abbreviation

VA	vertical angle
HA	horizontal angle
V%	degree or gradient display
HL/HR	horizontal left/right angle
VD	vertical distance
HD	horizontal distance
SD	slope distance
hPa	unit of air pressure: hectopascal
mmHg	unit of air pressure: millimeter of mercury
inHg	unit of air pressure: inch of mercury
m	unit of distance: meter
ft	unit of distance: feet
gon	unit of angle
mil	unit of angle
°C	unit of temperature: degree Celsius
°F	unit of temperature: degree Fahrenheit

4. ANGLE MEASUREMENT

The function of angle measurement covers measuring and displaying vertical and horizontal angles (VA and HL/HR), 0 set, horizontal set (HSet), switching to slope (V%), switching Face Right and Face Left (R/L), etc.

4.1 Angle



0Set:	Set the current angle to 0°.
HSet:	Input an angle to set as the current horizontal angle.
V%:	degree or gradient display
R/L:	Shift Face Left and Face Right.

4.2 HSet

Press HSet to go the screen of setting horizontal angel.

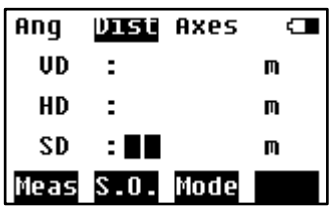
Input a value of the angle to set as the current horizontal angle. And press OK to confirm.

5. DISTANCE MEASUREMENT

The function of distance measurement covers measuring and displaying vertical distance (VD), horizontal distance (HD), slope distance (SD), stake out (S.O.), and setting of measuring mode (Mode), etc.

5.1 Distance

Aim at the center of the target prism through the optical eyepiece by adjusting the focus, and press Meas to start the distance measurement.



Meas:	Start to measure the distance.
S.O.:	Start to stake out the distance.
Mode:	Set the measure mode

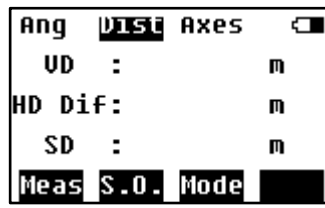
5.2 Stake Out (S.O.)

Input a distance to stake out. It could be a vertical distance, horizontal distance or slope distance, by pressing Shft to shift the

mode.

Shft:	shift the distance type to stake out
←:	delete
→:	move right
S.O.:	Save the input value and continue to stake out.

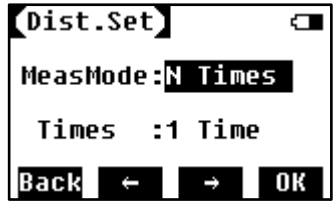
Display of Stake Out Result



HD Dif:	The distance difference between the current horizontal distance and the horizontal distance about to stake out.

5.3 Mode

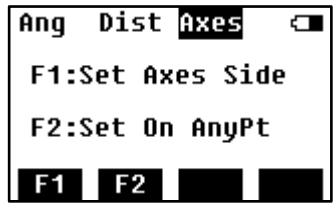
This setting is to change the mode of measurement and measure times.



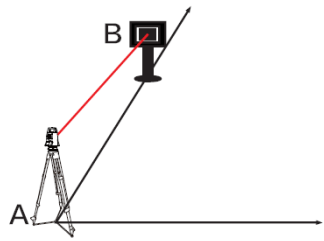
6. AXES STAKE-OUT

This session is to introduce the stake-out of the point by entering the offset to a baseline. There're 2 options to define the baseline. One is to define by station point and a known bearing angle (0°00'00"), one is to define by two new points.

Press F1 or F2 to select.

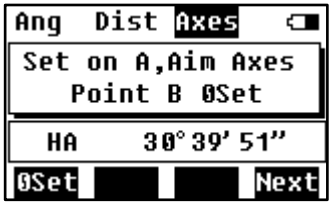


6.1 Stake Out of One Side on the Axes

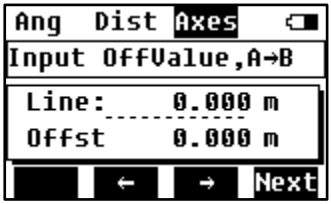


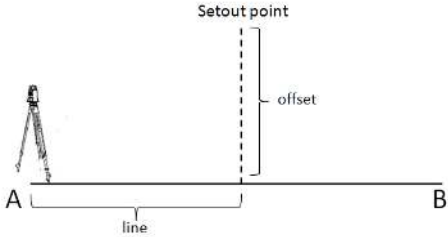
Step 1: Set the theodolite at Point A.

Step 2: Aim at the prism which is set at Point B and press OSET to set it to 0°. Then press NEXT to enter the next screen.



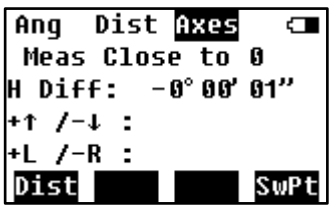
Step 3: Input two offset value.





Line	Offset value along the axes from Point A to B. (it is a designed value)
Offst	Offset value perpendicular to the axis. (it is a designed value)

Step 4: Press F1 to measure. Move the prism according to the indications on the screen, until all the values on the screen are 0.

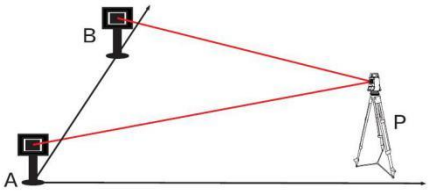


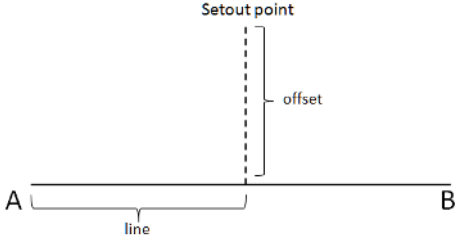
H Diff	the angle difference between "the HA of staking out point" and "the HA of

	current target”
+↑/-↓	offset of perpendicular to the axis
+L/-R	offset along the axis
SwPt	Return to input offset to start a new point.

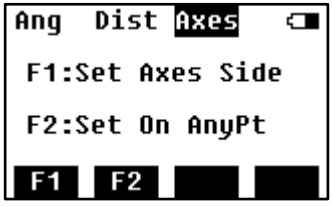
6.2 Stake Out of Any Point

Stake out in this mode can set the theodolite at any point outside the axis.

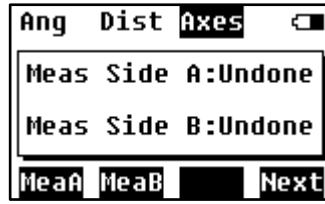




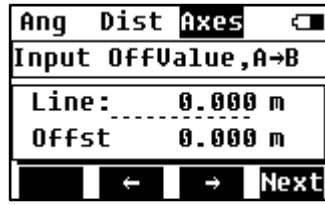
Select F2.



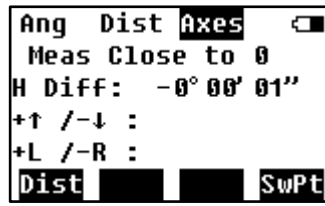
Step 1: Measure the distance to Point A and B, then press F4 to next step.



Step 2: Input the line and offset values, press F4to next step.

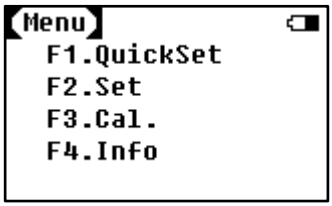


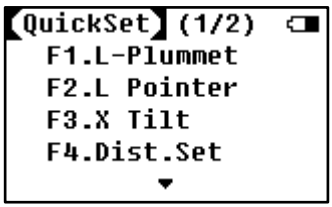
Step 3: Press F1to measure. Indicate the poleman to move the prism according to the indications on the screen, until all the values on the screen are 0.

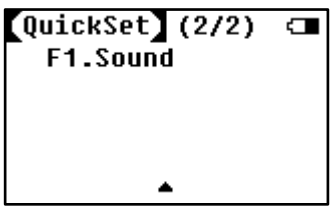


7. QUICK SETTING

Press Menu key and F1 Quick set to enter this page. There're 5 settings in QuickSet: laser plummet, laser pointer, compensation on X axes, distance setting, backlight and sound.

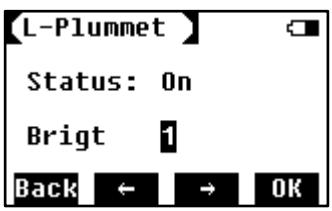






7.1 Laser Plummet

Press F1 for laser plummet setting. You can also set the brightness grade for the plummet.

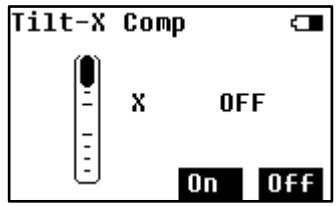


7.2 Laser Pointer

Press F2 to turn on laser pointer.

7.3 Compensation on X axis

Turn on and off the compensation on X axis, and check the tilt value.

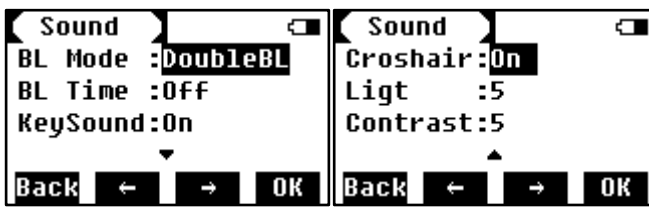


7.4 Distance Setting

Set the prism constant, measure mode and measure times under the distance setting page.

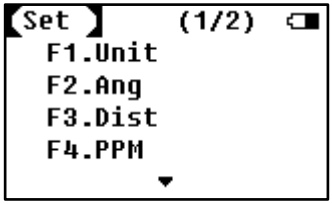
7.5 Backlight and Sound

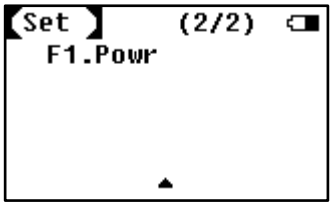
Set the screen backlight, beep of pressing key, crosshair backlight.



8. SETTING

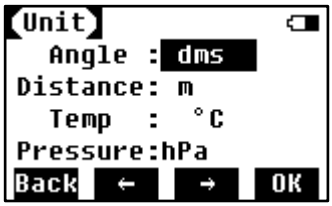
Press Menu, then F2 to enter the SET page. It covers 5 settings: unit, angle, distance, PPM, and power set.





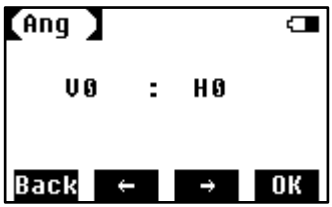
8.1 Unit

Set the units of angle, distance, temperature and air pressure.



8.2 Angle

Set the display of vertical angle.



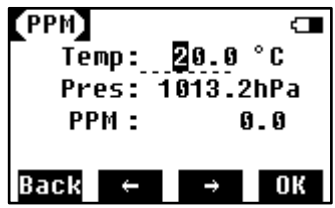
8.3 Distance

Set the scale and height for distance measurement.

Scale	Scale factor
Ht	Elevation of the station point

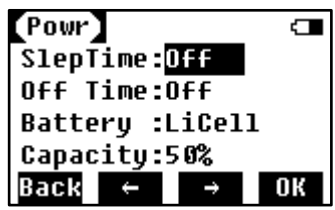
8.4 PPM

Set parameters related to temperature and air pressure.



8.5 Power

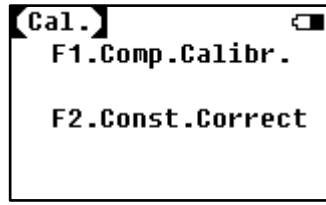
Set the sleep time/ off time. Check the battery capacity directly.



SlepTime	Time to enter to sleep mode if no operation.
Off Time	Time to power off if no operation.

9. CALIBRATION

Press F3 Cal. Into the calibration mode. This program is to calibrate the errors and correct additive constant.



9.1 Calibrate i Angle

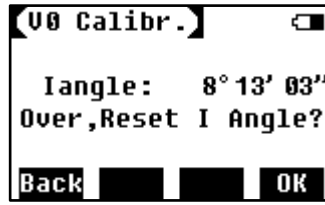
i angle is also referred to the vertical index difference.

Step 1: On Face Left, collimate the crosshair center in a collimator, and adjust the focus until it is clear. Press OK to proceed to next step.

Step 2: Turn the theodolite to Face Right, and collimate the same crosshair center in the collimator until it is clear. Press OK to proceed to next step.

Step 3: The equipment will show the index difference. Press OK to

confirm and calibrate. Caution: If the difference is too large, the system will suggest resetting the i angle. Press OKto continue, or Backto return to the calibration again.



Tips: If necessary, please repeat the calibration of i angle according to the steps above.

9.2 Correction of Additive Constant

Caution: Do not change the constant if unnecessary.

The additive constant is relatively stable. We suggest inspecting it once or twice a year. You can follow the following steps to do a quick inspection and correction.

Inspection

Step 1: Set the instrument on a flat ground, mark it as Point A. Along the vertical crosshair, mark Point B and C with a space of 50m on the same line. Set reflectors on Point B and C precisely.

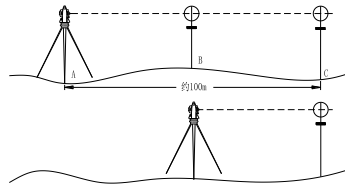
Step 2: Set the temperature and air pressure in the system, and measure the horizontal distances of AB and AC accurately.

Step 3: Set the theodolite on Point B and level it precisely. Measure the horizontal distance of BC accurately.

Step 4: Now we can get the additive constant by the following formula.

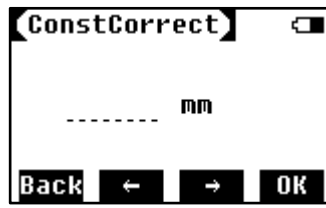
K=AC-(AB+BC)

K should be close to 0. If |k|>5mm, the theodolite should be delivered to professional workshop which has standard baseline to calibrate.



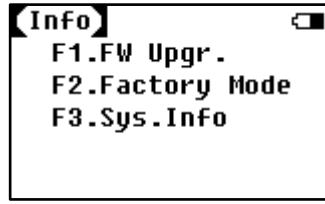
Correction

According to the formula, input the K value in the following screen.



10. INFORMATION

Press F4 Info in the menu page. Here you can upgrade firmware and check the system information.

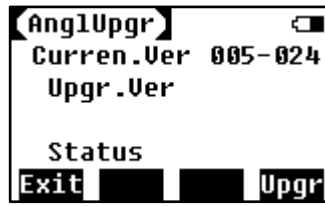


10.1 Firmware Upgrade

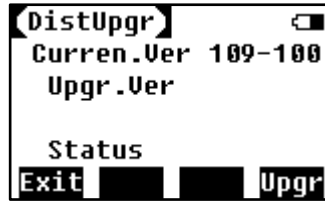
Firmware upgrade includes angle system and distance system. Press F1 to enter the firmware upgrade page.

It is required to connect the theodolite with computer via RS232 serial interface.

Angle Upgrade



Distance Upgrade

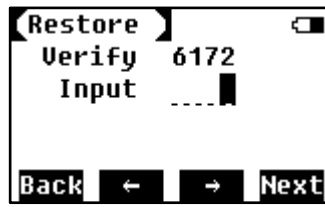


System Upgrade

Hold key 1, and press power to enter to system upgrade. Follow the operation on PC upgrading software.

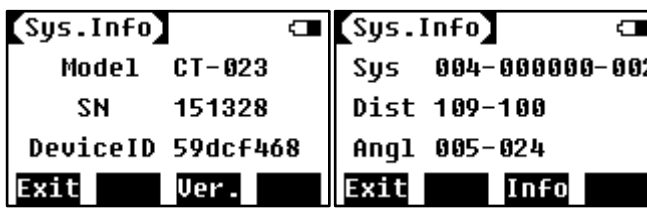
10.2 Factory Mode

Press F2 to enter the factory mode and reset to default setting. Input the password to proceed.



10.3 System Information

Press F3 to check the system information. The model name, serial number, device ID, system version, distance version and angle version shown on it.



11. SPECIFICATION

TELESCOPE	
Image	Erect
Magnification	26.5X
Aperture (telescope)	40mm
Aperture (distance)	45mm
Resolution	3”
Field of View	1°30”
Min. Focusing	1.5m
Length	155mm
LASER	
Wave Length	635±20nm
Class	II
Diameter of Laser Dot	5mm/100m
Accuracy	10”
ANGLE	
Type	Absolute Encoding
Diameter of Disk	79mm
Detecting Method	Horizontal: dual; Vertical: dual
DISTANCE	
Reflecting Target	Single Prism
Range	300m
Accuracy	±(3mm+2ppm*D)
Time	Continuous: 0.35s; Fine: 1.5s
Atmospheric Correction	Manual input, auto correct.
Prism Constant Corr.	Manual input, auto correct.
LEVEL	

Plate Vial	30”/2mm
Circular Vial	8’/2mm
COMPENSATOR	
Type	Single Axis
Range	±3’
Resolution	3”
LASER PLUMMET	
Type	Class II visible red laser
Wave of Length	635±20nm
Accuracy	1.5mm (when HT 1.5m)
Diameter	2.5mm (when HT 1.5m)
DISPLAY	
Type	160*96 Dot Matrix
Size	2.7 inch
POWER	
Type	Li-on
Voltage	7.4V
Working Time	8h
ENVIRONMENT	
Working Temperature	-20°C - +50°C
SIZE & WEIGHT	
Size	165 X 160 340 mm
Weight	4.7kg

12. ERROR CODE

Category	Message	
Angle Problem	UpperV ERR	
	LowerV ERR	
	HL ERR	
	HR ERR	
	V CCD Error	
	H CCD Error	
	V Rotate ERR	
	H Rotate ERR	
Distance Problem	ERR32	Dimmer motor error
	ERR33	High-voltage error
	ERR35	Internal light path error
	ERR38	Internal light path error
	ERR41	Temperature sensor error

When you see error message, please power on the theodolite again. If it is not solved, return to your local dealer for further inspection.