



STONEX D1 Digital Level

User Guide



*STONEX D1 Digital Level – User Guide
Ver. 2 – Rev. 2 (December 2015)*

Table of contents

1. What is in the box.....	4
2. Introduction.....	5
3. Technical specifications	6
4. Preliminary operations.....	8
4.1 Parts of the instrument.....	8
4.2 Remove and recharge the battery.....	9
4.3 Buttons function.....	10
4.4 Bar-code leveling staff.....	10
5. General operation	11
5.1 Instrument set up	11
5.2 Levelling-up.....	11
5.3 Sighting and focusing	11
5.4 Optical reading on staff	11
5.5 Azimuth measuring.....	12
5.6 Electronic reading	13
5.7 Measuring error types	14
6. Instrument settings	15
6.1 Unit setting	15
6.2 Auto Off setting.....	16
6.3 Repeated measurement setting	17
6.4 Setting of positive staff and reverse staff.....	18
6.5 Setting of measuring times	19
7 Check and adjustments	21
7.1 Tripod.....	21
7.2 Circular bubble.....	21
7.3 Electronic i angle check and adjust.....	22
8. Instrument maintenance.....	24
8.1 Cleaning and Drying.....	24
8.2 Storage.....	24
8.3 Transportation.....	24
8.4 Check	24
9. Copyrights, warranty and environmental recycling	25
9.1 Safety Recommendations	29

1. What is in the box

	Stonex D1 Digital Level instrument unit	N.1
p/n 30-350551	BT32, Li-Ion battery, 7.4V, 2.000mAh	N.1
p/n 30-350502	FDJ6-L1, battery charger 110/220V for BT32/BT82/BT 43	N.1
N/A	B3120, flexible barcode tape (2m)	N.1
N/A	Silica gel	N.1
N/A	Plastic Rain cover	N.1
N/A	Wrench (2.5mm)	N.1
N/A	Wrench (3mm)	N.1
N/A	Adjusting pin	N.1
	User Guide (ENG)	

Available barcode staffs (to be ordered separately, not included in the bundle)

p/n 30-070051	B2620, high accuracy fiberglass staff, 2m, 1 segment, barcode on side 1, mm on side 2
p/n 30-070053	B2650, aluminium staff, 5m, 4 segments, barcode on side 1, mm on side 2

2. Introduction

Thank you and congratulations for your choice and confidence in STONEX.

STONEX D1 Digital Level is a rugged and reliable tool that will cut your working times and any possible typing and reading error.

To fully appreciate your new Digital Level we suggest to read and fully understand the User manual.

In case you need additional explanations, please contact your local Stonex Dealer or forward the request to Support@stonex.it.

Product identification.

The model and the serial number are on the right side of the instrument. Please enter the S/N in the following field refer to this information when you contact your Dealer or the STONEX Support/Service.

Product: STONEX D1 Digital Level - Serial N.: _____

STONEX D1 digital level is designed with a new coding technology, which maximize work efficiency and minimize typing and staff reading errors, providing consistent measurement precision and speed, regardless of operator skill.

Stonex D1 is the perfect levelling instrument for general construction engineering, deformation surveys, agricultural water conservancy and geodetic leveling. Using the accurate Stonex fiberglass staff, Stonex D1 can be used for Third and Fourth-order Geodetic leveling networks.

The fast and accurate automatic compensator gives always high accuracy measurements and working efficiency. The instrument's working temperature is between -20°C and +50°C.

3. Technical specifications

ACCURACY

Standard Deviation (1 km double run - ISO 17123-2)	
Electronic measurement	±1.5mm (1)
Optical measurement	±1.5mm (1)
Distance measuring accuracy	D ≤10m <±10mm D >10m <±0.2 %×D (1)

ELECTRONIC MEASUREMENT

Time for single measurement	< 2s
Measuring range	2-80m
Measuring mode	single, tracking

DISPLAY RESOLUTION (mm/ft)

Height	1/0.01
Distance	10/0.1

TELESCOPE

Image	Erect
Magnification	28x
Clear objective aperture	45mm
Field of view at 100m	2.6m
Shortest focusing distance	0.8m

AUTOMATIC COMPENSATOR

Working range	15'
Setting accuracy	±0.4"

POWER

Battery (B31-1400)	Li-ion, 2000mAh, 7.4V rechargeable
Continuous operation time	Approx. 40 hours

MEASURING PROGRAMS

On-board programs	DH, inverse staff measurement, i error checking and adjustment
-------------------	---

OTHERS

Display	Segment display
Keyboard	Function key board,6 keys
Interface	RS-232C
Sensitivity of circular level	8'/2mm
Water and dust protection	IP54
Operating temperature	-20°C ~ +50°C
Net weight	2kg, battery included

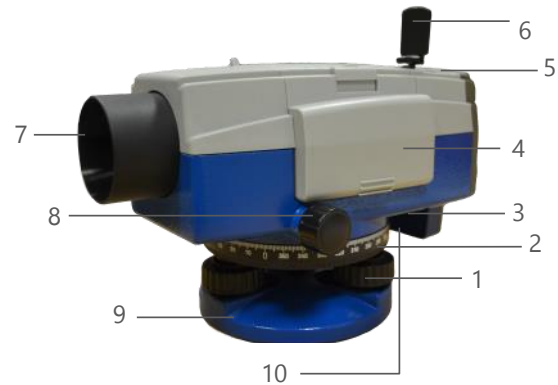
(1) using Stonex fiberglass staff p/n 30-070051

Specifications subject to change without notice

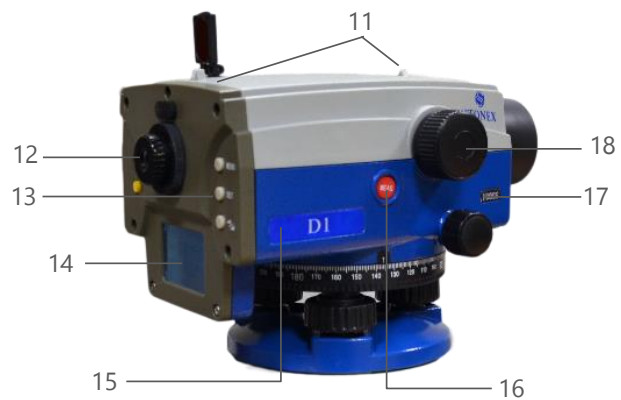
4. Preliminary operations

4.1 Parts of the instrument

1. Footscrew
2. Horizontal circle
3. Adjusting screw for circular bubble
4. Battery
5. Circular bubble
6. Mirror
7. Objective
8. Horizontal movement knob
9. Bottom plate
10. Compensator check button



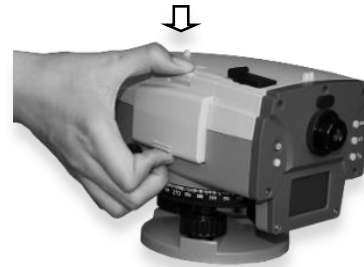
- 11 Gunsights
- 12 Eyepiece ring
- 13 Keyboard
- 14 Display
- 15 Model label
- 16 Trigger key
- 17 Serial number
- 18 Focusing knob



4.2 Remove and recharge the battery

Removing the battery

Press the buckle and pull out the battery.




Recharging the battery:

- Insert the charger jack into the plug of the battery;
- insert the charger into a 100VAC-240VAC (50-60Hz) plug,
- check if the the LED is lite (RED).

As the recharge is completed, the LED turns green. This takes about 3-4 hours.



 **Caution:** the battery charger is intended **for indoor use only.**

 **Note:**




1. New batteries need to be fully charged and discharged several times to reach their best performances; the first charge should be not less than 10 hours, continuing the charge even when the led is green;

3. LED behavior:

- RED lit: charging in progress;
 - GREEN lit: charging completed;
 - RED Flashing: no-loading, connection failed or defective battery.
-

4.3 Buttons function



Key	First Function	Second Function
	Power on/off	
	Backlight on/off	
MENU	Enter and shift setting menu	Change settings
SET	Save settings	
	Change display mode for distance and height	Return to previous menu
MEAS	Start measuring	

4.4 Bar-code leveling staff

Digital level D1 electronic readings require a specific bar-code staff. The best leveling precision is reached using accurate fiberglass one section bar-code staffs. Anyway even aluminium foldable staff and the coded band included in the basic set can be used for less accurate leveling operations.

 **Note**

Only Stonex barcoded staff must be used with D1; staffs from any other producer give no electronic reading of the staff itself.

5. General operation

5.1 Instrument set up

Position a solid tripod – aluminium or wooden – on a suitable place around in the middle of the levelling base, and firmly fix it on the ground; the tripod head should be leveled as flat as possible, to minimize the levelling procedure using the bubble on the instrument.

Carefully take the instrument from the transport case and place it on the tripod head. Support it with one hand, and tighten the 5/8" centering screw of the tripod on the bottom of the unit to make sure it is secured to the tripod.

5.2 Levelling-up

Once the instrument is fixed on the tripod, turn the footscrews to make it perfectly leveled. As the bubble is in the middle of the circular level, the instrument is pretty leveled.

The bubble image can be directly observed through the mirror (N. 6, pag.7)

5.3 Sighting and focusing

Before to aim to the staff, it is necessary to focus the telescope crosshair. Aim the telescope toward a bright background and turn the eyepiece ring (N. 12, pag. 7) until the crosshair appears sharp and absolutely black.

Then aim to the staff sighting through the gunsights (N. 11, pag.7), and turn the focusing knob (N.18, pag.7) until the staff image appears sharp and is free from parallax with respect to the crosshair, i.e. there should be no apparent movement between the horizontal crosshair and a staff graduation when the observer moves his eye slightly up and down.

Finally turn the instrument with the horizontal movement knob (N.8, pag.7) until the vertical crosshair is exactly aimed on to the centre of the staff.

5.4 Optical reading on staff

After sighting the staff, check whether the circular bubble is in the middle, and press the compensator button (N.10, pag.7) to check whether the compensator is working properly.

Read out the value through eyepiece according to the position of horizontal crosshair on the staff.

Then read out the millimeter value on the display which is within a centimeter interval and relevant to horizontal crosshair. When strong wind or ground vibration happens, the Surveyor should support the center of tripod with hands so as to make it more stable.

In order to compute the horizontal distance, the following procedure is necessary:

Read out the values of top line and bottom line of stadia hairs. Calculate the distance from instrument to staff, that is, $L=100 \times l$.

 **Note:**

l: Distance between top line and bottom line in the cross hairs.

L: The distance from target to instrument.

100: Multiplication factor of telescope.

In the right figure, the difference between the upper (1.648) and the bottom (1.588) line is 0.060m, thus the horizontal distance is $0.060 \times 100 = 6.0\text{m}$.

Optical reading of horizontal crosshair is: 1.618m.

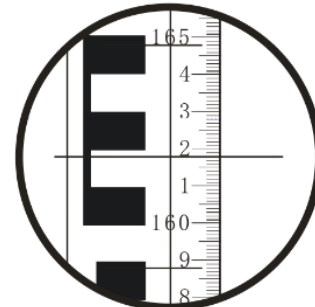
Optical reading of top line is: 1.648m.

Optical reading of bottom line is: 1.588m.

Imaging information on staff:

Optical reading of elevation is: 1.618m.

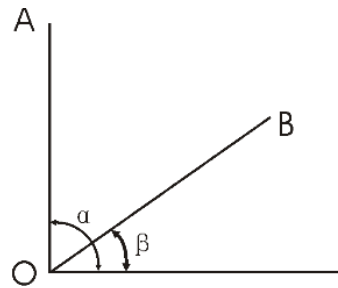
Horizontal distance is: 6.0m.



Imaging information on staff

5.5 Azimuth measuring

Collimate target A with vertical crosshair, the angle value of horizontal index plate is X, rotate the instrument, and collimate target B, the angle value of horizontal index plate is Y, then $\angle AOB = X - Y$.



Azimuth measuring

5.6 Electronic reading

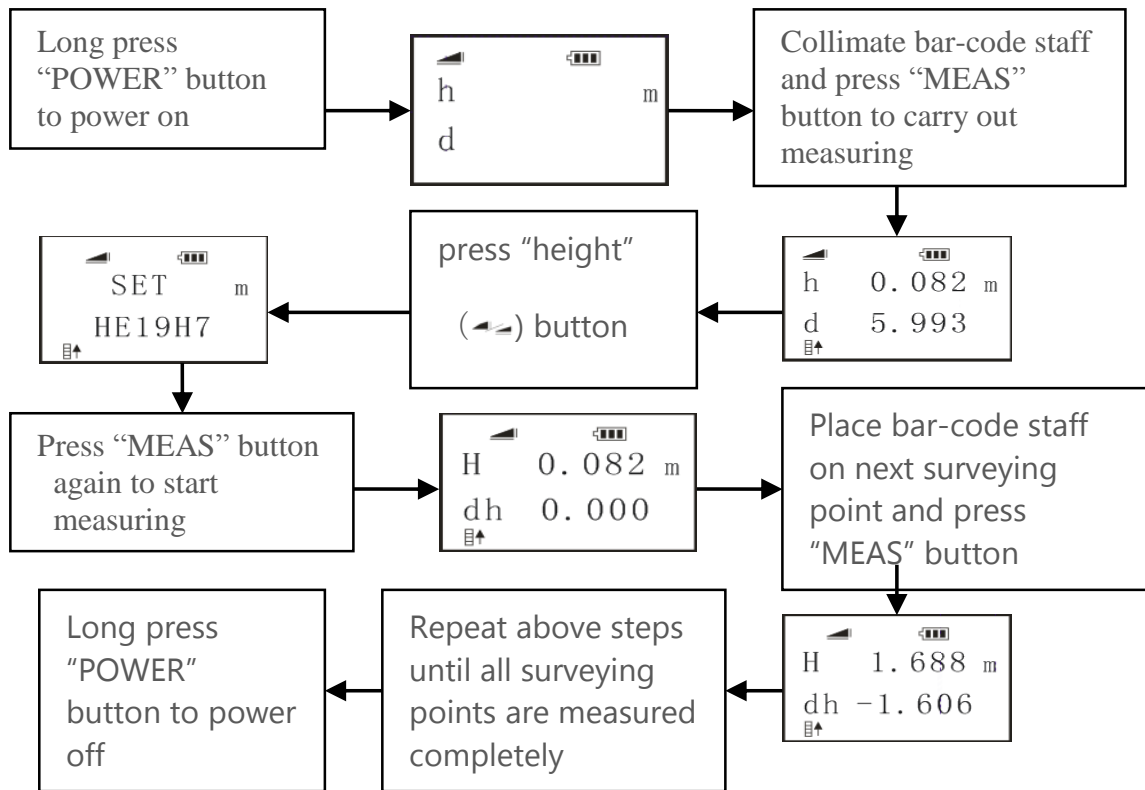
Switch on the instrument by long pressing the “POWER” button, and aim to the staff with optical sight. Turn focusing knob until the staff image appears sharp and is free from parallax with respect to the crosshair.

 *The staff must be turned on the bar code side.*

Turn tangent screw to place vertical crosshair of reticle in the middle of the staff. If the horizontal crosshair of the reticle is not perpendicular to staff, move the staff to make it through. Press “MEAS” button to start measuring.

After measuring result is obtained, press “height” button to enter “height difference” display, press “MEAS” button again, the instrument calculates and displays elevation difference automatically.

Press “backlight” button to turn on or off backlight of the screen. After initiating the instrument, short press “POWER” button to turn on or off battery indicator. After measurement complete, long press “POWER” button to power off.



5.7 Measuring error types

01	Environment is too dark
02	Lack of contrast, environment is not good for digital measurement
03	Incorrect barcode, false focusing, blurry barcode, etc; focus and collimate again
04	Wrong barcode, check staff, focus and collimate again
05	Staff is too close
06	Below barcode is not enough to read, check staff
07	Some barcode is not enough to read, check staff
08	Up barcode is not enough to read, check staff
09	Wrong barcode, check staff
10	Some barcode is not enough to read, check staff
11	Wrong barcode, check staff

12	Measuring stop, collimate and measure again
13	Environment is too bright
17	Measuring error

6. Instrument settings

As the instrument is initialized, press "MENU" button to enter the preferred settings. Press "height" button to exit.

6.1 Unit setting

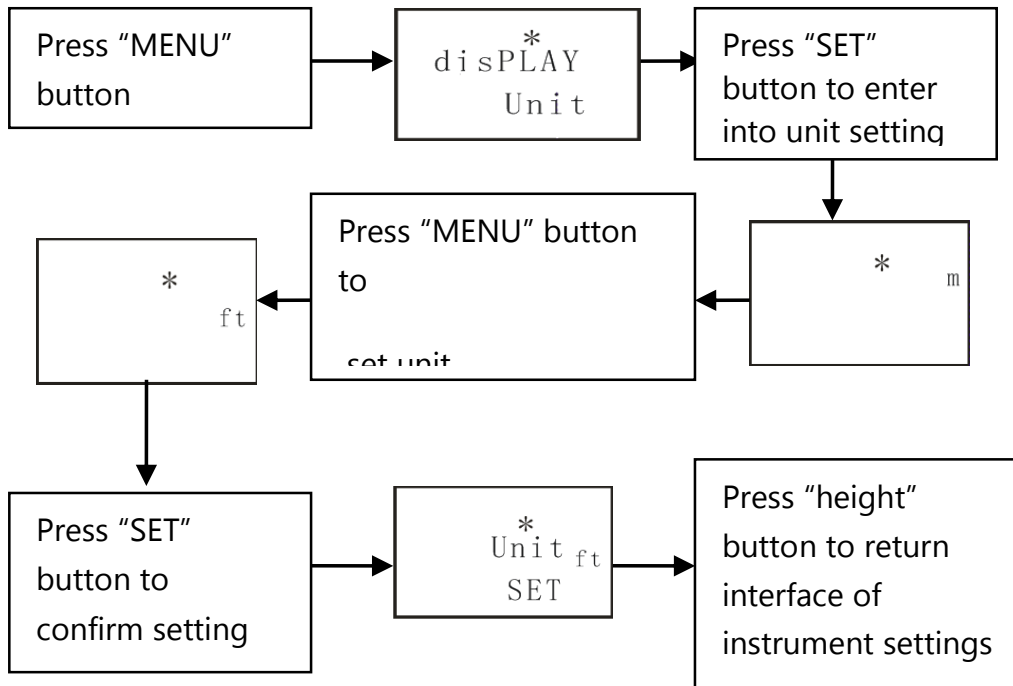
Display unit (unit selection), and default setting is m(meter). Relevant minimum resolution is shown in below table.

Unit selection	Displayed value	Minimum resolution
m (meter)	h(height)/dh(elevation difference)	0.0002m
	d(distance)	0.001m
ft (feet)	h(height)/dh(elevation difference)	0.0001ft
	d(distance)	0.001ft
f.i (feet/inch)	h(height)/dh(elevation difference)	1/8inch
	d(distance)	1/8inch

① Steps:

- Press "SET" button to enter function selection menu;
- Press "MENU" button to select unit (display circularly): m(meter), ft(feet), f.i (feet/inch);
- Press "SET" button to confirm;
- Press "height" button to return to the selection menu.

② Flow diagram:



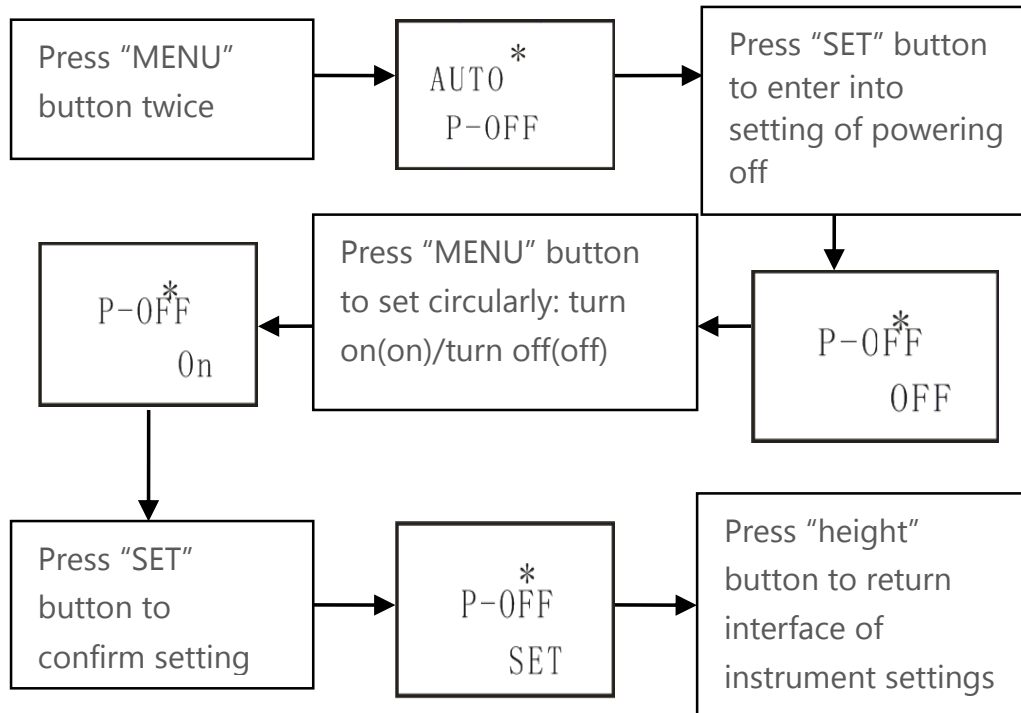
6.2 Auto Off setting

Auto p-off (power off automatically), and default setting is off. When auto off setting is on and there's no operation on instrument in ten minutes, the instrument will be powered off automatically.

① Steps:

- Press "SET" button to enter function selection menu;
- Press "MENU" button to select (display circularly): off/on;
- Press "SET" button to confirm;
- Press "height" button to return function selection menu.

② Flow diagram:



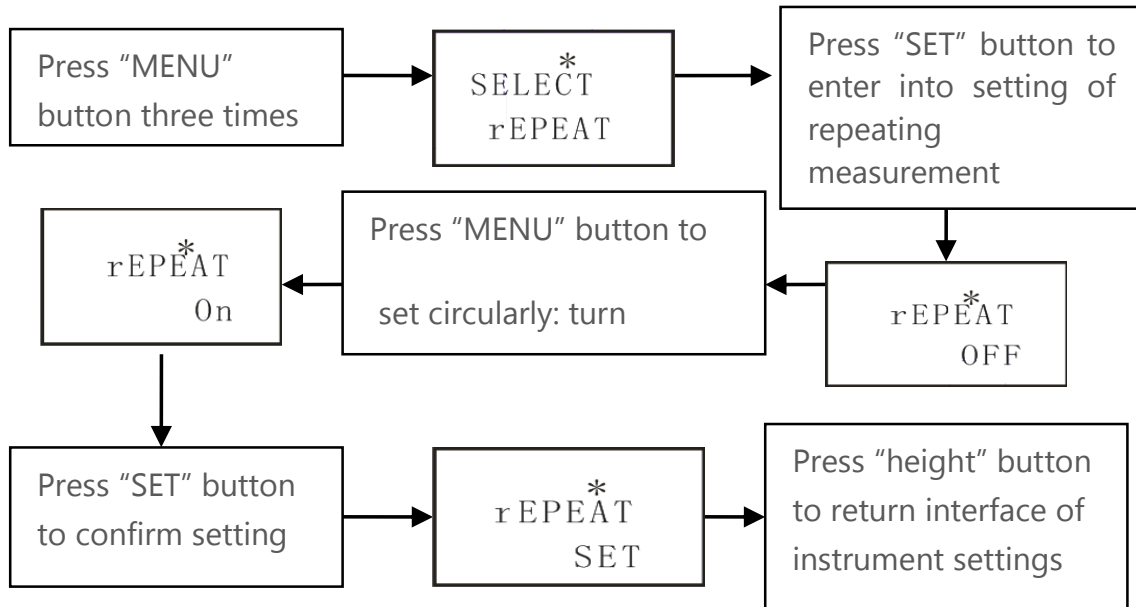
6.3 Repeated measurement setting

Select *Repeat* (repeated measurement setting), default setting is off.

① Steps:

- Press "SET" button to enter function selection menu;
- Press "MENU" button to select (display circularly): off/on;
- Press "SET" button to confirm;
- Press "height" button to return function selection menu.

② Flow diagram:



6.4 Setting of positive staff and reverse staff

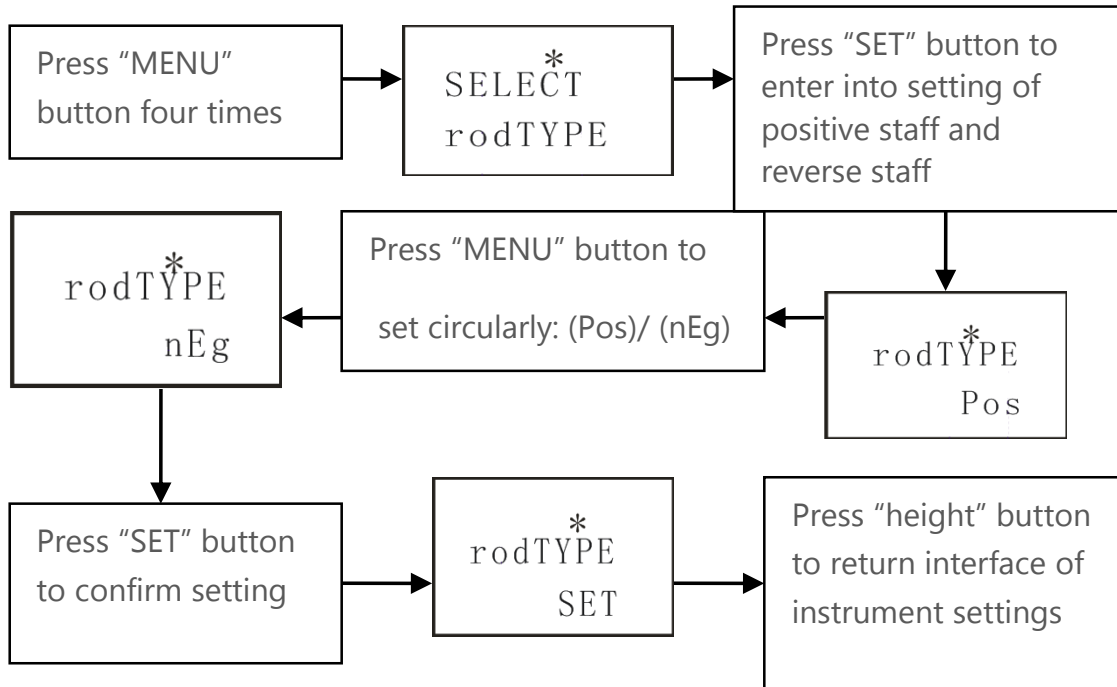
Select *Rodtype* (setting of positive or reverse staff), default setting is "pos" mode (positive staff). Underground and indoor survey often are more comfortable using reverse staff ("neg" mode).

Once set as "neg" mode, the instrument will enter into this mode while measuring. Normal measuring can be carried out under the condition that the instrument must be reset as positive staff ("pos" mode).

① Steps:

- Press "SET" button to enter function selection menu;
- Press "MENU" button to select (display circularly): pos (positive staff), neg (reverse staff);
- Press "SET" button to confirm;
- Press "height" button to return function selection menu.

② Flow diagram:



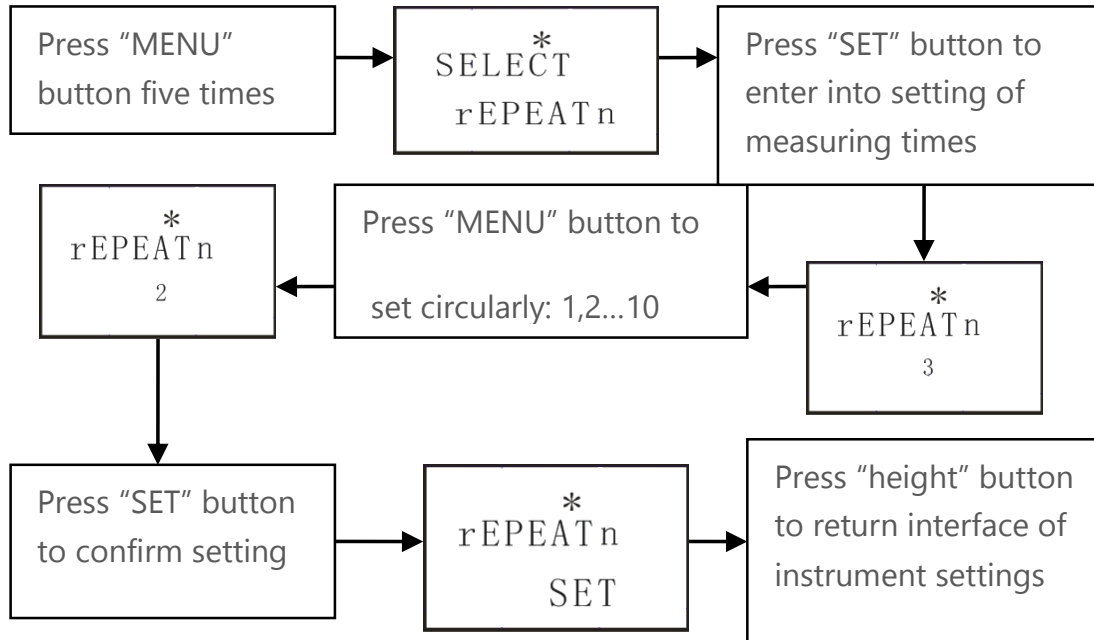
6.5 Setting of measuring times

Select *Repeat N* (setting of measuring times), default setting is 3 times.

① Steps:

- Press "SET" button to enter;
- Press "MENU" button to select (display circularly): 1—10;
- Press "SET" button to confirm;
- Press "height" button to return function selection menu.

② Flow diagram:



7 Check and adjustments

7.1 Tripod

Before to start a measurement session check the tripod steadiness. If necessary use a wrench to adjust tightness of the tripod screws.

7.2 Circular bubble

After firmly set up the tripod on the ground and configured the instrument, turn three footscrews, and center the circular bubble, then rotate the instrument 180 degrees.

If the bubble moves and doesn't remain in the center of circular level, further adjustment of the bubble is necessary.

Half of bubble displacement is taken out with the footscrews and the other half with one cross screwdriver and two adjustment screws. As an adjustment screw is tightened the bubble runs towards it and, as it is loosened, the bubble runs away from it.

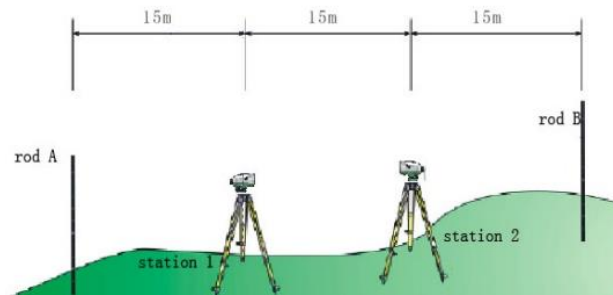
The first adjustment screw to be turned, therefore, is the one that is the nearest to the line connecting the middle of the bubble and the centre of the setting circle. It is turned only until the bubble reaches the centre of the circle or until it can be set in the centre by means of the other screw.

It is necessary to complete the adjustment that the screws must be tuned. The circular bubble is in correct adjustment when it stays in the centre of the circle in whatever direction the telescope is pointing.

Keep the circular level in adjustment, thereby ensuring that the compensator will always be well within its working range.

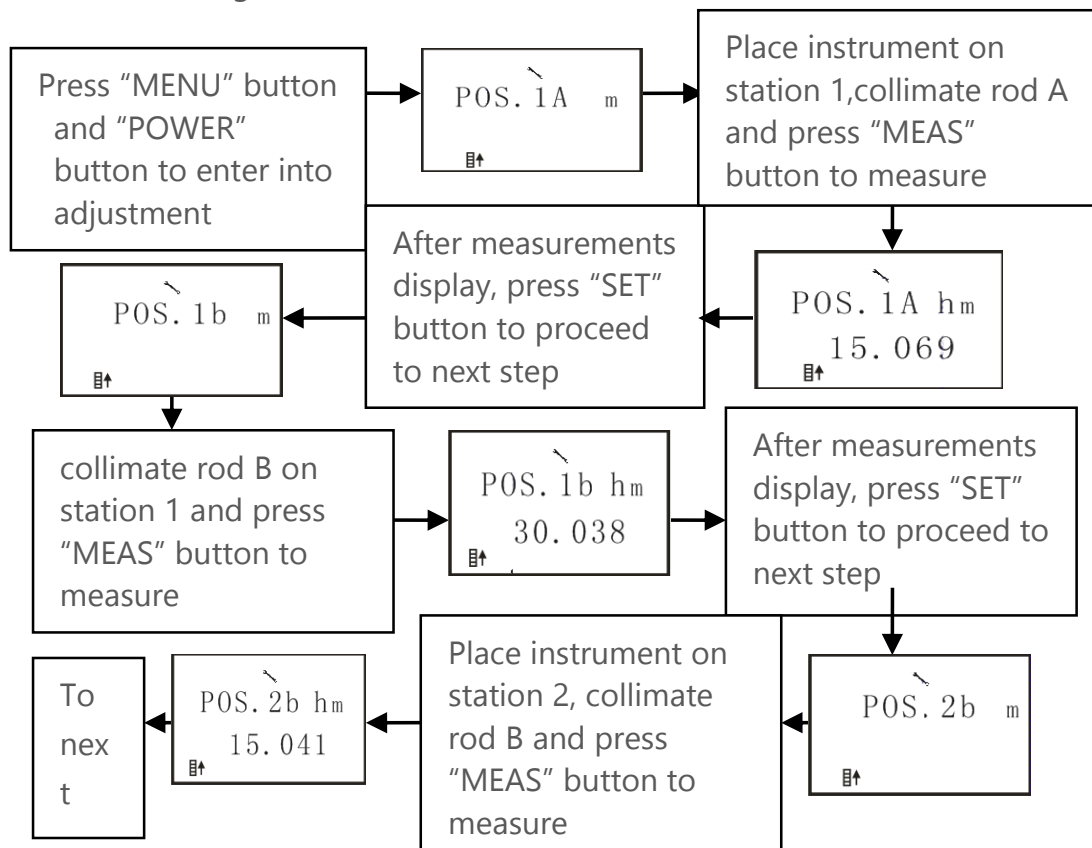
7.3 Electronic i angle check and adjust

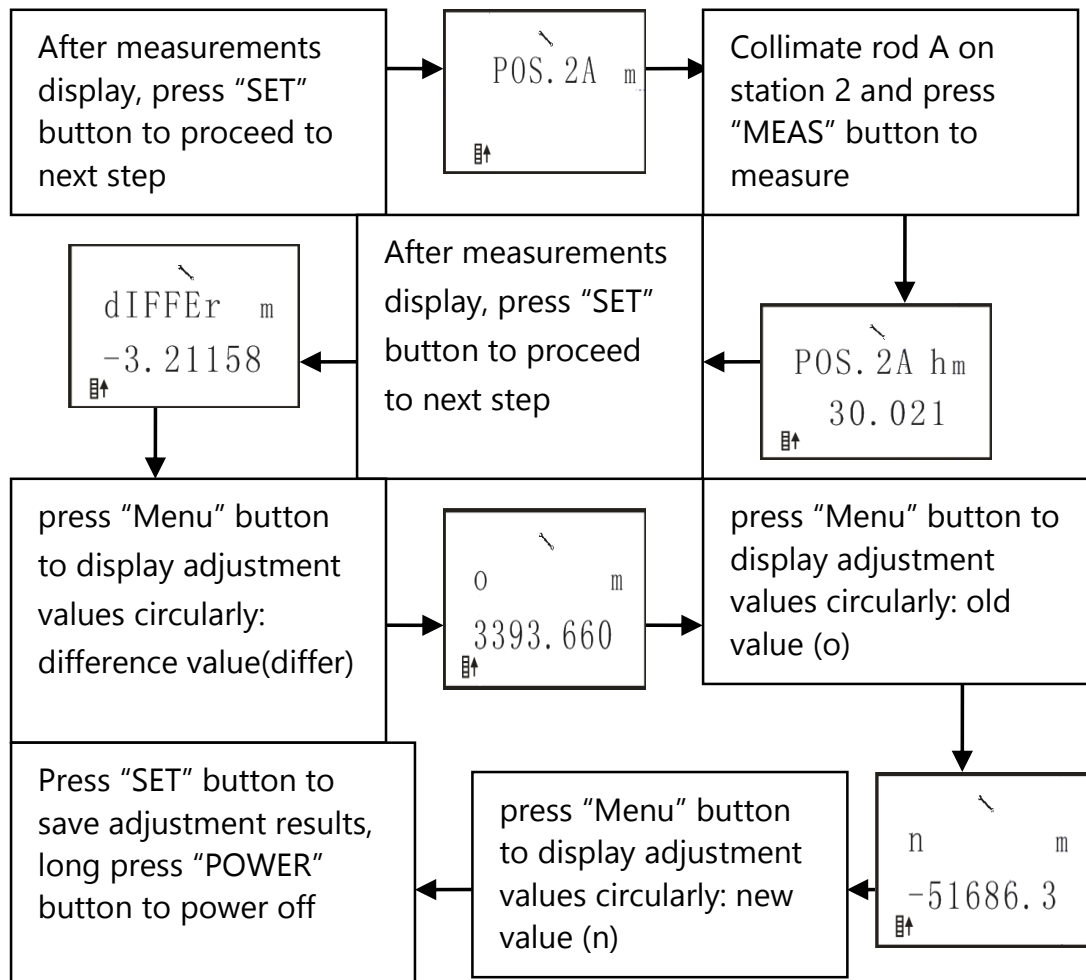
Adjust i angle of instrument in order to avoid influences on surveying results from long-distance transportation, long-term storage, temperature change and so on.



Put two level staffs (rod A and rod B) on two ground points on a distance of around 45m .

Divide the distance into three equal parts and place instrument on station points (station 1 and station 2) separately. Thus respectively observe two numerical readings of rods based on each station.





8. Instrument maintenance

8.1 Cleaning and Drying

- Wipe up painted surface.
- Blow dust off lenses.
- Use only a clean degreasing cotton for cleaning up. If necessary, moisten the cotton with little pure alcohol. Do not use other liquids (oil, gasoline, water, etc) which may attack the polymer components.
- Never touch the glass lens with fingers.
- Be careful to wipe damp the instrument. Take out the instrument from the case and dry it completely. Do not store the instrument in case if wet. Besides, keep the case clean inside and outside, and keep it dry.

8.2 Storage

When the instrument is stored for a long time, take it out from case in order to allow the air to circulate and avoid lens's mildew. Storage must be under the conditions of dust prevention, air circulation and low humidity.

In wet areas use desiccator and fuming cupboard. In cold regions, do not move the instrument indoors during the period of not using it, it's supposed to remain in safe places under ambient temperature, which can prevent water vapour condensed on optical glasses and inside of instrument.

8.3 Transportation

Put the instrument into the case which includes foam inserts or other shockproof stuff for transportation.

8.4 Check

Check the instrument on a regular basis, and adjust it according to instruction manual if necessary.

 **NOTE:**

These designs, figures and specifications are subject to change without notice. We shall not hold liability for damages resulting from errors in this instruction manual.

9. Copyrights, warranty and environmental recycling

Copyrights and trademarks

© 2014, STONEX® Limited. All rights reserved.

Copyrights, warranty and environmental recycling

Terms and conditions of this Limited Warranty constitute the complete and exclusive warranty agreement between the Customer or Dealer and STONEX® for the Product and supersede any prior agreement or representation made in any STONEX® sales document or advice that may be provided to Customer by any STONEX® representative in connection with Customer's purchase of the Product. No change to the conditions of this Limited Warranty is valid unless it is made in written form and signed by an authorized STONEX® supervisor.

STONEX® warrants that its products:

- (1) are free from defects in materials or workmanship for 2 years.
 - a) Accessories or specific parts for which different limited warranty period shall apply.
- (2) Have been tested/calibrated in proper working status before the shipment.

The warranty period starts from date of first sale of the instruments.

At its sole discretion, under the warranty period, STONEX® will repair the product or send parts for replacement at its expense.

STONEX® agrees to repair or replace the defected instrument within thirty (30) days only if STONEX® recognizes that the defects of the instrument are not caused by human factors or no obvious damage to its surface is visible. STONEX® warrants any new replaced parts or products are warranted to be free from defects in materials and workmanship for thirty (30) days or for the remainder of the Limited Warranty Period of the Product in which they are installed, whichever is longer. Faulty Parts or Products replaced under this Limited Warranty shall become property of STONEX®.

All products that have to be repaired have to be returned to our technical representative office location via any delivery company the customer prefers, nevertheless STONEX® is not accountable for the unlikely event that the Products gets lost in transit.



Any damage inflicted by the customer or by third party after the products has been delivered to the customer is excluded from the limited warranty as well any damage arising from an improper use, from any action or use not provided for in the enclosed user guides and/or manuals.

Shipping policy

The Customer is required to pay for the charges for shipping of fault part or instruments to STONEX® representative office and STONEX® is providing the shipping for return. Dealers must follow STONEX® repair/service procedure to achieve a better and prompt service result.

Return policy Dead On Arrival instruments

All returned products have to be shipped to STONEX® representative office. The original Purchaser has a period of seven (7) days starting from date of purchasing to signal the existence of a defect in the instrument for a full refund (less shipping and handling), provided the product is in new, resalable condition and returned in the original, undamaged packaging. Customer has to pay for both the return and the original freight fees, regardless of the original freight paid by the Company.

All warranty books, instruction manuals, parts and accessories must be included as well as the original box in which the item was shipped.

We recommend to place the original carton inside another box, to avoid any additional damage to the carton itself. In some cases, returns of special items will require a re-stock fee. Acceptance of returned merchandise is final only after inspection by STONEX®.

Above terms and policies shall apply as for hardware. Dealers need to follow STONEX® repair/service procedure to achieve a better and prompt service result.

Firmware/Software warranty

Stonex® doesn't warrant that operation of Firmware/Software on any instruments will be uninterrupted or error-free, or that functions contained in Firmware/Software will operate to meet your requirements.

Stonex® will forward the Software/Firmware Fix to the dealer or customer. Firmware/software Fix means an error correction or other update created to fix a previous firmware version that substantially doesn't conform to the instruments specification.

Over Warranty repair(s) policy

The Customer shall pay the standard repair fees for any service (whether part replacement or repairs) and performed by STONEX® under request and explicit authorization of the customer itself. In this case the customer is charged for return shipment's fees as well.

Disclaimer and Limitation of Remedy

All other express and implied warranties for this product, including the implied warranties of merchantability and fitness for a particular purpose and/or not infringement of any third party's rights, are hereby disclaimed. Stonex® expressly disclaims all warranties not stated in this limited warranty. Any implied warranties that may be imposed by law are limited in duration to the term of this limited warranty. Some jurisdictions do not allow the exclusion of implied warranties or limitations on how long an implied warranty lasts, so the above exclusions or limitations may not apply to customer.

Customer must read and follow all set-up and usage instructions in the applicable user guides and/or manuals enclosed. If customer fails to do so, this product may not function properly and may be damaged.

Customer may lose data or sustain personal injuries. Stonex®, its affiliates and suppliers do not warrant that operation of this product will be uninterrupted or error free; as do all electronics at times. If this product fails to work as warranted above, customer's sole and exclusive remedy shall be repair or replacement. In no event will Stonex®, its affiliates or suppliers be liable to customer or any third party for any damage in excess of the purchase price of the product.



This limitation applies to damages of any kind whatsoever including (1) damage to, or loss or corruption of, customer's records, programs, data or removable storage media, or (2) any direct or indirect damages, lost profits, lost savings or other special, incidental, exemplary or consequential damages, whether for breach of warranty, contract, tort or otherwise, or whether arising out of the use of or inability to use the product and/or the enclosed user guides and/or manuals, even if Stonex®, or an authorized Stonex® representative, authorized service provider or reseller has been advised of the possibility of such damages or of any claim by any other party. Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages for some products, so the exclusions or limitations may not apply to customer. This limited warranty gives customer specific legal rights, and customer may also have other rights which vary from country/state/jurisdiction to country/state.

Instruments

Two (2) years on STONEX® Products:

Stonex D1

Excluding power supply accessories, for which warranty time is 6 month

Environmental recycling

The carton box, the plastic in the package and the various parts of this product have to be recycled and disposed of in accordance with the current legislation of your Country.



9.1 Safety Recommendations

Warnings and Cautions

An absence of specific alerts does not mean that there are no safety risks involved in the use of this equipment.

Always follow the instructions that accompany a Warning or Caution, reported in this.

This information are intended to minimize the risk of personal injury and/or damage to propriety. In particular, observe safety instructions that are presented in the following form:

WARNING - A Warning alerts about risk for health and/or damage to the propriety. A warning identifies the nature of the risk and the extent the possible injury and/or damage. It also describes how to protect yourself and/or the equipment from this risk.

CAUTION - A Caution alerts about a possible risk of damage to the equipment and/or loss of data, but no risk for human safety.

WARNING

- Do not creates damage at the rechargeable Lithium-ion battery.

A damaged battery can cause an explosion, with risk or fire, and can result in personal injury and/or property damage.

To prevent injury or damage:

- Do not use or charge the battery if it appears to be damaged. Signs of damage are discoloration, warping, leaks of liquids.
- Do not expose the battery to fire, high temperature, or direct strong sunlight.
- Do not introduce the battery in water or liquid substance , in general.
- Do not use or store the battery in very hot ambient.
- Do not drop or puncture the battery.
- Do not open the battery and do not put in short-circuit its electrical contacts.

WARNING

- Avoid direct contact with the rechargeable Lithium-ion battery if it appears damage. Battery liquids are corrosive and, and contact with it can result in personal injury or damage to properties.

To prevent injury or damage:

- If the battery leaks, avoid contact with the battery fluid.
- If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!
- If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.



STONEX® SRL

Via Cimabue, 39 - 20851 Lissone (MB) - Italy

Phone: +390392783008; +390392785575 | Fax: +390392789576

www.stonexpositioning.com | info@stonexpositioning.com