CONTENTS

FOREWORDS

Congratulations on your purchasing the Digital Level DL-201/2007. In order to operate this instrument correctly, please read this user manual carefully and keep it well so as to refer to it easily in the future. Before use, please check the standard features and make sure all the equipments and accessories are available.

In order to facilitate reading, some pictures are simplified.

PRECAUTIONS

Before using this instrument, please make sure that each function is running well.

●Avoid to make the surface of the digital staff as well as the joints between each section dirty or damaged, otherwise it will influence on the accuracy of reading and measurement. This is because the instrument needs to transfer the black & white bar code to electric signal. That's why in case the digital staff is dirty, the accuracy would be descended, or even the instrument is not able to measure.

●Tripod

The digital level should be mounted on wooden tripod. Metal tripod is lighter and shack easily, which will affect the accuracy. Each leg of the tripod should be fixed well by screws.

●Tribrach

Please check the adjusting screw on the tribrach frequently, do make sure the central fixing screw is tightened.

●Packing well to avoid the instrument shaked

The digital level should be handled carefully to avoid shaking and crashing during transportation. Severe shaking would damage the measurement functions. When packing the instrument in the case, make sure the instrument is power off and take off the battery too.

●Carry the instrument carefully

When you need to move the instrument, you must grasp the lifting handle and take it off from the tripod.

●Avoid to expose the instrument in sun, rain or humid condition

Leaving the instrument in place of high temperature (+50℃) would damage the instrument. Do not shoot the sun with the objective len; otherwise the spare parts inside the instrument may be damaged.

●Avoid the great change of temperature

A great change on instrument temperature would descend the measuring range. For example, when the instrument is moved out from a hot car, please leave the instrument to adapt to the surrounding temperature before use.

●Battery Inspection

Check the remaining battery before use.

●Digital Staff

Wear a glove when using a digital staff.

SAFETY GUIDE

Serious injury or even death may occur if the following cautions are ignored.

●In case of explosion, do not place the instrument close to inflammable gas, liquid, or solid. Do not operate it in coal mine or dusty place.

●Do not disassemble or repair the instrument without authorization in case of dangers like fire, electric shock or damage to the instrument. Disassembling and maintenance are only implemented by RUIDE and its authorized service providers.

●Do not use the telescope to sight at the sun or sunlight that are refracted by reflectors like prisms in case of any hurt to the eyes.

●Do not operate the instrument with the digital staff near high voltage cables or transformers, in case of electric shock accident.

●Do not use the digital staff when under bad weather (thunder) in case of electric shock.

●Do not use chargers and batteries produced by a third party in case of fire.

●Do not use a broken power supply, wires, sockets and plugs in case of fire or electric shock.

●Do not use humid batteries or chargers in case of fire or electric shock.

●Do not place the batteries in fire or high-temperature environment in case of explosion or damage.

●Do not use the power supply mentioned in the manuals of non-manufacturers in case of fire or electric shock.

●Do not circuit the batteries in case of fire.

●Do not disassemble or assemble the instrument or operate the plug with wet hands in case of electric shock.

●Do not cover the charger when it is charging in case of fire.

●Do not touch the liquid leaked from the battery in case of hurt by the harmful chemicals. And please change the battery.

●Injury to persons or damage to goods may occur if the following cautions are not followed by operators.

●Harm: means hurt, burn, electric shock, etc.

●Damage: means serious damage caused to building, instrument or furniture.

●Overturning the instrument case may damage the instrument.

●Do not stand or sit on the case.

●Do not use the instrument case with broken belt, buckle, hinge, or lifting handle, in case that the instrument is damaged or it hurts the legs if the case falls.

●When mounting or delivering the instrument please be careful with the leg tips of the tripod.

●When mounting the instrument on the tripod, make sure the central fixing screw is tightened well to prevent the instrument from falling down.

●When mounting the instrument, make sure the screws of the tripod are tightened well.

●When moving the tripod, make sure the screws of the tripod are tightened well.

OPERATOR

●This instrument is only operated by technician.

It is required that the operator should be a qualified surveyor. Before operation, inspection and calibration, operators should be acknowledged the safety guidence.

●Please wear necessary suits for protection (e.g. safety shoes, safety helmet).

●Do not place the instrument directly on the ground. If the operator has to leave the instrument alone, please cover the instrument with a nylon cover (if available).

DECLARATION OF EXCEPTIONAL RESPONSIBILITY

●Users of this product should read the user manual thoroughly and implement periodical inspection to the performance of the instrument.

●Manufacturer and its dealers shall not be responsible for any direct or indirect consequences and profit loss resulted from destructive or intentional improper use.

●Manufacturer and its dealers shall not be responsible for any direct or indirect consequences and profit loss resulted from natural calamities (e.g. earthquake, hurricane, flood, etc.), fire, accidents, or fault of a third party.

●Manufacturer and its dealers shall not be responsible for failure to operate resulted from the fact that the data is changed or lost, or that operation is interfered.

●Manufacturer and its dealers shall not be responsible for any consequences and profit loss resulted from extra use without following the user manual.

●Manufacturer and its dealers shall not be responsible for any consequences and profit loss resulted from improper transportation or connecting with other products.

1. NAME OF EACH COMPONENT & ITS FUNCTION

1.1 Name of Each Component

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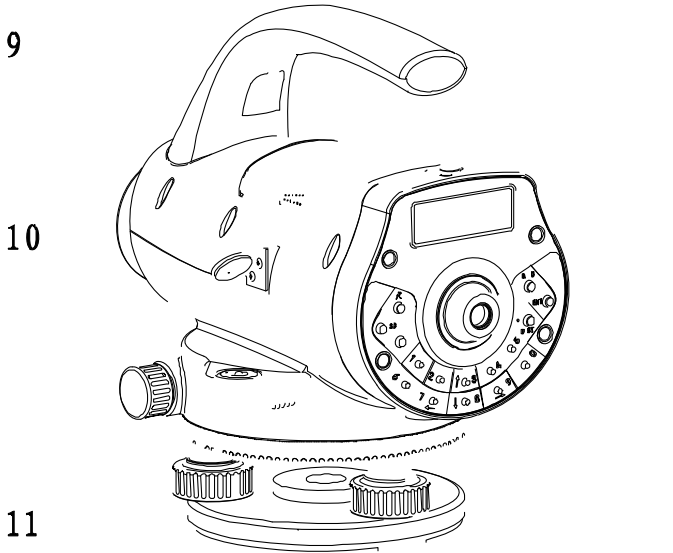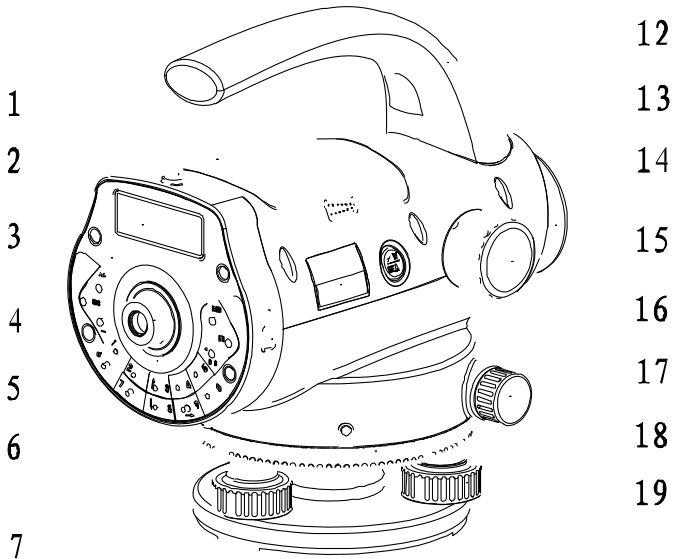
1   battery

2   rough collimator

3   LCD display

4   keyboard panel

5   keys

6   eyepieces: use for adjusting the definition of the crosshair.

7   protecting cover of eyepieces: by releasing this cover, you can implement the mechanical adjustment of the reticle in order to correct the optical collimation line error.

8   data transfer port: connecting with PDA or computer.

9   reflector of circular vial

10   circular vial

11   tribrach

12   lifting handle

13   model label

14   objective lens

15   focusing hand wheel: use for focusing of digital staff.

16   power/measure key: use for instrument power ON/OFF, and measure.

17   horizontal tangent hand wheel

18   horizontal dial: use for setting the horizontal direction value of the collimating direction to 0 or other required values.

19   leveling screws of the tribrach

1.2 Operation Keys & Functions

key	name	function
POW/MEAS	Power ON/OFF Measure	Power ON/OFF, and start to measure. Power ON: press once; Power OFF: hold on for 2 seconds.
MENU	menu	Return to the menu list.
DIST	distance measure	In measurement status, press it to start measure the distance and display the distance.
↑↓	select	Turn the page of menu list or data list.
→ ←	Number moving	Turn the left or right page when viewing the data, or move left or right in inputting status.
ENT	enter	To confirm the parameters or inputting data.
ESC	ESC	To escape from menu or any setting mode. Also to go backspace to delete a character in inputting mode.
0～9	number keys	Inputting numbers.
―	Mode of setting inverse staff	Use for inputting inverse staff. Set the inverse staff. You should activate this function in parameter setting first.
☀	illumination	Turn ON/OFF the illumination
.	decimal point	Input a decimal point; while inputting symbols or characters use this key to switch between alphabets and numerals.
REC	Record key	To record the measured data
SET	Set key	Enter the setting mode to set the measurement parameter, condition parameter and instrument parameter.
SRCH	Search key	Use for searching and displaying the record data.
IN / SO	Intermediate point/Stake out key	To measure the intermediate point or to skake out while carrying out the Leveling measurement.

MANU	Manually input key	To input the data manually when the [MEAS] key cannot be used to take measurement.
REP	Repeat measuring key	To repeat measuring the measured backsight or foresight point in the leveling measurement

1.3 Display

The display adopts dot matrix LCD, displaying 4 lines, with 20 characters in each.

LCD illumination： ON/OFF.

Press ☀ to turn ON or OFF the illumination. It can be set in instrument parameters

too.

Setting Contrast

There're 9 degrees for the contrast. Please refer to parameter setting to know how to

set the contrast.

Example:

```
Menu      1/2
►Standard Mode
  Leveling
  Adjust
```
Stardard Mode

```
Menu       1/2
  Standard Mode
► Leveling
  Adjust
```
Leveling Mode

```
Measure
Rod：
Dist：
N:3      >>>>>>>
```
Measuring

1.4 Symbols

key	function	key	function
p	The current data has been saved.	a/b	Several pages or menus are available which can be selected by [▲] [▼], b: total pages, a: current page
🔋	Battery level	Inst Ht	Instrument height
BM#	Bench Mark	CP#	Changeover Point
I	Staff Inversion		

2. PREPARATION FOR MEASUREMENT

2.1 Mounting the Instrument

Placing the Tripod.

Type E aluminum tripod with flat or dome head tripod is required.

(1) Adjust the three legs of the tripod to a proper length and tighten the fixing screws at the middle of the leg.

(2) Tighten the hexagonal nut on the head of the tripod in order to make the tripod legs not too loosen. Place the tripod on a certain point, expand the legs until the distance between each leg is about 1m. First, fix a leg, and move the other 2 legs to make the head of the tripod approximately leveled. If necessary, adjust the length of the tripod legs.

(3) Trample the legs into the earth or fix it well on the ground.

Mount the Instrument on the Head of the Tripod.

Take out the instrument carefully and place it on the head of the tripod.

(1) Aim the tripod central screw to the center of the tribrach and tighten the screw until it is fixed at the head of the tripod.

(2) If you need to define an angle or a line through the horizontal dial, you should center the instrument precisely with a plummet.

(3) Center the circular bubble by adjusting the three leveling screws of the tribrach. If you are using a dome headed tripod, you should slightly loosen the tripod central screw and rotate the instrument round the head of the tripod until the circular bubble is centered, then tighten the screw.

Mounting the Instrument on a Certain Point (centering)

If you need to measure an angle or alignment, please precisely center the instrument at a certain point with the plummet.

(1) Hang the plummet at the plummet hook of the central screw of the tripod.

(2) Adjust the plummet line to a proper height.

(3) In case the instrument is not centered at the known point, you can move the instrument to that point without changing the position relationship between the tripod leg and its head. First, put the tripod on the known point approximately until the plummet is about 1cm away from the point. Second, grasp two legs of the tripod

and adjust the tripod by the third leg until the head of tripod is leveled approximately with a proper height. Expand the legs of the tripod and fix it on the ground.

(4) Finally, observe the plummet and the hook and trample the legs into the ground.

(5) Slightly loosen the central screw of the tripod and move the instrument on the head until the plummet is centered at the known point. Tighten the tripod central screw.

Leveling the Instrument

Center the circular bubble by adjusting the tribrach screw.

First, put the tribrach as the below picture shown. Rotate 2 screws at the same time in opposite direction until the bubble moves to a position where the line between the bubble and screw C is perpendicular to the line between screw A and B (refer to Picture A). Then rotate the screw C to move the bubble to the center of the central circle. This procedure should be repeated for times until the bubble is centered on any directions. While leveling, remember the "Left Thumb Principle" which means that the moving direction of the bubble is the same as that of the left thumb. Do not rotate the leveling screw without thinking.
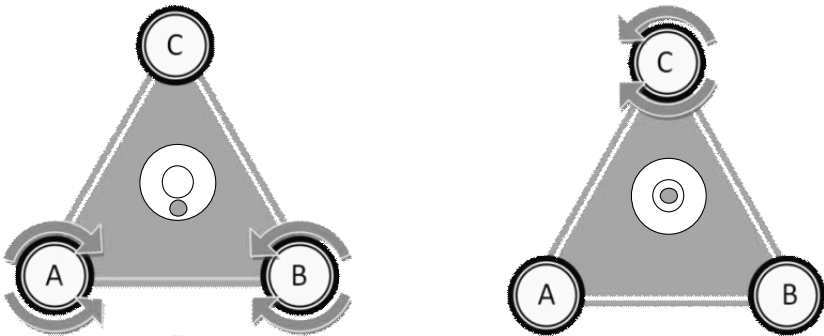
Notice: Do not touch the telescope during leveling.

Collimating and Focusing

(1) Sight at the digital staff with the rough collimator.

(2) Rotate the eyepiece slowly until the image of the crosshair becomes clear.

(3) Rotate the focusing hand wheel until the image of digital staff becomes clear. Rotate the horizontal tangent to move the image of the staff to the center of the vertical hair of the crosshair.

(4) Observe through the eyepiece. Move your eye slightly up, down, left and right to check whether the relative position between the crosshair and the image of the staff is not changed. If not, please return to step 1.

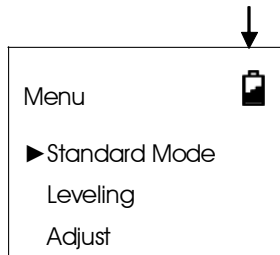Notice: Measurement accuracy may be influenced if the crosshair and focusing is not clear.

2.2 Power On

Press the power key (POW/MEAS).

2.3 Remaining Battery Display

The battery symbol indicates the remaining battery.

battery symbol

Menu
►Standard Mode
Leveling
Adjust

Full

Sufficient

Half

Battery low. Please change the battery.

The power will be cut off soon. You need to change the battery.

2.4 Setting the record mode

In order to save the measurement data in the internal memory of the instrument, the data saving mode should be set as auto save before leveling measurement. The default setting is "OFF".

Flash:

Save the measured data (jobs) into the internal memory

•User can choose "Flash" in "Out Module" of "Condition" Setting if the data needs to be saved in the flash.

The memory is 16 Mbit

•The maximum storage of memory is about 20,000.

•The maximum number of jobs is 256.

•Folder can not be created in the memory.

SD Card:

The measured data can be saved directly into the SD card.

• User can choose "SD" in "Out Module" of "Condition" Setting if the data needs to be saved in the SD card.

Communication Port:

Connect the instrument with external device by cable to receive the real-time measuring data.

User can only use Standard Measurement mode in this condition.

Off:

The measuring data will be displayed without storing and outputting, user can not use Leveling Measurement mode in this condition.

See next page for the example.

Operating Procedures	Operation	Display

1. Press [Set] key to enter the setting mode on Menu screen, see detail in Chapter 9 "Set".	[SET]	Menu 1/2
		►Standard Mode
		  Leveling
		  Adjust

2. Press [▲] or [▼] key to enter the "Out Module" in Condition setting.	[▲] or [▼]	Setting
		  Measurement
		►Condition
		  Instrument

3.Press [ENT] key;	[ENT]	Condition 1/2
		  Point No.
		  Wait Time
		►Out Module

4. Press [▲] or [▼] key to select.	[▲] or [▼]	Out Module 1/2
		►OFF
		  Flash
		  SD

5. Press [ENT] to confirm.	[ENT]	Out Module 1/2
		  OFF
		► Flash
		  SD

Note: When the output is in "Flash", the "F" mark will be displayed on the top right side of the screen; when the output is in SD card, the "S" mark will be displayed; when the output is by USB, the "U" mark will be displayed; when the output is off, no mark will be displayed.

2.5 SD Card

User can use SD card for data storage, data copy and data search.

SD card function only can be used while the "Out Module" is set as "SD"

To format the SD card please refer to the Chapter 7 "Format Flash or SD Card"

For SD card management, please refer to the Chapter 8 "Data Manage"

Note: When the system is loading data from the SD card, do not remove the battery and SD card, otherwise, the saved data will be damaged, even it will influence on the memory storage; the defective SD card may damage the memory storage.

2.6 Menu

The menu includes following programs, the functions located in different menus which can't be always optional at the same time. (You may change the mode for different functions)

For example, when the "Out Module" is "Communication port" or "OFF", the Leveling Mode and Adjust Mode can not be carried out. If user enters the Leveling mode, the "Start Leveling" and "Continue Leveling" can not be chosen at the same time.

	1st Menu	2nd Menu	3rd Menu	4th Menu
Menu	Standard Mode	Measure		
		S.O G.H		
		S.O H.D		
		S.O Dist		
	Leveling	Start Leveling	BFFB	
		Continue	BBFF	
		End Leveling	BF/BIF	
			Outward/Return	
	Adjust	Method A		
		Method B		
	Data manage	Make Group		
		Input Pt		
		Search	Flash / SD	Job / PN / BM#
		Copy Job	Flash / SD	
		Delete Job	Flash / SD	
		Check Capacity	Flash / SD	
		File Out	Flash / SD	
	Format		Flash / SD	

2.7 SET

"Set" key is used for setting the parameters. When carry out the precise measurement, it is recommended to use the continuous measuring mode which will help improve the accuracy by the average value; "Auto power off" is available, which means that the power will be cut off in 5 minutes without any operation; Data will be saved automatically in the Leveing mode while power off; The backlight can be switched by using the key.

SET	Measurement	Measure Mode	Single / N Times / Continuous
		Minimum Reading	Standard 1mm / Precise 0.1mm
		Inverse Mode	Use / No Use
		Unit	m(meter) / ft(US.ft)
		Limited tolerance	B-F sight distance Dif/Cumulated sight distance Dif /limited HD Dif/limited Dif of HD Dif/limited sight distance/limited sight height
	Condition	Point No.	Increase / Descend
		Wait Time	1~9 Second
		Out Module	OFF/Flash/SD/Communication port
		Communication	Standard / User
		Auto Off	5 min / Off
	Instrument	Contrast	1~9
		Backlight	On/Off
		Instrument Info	

2.8 Inputting Characters

When the "Out Module" is on, user can input the alphabets and numerals in the place that needs to be noted.

Program	Character	Maximum
Group (SD Card Only)	Only capital letter, number and "-" etc.	8 Characters
Info	Lowercase and capital letter, number and all symbols	16 Characters

For example: Input "Tp#7" in Info1

Operating Procedures	Operation	Display
1. Press [●] key to enter the capital letter inputting mode.	[●]	Measure 　Info#1 =>
2. Press [◄] or [►] key until the cursor flashes in the let er "T".	[◄]or[►]	Measure 　Info#1 ? => QRSTUVWXYZ<u>A</u>BCDEFGHIJ
3. Press [ENT] key to enter "T" which will be displayed at the bottom of the line.	[ENT]	Measure 　Info#1 ? => JKLMNOPQRS<u>T</u>UVWXYZABC
4. Press [●] to input the lowercase lette.	[●]	Measure 　Info#1 ? => T qrstuvwxy<u>z</u>abcdefghij
5. Press [◄] or [►] key until the cursor flashes in the letter "p" and press[ENT].	[◄]or[►] [ENT]	Measure 　Info#1 ? => T ghijklmno<u>p</u>qrstuvwxy
		Measure 　Info#1 ? => Tp fghijklmno<u>p</u>qrstuvwxy

6. Press [●] to enter the symbol inputting mode.	[●]	Measure Info#1? => Tp ?@[_]^{|}!"#$%&'()*
7. Press [◄] or [►] key until the cursor flashes in the letter "#", then press [ENT].	[◄] or [►] [ENT]	Measure Info#1? => Tp [_]^{|}!"#$%&'()*+-
8. Press [ESC] key to enter numeral inputting mode.	[ESC]	Measure Info#1? => Tp# [_]^{|}!"#$%&'()*+-
9. Press numeric key [7], after confirming the inputted content, press [ENT] key.	[7] [ENT]	Measure Info#1? => Tp#7

● Use [●] key to switch the input mode.

      Capital letter   Lowercase letter   Symbol

        ABCD ◄————► abcd◄————► !"#$

●Available symbols to input are as follow:

!" #$%& ()*+-. / :;<=>?@[_]^\ {|}

2.9 Staff Collimation and Focus

  (1) Focusing

Adjust the eyepiece focusing screw until the crosshair can be seen clearly. Then adjust the focusing screw until you can see the staff clearly through the objective lens.

A precise focusing can shorten the measuring time and improve the accuracy. Measurement of high accuracy requests precise focusing as well as continuous measures.
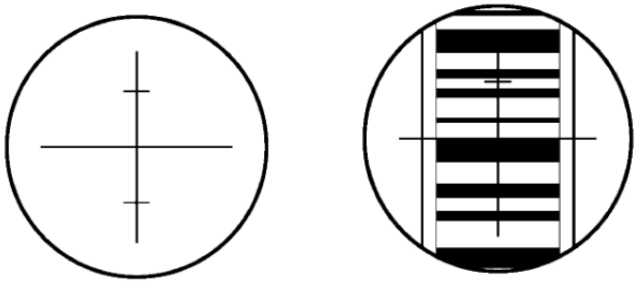
(2) Obstacles

Measurement can be implemented if the staff is blocked less than 30%. Even if the crosshair center is blocked, as long as the field of view is blocked less than 30%, measurement still can be implemented. However, in this case, the accuracy might be affected.

(3) Shadow and shaking

The surveying accuracy may be influenced if the staff is covered by shadow or the stuff is shaking. In some cases, it is not possible to measure.

(4) Backlight and glistening

If the background of the staff is very bright, it will affect the contrast of the staff, the digital level might not be able to measure. You can cover something ahead of the objective len in order to reduce the background light invading to the len. When a strong light comes into the eyepiece, it might not be able to measure either. You can also cover the eyepiece in order to block the strong light from coming into the eyepiece.

If the glistening of the staff is too strong, you need to rotate the staff to reduce the glistening.

When the sun is in a low position (for example, in the morning or at night fall), or if the sun light comes into the objective lens directly, it is suggested to block the sunlight with hands.

2.10 Surveying Note

In order to make full use of the functions of instrument, please pay attention to the following:

(1)   Set up the staff in bright place. If possible, prolong the staff completely. If the tower-type staff is used please pull the staff to the bayonet to make the interval between bayonets pass muster;

bayonet
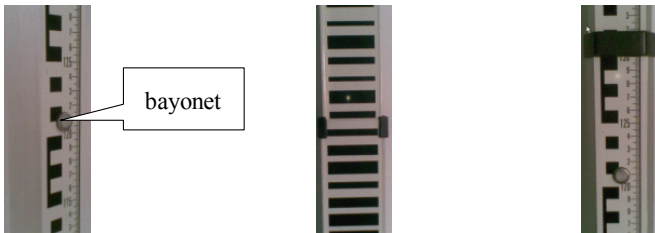
If illumination is employed, it is suggested to illuminate the whole staff, otherwise the accuracy might be affected.

(2) It will affect the accuracy when staff blocked. If the bar code on the staff is blocked by tree branches or leaves, the digital level might display error, or the accuracy decreased.

(3) If the place where the staff located darker than that of the eyepiece, an error might occur; you can block the light for the eyepiece with something proper.

(4) Deflection and pitching of the staff may affect the accuracy. During the measurement, make sure the staff is paralleled to the vertical hair of the reticle. The staff should be unfolded completely and fixed well. Make sure the joints of the staff are well and precise. Avoid to measure through the glass window.

(5) After a long storage or transportation, check and calibrate the digital and optical sight errors. Then adjust the circular vial and keep the optical parts clean.

3. STANDARD MODE
Standard Mode includes Measure, S.O G.H, S.O H.D and S.O Dist.

3.1 Measure

In Measure function, user can measureing the staff reading and distance without calculating the ground height. When the "Out Module" in "Condition Setting" is set as "Flash" or "SD", user needs to input job name and information. All Data will be saved in the flash or SD card.

For the measuring time, please refer to the "Measure Mode" of "Measurement Set"

[Example]: "Out Module" is "Flash", "Measure Mode" is 3 times

Operating Procedures	Operation	Display

1. Press [ENT] key.	[ENT]	Menu 1/2
		 ►Standard Mode
		   Leveling
		   Adjust

2. Press [ENT] key.	[ENT]	Standard Mode 1/2
		►Measure
		  S.O G.H
		  S.O H.D

3. Input the job name and press [ENT]. ※1), 3)	Input job name [ENT]	Measure Job Name? =>J01

4. Input measuring point name 12 and press [ENT].
  ※1), 3)
	Input measuring point
	[ENT]
		Measure
		  Meas#
		=>12

5. Input the note1-3 and press [ENT]. ※1) ※3)	Input Info 1 [ENT]	Measure Info#1? =>1
● If user want to skip the note 2 and enter to step 6, it just needs to press [ENT] key.	Input Info 2 [ENT]	Measure Info#2? =>1
6. Collimate at the staff.	Input Info 3 [ENT]	Measure Info#3? =>1

7. Press [MEAS] key. Measuring for 3 times and the result will be displayed for M seconds※4）※5). ● If the Measure Mode is Continuous, press [ESC], the last measuring result will be displayed for M seconds. 8. Press [REC] key to save the result. ※6).	[MEAS] Continuous [ESC] [REC]	Measure Press[MEAS] to meas Meas#:12 <hr>Measure Rod: Dist: N:3　　＞＞＞＞＞＞＞ <hr>Measure　　　　1/2 Rod Ave:0.8263m Dist Ave:18.818m N:3　　　δ:0.04mm

※1) The maximum of job name is 8 characters of capital letter or number, and the maximum of note is 16 characters of lowercase and capital letter, number and symbols.

※2) The maximum of point name is 8 characters.

※3) When the "record mode" is off, the job name, point name and note can not be inputted.

●Relationship between measuring number（Mn）and point name(Pn)is as follow:

Mn 11 Pn 1　　　　Mn 12 Pn 1　　Mn 13 Pn 1……

　　　　　Pn 2　　　　　　　　Pn 2　　　　　　Pn 2

　　　　　Pn 3　　　　　　　　Pn 3　　　　　　Pn 3

　　　　　　·　　　　　　　　　　·　　　　　　　·

　　　　　　·　　　　　　　　　　·　　　　　　　·

　　　　　　·　　　　　　　　　　·　　　　　　　·

※4) "Wait Time" can be set manually, please refer to "Set"

※5) After measuring, the result will be displayed. Press [▲] or [▼] to switch the page.

※6) After being saved, the point name will increase or descend automatically.

After measuring, press [▲] or [▼] key to switch the pages

	Distance display:
Measure 1/2 Rod Ave:0.8263m Dist Ave:18.818m N:3 δ:0.04mm	N-times: average surveying value Continuous: last surveying value N: Surveying time δ: Standard offset
Measure 2/2 Meas#:12 PN:1	measured point name point name
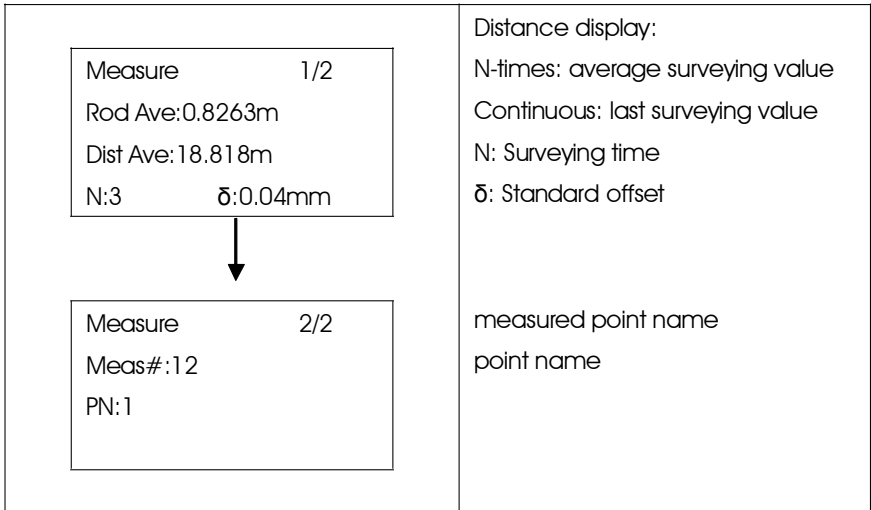
3.2 S.O G.H (Stake out Ground Point)

System can measure the height of corresponding point B by the height value

(Ha+△H), which is calculated by the height (Ha) of the known point A. The

measurement result will not be saved.

Please see the example in the next page.

Operating Procedures	Operation	Display

1. Press [ENT] key.	[ENT]	Menu 1/2
		►Standard Mode
		  Leveling
		  Adjust

2. Press [ENT] key.	[ENT]	Standard Mode 1/2
		  Measure
		►S.O G.H
		  S.O H.D

3. Input the ground height of backsight point and press [ENT].	Input BS G.H [ENT]	S.O G.H Input BS G.H =23.000 m
4. Input the ground height of stakeout point and press [ENT].	Input SO G.H [ENT]	S.O G.H Input SO G.H =25.000 m
5. Focus and sight at the backsight point, then press [MEAS].	[MEAS]	S.O G.H Meas BS Pt Press[MEAS] to meas
6. The measuring result of backsight point will be displayed, then press [ENT] key.	[ENT]	S.O G.H F B Rod: 1.512m B Dist: 26.78m N:3 δ:0.4mm
	[MEAS]	S.O G.H

7. Focus and sight at the stakeout point, then press [MEAS].		Meas SO Pt Press[MEAS] to meas
8. The measuring value and stakeout value will be displayed. ↑ indicates that the staff is too low and it needs to be moved up.		S.O G.H S Rod:　1.612m S.O: ↑ 2.100m N:3　　　δ:0.4mm
9. Press [▲] or [▼] key to switch to the page of sight distance and height of stakeout point, then press [ENT].	[▲] or [▼] [ENT]	S.O G.H S Dist:　26.78m 　G.H:　22.90m
10. Press [REP] to start a new stakeout job and start over backsight point surveying. Press [ENT] to continue stakeout measurement. Press [ESC] to exit.		S.O G.H REP:　New Meas ENT:　Continue ESC:　Exit

3.3 S.O H.D (Stake out Height Difference)

According to the inputted height difference ΔH which calculated from known point A

and point B, system can measure out the corresponding point B, the measurement result will not be saved.

Operating Procedures	Operation	Display
1. Press [ENT] key.	[ENT]	Menu　　　　　　　1/2 ►Standard Mode 　Leveling 　Adjust
2. Press [ENT] key.	[ENT]	Standard Mode　　1/2 　Measure 　S.O G.H ►S.O H.D
3. Input height difference value and press [ENT].	Input H.D [ENT]	S.O H.D Input SO H.D =-1.000　　m
4. Focus and sight at the backsight point, then press [MEAS].	[MEAS]	S.O H.D Meas BS Pt Press[MEAS] to meas
5. The measuring result of backsight point will be displayed, then press [ENT] key.	[ENT]	S.O H.D　　　　　　F B Rod:　1.512m B Dist :　26.78m N:3　　　δ:0.4mm
	[MEAS]	S.O H.D

6. Focus and sight at the stakeout point, then press [MEAS].		Meas SO Pt Press[MEAS] to meas]
7. The measuring value and stakeout value will be displayed. ↓ indicates that the staff is too high and it needs to be moved down.	[▲] or [▼] [ENT]	S.O H.D S Rod: 1.612m H.D: ↓ 0.900m N:3 δ:0.4mm
8. Press [▲] or [▼] key to switch to the page of S Dist (Sight Distance) and H.D (Height Difference) of stakeout point, then press [ENT].		S.O H.D S Dist: 26.78m H.D: -0.100m
9. Press [REP] to start a new stakeout job and start over backsight point surveying. Press [ENT] to continue stakeout measurement. Press [ESC] to exit.		S.O H.D REP: New Meas ENT: Continue ESC: Exit

3.4 S.O Dist(Stake out Distance)

According to the inputted distance Dab from known point A to point B, system can measure the corresponding point B. The measurement result will not be saved.

Operating Procedures	Operation	Display
1. Press [ENT] key.	[ENT]	Menu 1/2 ►Standard Mode Leveling Adjust
2. Press [▼] key.	[▼]	Standard Mode 1/2 Measure S.O G.H ►S.O H.D
3. Press [ENT] key;	[ENT]	Standard Mode 2/2 ►S.O Dist
4. Input stakeout distance and press [ENT];	Input S.O Dist [ENT]	S.O Dist Input SO Dist =15.000 m
5. Focus and sight at the stakeout point, then press [MEAS].	[MEAS]	S.O Dist Meas SO Pt Press[MEAS] to meas

6. Press [▲] or [▼] to switch page and display the rod reading and input value, then press [ENT].	[▲] or [▼] ［ENT］	S.O Dist S Dist: 26.78m Dist: ←11.78m
7. Press [ENT] to continue stakeout measurement. Press [ESC] to exit.	[ENT] or [ESC]	S.O Dist S Rod: 1.005m Input: 15.00m
		S.O Dist ENT:Continue ESC:Exit

4. LEVELING

In Leveling Mode, "Out Module" should be set as "Flash" or "SD". In this section, we take "Flash" for example.

If user wants to save leveling measured data directly to SD card, the "Out Module" should be set as "SD".
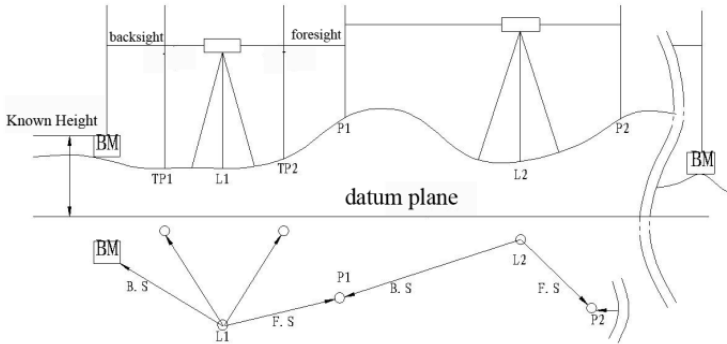
4.1 Start Leveling

In "Start Leveling" function, user should input job name, pointname and height of benchmark, and then start to do the measuring.

Leveling 1: B1→F1→F2→B2

Leveling 2: B1→B2→F1→F2

Leveling 3: B→F/ B→I→F

Leveling 4:Outward/Return：B1→F1→F 2→B 2/ F 1→B 1→B 2→F 2

After measuring a station, user can switch off the instrument to save power, the instrument will automatically continue the next station measurement after power on. If the measurement do not finish while power off, the point needs to be remeasured after switching on the instrument.

Operating Procedures	Operation	Display

1. Press [ENT] key.	[ENT]	Menu 1/2
		    Standard Mode
		 ► Leveling
		    Adjust

2. Press [ENT] key.	[ENT]	Leveling
		 ► Start Leveling
		    Continue Leveling
		    End Leveling

3. Input job name and press [ENT].	Input Job Name [ENT]	Leveling Job Name? =>J01

4. Press [▲] or [▼] to choose Leveling Measurement mode and press [ENT];	[ENT]	Leveling
		 ►B1→F1→F2→B2
		    B1→B2→F1→F2
		    B→F/B→I→F

5. Press [▲] or [▼] to choose from Input BS Pt or Transfer(call up an existed basepoint height). ※1) Then press Enter.	[▲] or [▼]
	 [ENT]
		Leveling 1/2 F
		  Input BS Pt
		  Transfer

6. Input the point name of benchmark and press [Ent]	Input BM# [ENT]	Leveling F BM#? =>B01

7. Input the information and press [ENT]. (Press [ENT] directly to skip).	Input Info [ENT]	F Info#1 =>1
8. Input ground height of backsight point and press [ENT].	[ENT]	F Info:#2 =>1
		F Info:#3? =>1
		F Input BS G.H =100 m

※1) The existed point data can be input in the menu→Data Manage→Input Pt.

※2) User can input three groups of notes, each notes has 16 characters of numbers or symbols

Leveling: Measurement of backsight and foresight data

Leveling measurement 1: B1→F1→F2→B2

Operating Procedures	Operation	Display
1. After inputting the ground height of backsight point, the screen will display "Bk1 (backsight). If the previous step is "Start Leveling", screen will display BM#(Benchmark number).		Level BFFB Bk1 BM#:B01 Press [MEAS] to meas
2. Sight at the staff which is on the backsight point (Bk1). 3. Press [MEAS] key. Example: If it measures 3 times, after surveying, the average value will be displayed for M seconds ※ 1).	Sight at Bk 1 [MEAS]	Level BFFB F Bk1 BM#:B01 >>>>>>>>>
4. When it is in continuous measuring mode, press [ESC] to display the last measuring data for M seconds.	In continuous measuring mode [ESC]	Level BFFB B1Rod:0.8259m B1Dist: 3.914m N:3 >>>>>>>>>
		Level BFFB 1/2 B1Rod Ave:0.8259m B1Dist Ave: 3.914m N:3 δ:0.00mm
5. Then the screen will display "Fr1" and the foresight point name will increase or descend automatically. Now press [ESC] can modify the point	Sight at Fr1 [MEAS]	Level BFFB Fr1 PN :P01 Press [MEAS] to meas

name. After that, collimate the staff in the foresight point (Fr1).		Level BFFB 1/2 F1Rod Ave:0.8260m F1 Dist Ave: 3.914m N:3 δ:0.02mm
6. Press [MEAS]. After measuring, the average value will be displayed for M seconds.	Sight at Fr2 [MEAS]	Level BFFB Fr2 PN :P01 Press [MEAS] to meas
7. Sight at the staff in the foresight point (Fr2) and press [MEAS].		Level BFFB 1/2 F2 Rod Ave:0.8260m F2 Dist Ave: 3.913m N:3 δ:0.02mm
8. After measuring, the average value will be displayed for M seconds.	Sight at Bk 2 [MEAS]	Level BFFB Bk2 BM#:B01 Press [MEAS] to meas
9. Focus and sight at the staff in the backsight point (Bk2) and press [MEAS].		Level BFFB 1/2 B2 Rod Ave:0.8261m B2 Dist Ave: 3.915m N:3 δ:0.02mm
10. If there are more backsight and foresight points, user can start from the step 2 to 9.		

※1) User can set the display time in the "Condition Setting".

After measuring, following data will be displayed.

Press [▲] or [▼] key to turn page.※

After measuring the backsight point 1(Bk 1), press [▲] or [▼] to display the following interface:

Level BFFB 1/2	The following items are only displayed on the
B1 Rod Ave:0.8259m	N-times measuring mode:
B1 Dist Ave : 3.914m	Distance to the Backsight point
N:3 δ:0.00mm	N times mode: Average value

Continuous mode: Last measuring value

N: Total measuring times

δ: Standard offset

| Level   BFFB   2/2 | |
| BM#:B01 | Backsight point name |

After measuring the foresight point 1(Fr 1), press [▲] or [▼] to display the following interface:

Level BFFB 1/2	Disance to the foresight point
F1 Rod Ave:0.8260m	N times mode: Average value
F1 Dist Ave : 3.914m	Continuous mode: Last measuring value
N:3 δ:0.02mm	N: Total measuring times

δ: Standard offset

Level BFFB 2/2	
H.D 1: -0.0001m	Height Difference from Bk1 to Fr1
Fr GH1:99.9999m	Ground height of forsight point
PN :P01	

After measuring the foresight point 2(Fr 2), press [▲] or [▼]to display the following interface:

```
Level    BFFB    1/2
F2 Rod Ave:0.8260m
F2 Dist Ave : 3.913m
N:3        δ:0.02mm
```

Disance to the foresight point
N times mode: Average value
Continuous mode: Last measuring value
N: Total measuring times
δ: Standard offset

```
Level    BFFB    2/2
d :0.000m
Σ:7.828m
PN   :P01
```

d:backsight distance sum-foresight distance sum
Σ:backsight distance sum+oresight distance sum
Foresight point name

After measuring the backsight point 2(Bk 2), press [▲] or [▼]to display the following interface:

```
Level    BFFB    1/3
B2 Rod Ave:0.8260m
B2 Dist Ave :3.915m
N:3        δ:0.02mm
```

Distance to the Backsight point
N times mode: Average value
Continuous mode: Last measuring value
δ: Standard offset

E.V:Elevation offset difference=(Bk1-Fr1)-(Bk2-Fr2)

```
Level    BFFB    2/3
E.V Limit:   0.0mm
d:        0.001m
Σ:        7.828m
```

d: backsight distance sum-foresight distance sum
Σ:backsight distance sum+foresight distance sum

Height Difference from Bk2 to Fr2

```
Level    BFFB    3/3
```

Ground height of foresight point

```
H.D 2:0.0000mm            Backsight point name
Fr GH2: 100.0000m
BM#:B01
```

Leveling measurement 2: B1→B2→F1→F2

Operating Procedures	Operation	Display
1. After inputting the ground height of backsight point, the screen will display "Bk1 (backsight).If the previous step is "Start Leveling", screen will display BM (Bench Mark).		Level BBFF Bk1 BM#:B01 Press [MEAS] to meas
2. Sight at the staff in the backsight point (Bk1) and Press [MEAS] key.	Sight at Bk 1 [MEAS]	Level BBFF Bk1 BM#:B01 > > > > > > > > > > >
3. Focus and sight at the staff in the backsight point (Bk2) and press [MEAS].	Sight at Bk 2 [MEAS]	Level BBFF Bk2 BM#:B01 Press [MEAS] to meas
4. Sight at the staff in the foresight point [Fr1]. Meanwhile press [ESC] can change the foresight point name.	Sight at Fr1 [MEAS]	Level BBFF Fr1 PN:P01 Press [MEAS] to meas

Press [MEAS] to measure.		
5. Sight at the staff in the foresight point (Fr2) and press [MEAS].	Sight at Fr2 [MEAS]	Level BBFF Fr2 PN:P01 Press [MEAS] to meas
6. Move the station and sight at the staff in the backsight point (Bk1), and then press [MEAS]. If there are more backsight and foresight points, please repeat step 2 to 5.	Sight at Bk 1 [MEAS]	Level BBFF Bk1 PN:P01 Press [MEAS] to meas

After measuring, the following data will be displayed.

Press [▲] or [▼] key to turn page※

After measuring the **backsight point 1(Bk 1)**, press [▲] or [▼] to display the following interface:

Level BBFF 1/2
B1 Rod Ave:0.8259m
B1 Dist Ave : 3.914m
N:3   δ:0.00mm

Level BFFB 2/2
BM#:B01

The following items are only displayed on the N-times measuring mode:
Distance to the Backsight point
N times mode: Average value
Continuous mode: Last measuring value
N: Total measuring times
δ: Standard offset

Backsight point name

```
┌────────────────────────────────────────┐
│                                        │
└────────────────────────────────────────┘
```

After measuring the **backsight point 2(Bk 2)**, press [▲] or [▼]to display the following interface:

```
┌───────────────────────────────────────────────────────────────┐
│                                                               │
│  ┌──────────────────────────┐   Distance to the Backsight point│
│  │ Level    BBFF    1/2     │   N times mode: Average value    │
│  │ B2 Rod Ave:0.8260m       │   Continuous mode: Last measuring value │
│  │ B2 Dist Ave:3.915m       │   δ: Standard offset             │
│  │ N:3        δ:0.02mm      │                                  │
│  └──────────────────────────┘                                  │
│                                                               │
│  ┌──────────────────────────┐   Backsight point name          │
│  │ Level    BBFF    2/2     │                                  │
│  │ BM#:B01                  │                                  │
│  │                          │                                  │
│  │                          │                                  │
│  └──────────────────────────┘                                  │
│                                                               │
└───────────────────────────────────────────────────────────────┘
```

After measuring the **foresight point 1(Fr 1)**, press [▲] or [▼] to display the following interface:

```
┌───────────────────────────────────────────────────────────────┐
│                                  Disance to the foresight point │
│  ┌──────────────────────────┐   N times mode: Average value    │
│  │ Level    BBFF    1/2     │   Continuous mode: Last measuring value │
│  │ F1 Rod Ave:0.8260m       │   N: Total measuring times       │
│  │ F1 Dist Ave: 3.914m      │   δ: Standard offset             │
│  │ N:3        δ:0.02mm      │                                  │
│  └──────────────────────────┘                                  │
│                                                               │
│  ┌──────────────────────────┐                                  │
│  │ Level    BBFF    2/2     │                                  │
│  │ H.D 1: -0.0001m          │   Height difference from Bk1 to Fr1 │
│  │ Fr GH1:99.9999m          │   Ground height of foresight point │
│  │ PN   :P01                │                                  │
│  └──────────────────────────┘                                  │
│                                                               │
└───────────────────────────────────────────────────────────────┘
```

After measuring the **foresight point 2(Fr 2)**, press [▲] or [▼] to display the following interface:

```
Level    BBFF   1/3          Disance to the foresight point
F2 Rod Ave:0.8260m           N times mode: Average value
F2 Dist Ave: 3.913m          Continuous mode: Last measuring value
N:3        δ:0.02mm          N: Total measuring times
                             δ: Standard offset


Level    BBFF   2/3          E.V:Elevation offset difference＝(Bk1-Fr1)-(Bk2-Fr2)
E.V Limit:0.0mm              d: backsight distance sum-foresight distance sum
d :0.000m                    Σ:backsight distance sum＋oresight distance sum
Σ:7.828m                     Foresight point name


                             Height Difference from Bk2 to Fr2
Level    BBFF   3/3          Ground height of foresight point
H.D 2: 0.0000m
Fr GH2:100.000m
PN   :P01
```

Leveling measurement 3: B→F/B→I→F

Operating Procedures	Operation	Display
1. After inputting the ground height of backsight point, the screen will display "Bk1 (backsight).		Level BIF Bk1 BM#:B01 Press [MEAS] to meas
2. Sight at the staff in the backsight point (Bk1) and Press [MEAS] key.	Sight at Bk 1 [MEAS]	Level BIF Bk1 BM#:B01 ＞＞＞＞＞＞＞＞＞＞＞

3. Press [IN/SO] (Intermediate and Stake out）.	[IN/SO]	Level BIF BRod Ave:0.8260m BDist Ave: 3.913m N:3 δ:0.02mm
4. Chosse "Intermediate" and press [ENT].	[▲] or [▼] [ENT]	Level BIF Fr1 Pn :P01 Press [MEAS] to meas
5. Input the point name of intermediate point and press [ENT].	Point name [ENT]	Level BIF ►InterMediate Stake Out
6. Input the information and press [ENT].	Info [ENT]	InterMediate PN ? =>TP01_
7. Focus and collimate the staff in the intermediate point. Press [MEAS] to measure.	[MEAS]	InterMediate Info#1? =>
8. Press [REC] to save data; press [ENT] if user wants to continue intermediate point measurement; press [ESC] to exit.	[REC] [ESC]	InterMediate PN :TP01 Press [MEAS] to meas

9. Sight at the staff in the foresight point (Fr1) and press [MEAS].	Sight at Fr1 [MEAS]	InterMediate Rod Ave：0.9030m Dist Ave：17.008m N:3 δ:0.02mm
10. Focus and sight at the staff in the backsight point (Bk2) and press [MEAS].	Sight at Bk 2 [MEAS]	InterMediate SaveData [REC] Continue [ENT] Exit [ESC]
11. Press [IN/SO] to choose "Intermediate point and Stakeout measurement"	[IN/SO]	Level BIF Fr1 PN :P01 Press [MEAS] to meas
12. Choose "Stake Out" and press [ENT].	[▲] or [▼] [ENT]	Level BIF Bk2 PN :P01 Press [MEAS] to meas
13. Whether to load the ground height data, [ENT] for yes,[ESC] for no.	[ESC]	Level BIF Fr2 PN :P02 Press [MEAS] to meas
14. Input the ground height and press [ENT].	[ENT]	Level BIF InterMediate ► Stake Out
	S.O point	Stake Out Load Data?

	name [ENT]	Yes: [ENT] No: [ESC]
15. Input the point name of stakeout point and press [ENT].		
	Input note [ENT]	Stake Out Input SO G.H ＝3.000 m
16. Input the Info and press [ENT]		
	[MEAS]	Stake Out Set G.H: 3.000m PN :G01
17. Sight at the stakeout point and press [MEAS].		Stake Out Info#1 ＝＞_
18. Screen will display the S.O Rod (Stakeout rod value) and S.O H.D (Direction and Height of the staff movement).		Stake Out Set G.H: 3.000m PN :G01 Press [MEAS] to meas
	[REC] [ESC]	Stake Out S.O Rod: 0.9980m S.O H.D: ↓0.0275m N:3 δ:0.02mm
19. Press [REC] to save data; press [ENT] if user wants to continue intermediate point measurement; press [ESC] to exit.	[ENT]	Stake Out SaveData [REC] Continue [ENT] Exit [ESC]
20. Press [ENT] to continue the foresight point measurement.		
		Level BIF Fr1 PN :P02

		Press [MEAS] to meas

After measuring the backsight point 1(Bk 1), press [▲] or [▼] to display the following interface:

Level BIF 1/2	Distance to the Backsight point
BRod Ave:0.8260m	N times mode: Average value
BDist Ave:3.915m	Continuous mode: Last measuring value
N:3 δ :0.02mm	δ : Standard measurement

Level BIF 2/2	
PN：P05	Backsight point name

After measuring the foresight point 1(Fr 1), press [▲] or [▼] to display the following interface:

Level BIF 1/3	Disance to the foresight point
F2Rod Ave:0.8260m	N times mode: Average value
F2Dist Ave: 3.913m	Continuous mode: Last measuring value
N:3 δ :0.02mm	N: Total measuring times
	δ: Standard offset

Level BIF 2/3	
Fr GH:100.000m	Ground height of the foresight point
d :0.000m	d: backsight distance sum-foresight distance sum
Σ:7.828m	Σ:backsight distance sum+oresight distance sum

Level BIF 3/3	Height Difference from Bk2 to Fr2
H.D 2: 0.0000m	Foresight point name
PN :P01	

After measuring the intermediate point, press [▲] or [▼] to display the following interface:

InterMediate 1/2	Distance to intermediate point
Rod Ave:0.8260m	N times mode: Average value
Dist Ave:3.915m	Continuous mode: Last measuring value
N:3 δ:0.02mm	δ: Standard measurement

InterMediate 2/2	Ground height of intermediate point
Int GH:2.008m	Point name of intermediate point (the point
PN :TP05	name will increase or descend only after
	being saved.)

After staking out, press [▲] or [▼] to display the following interface:

	Measured value of the staff
Stake Out 1/2	N times mode: Average value
S.O Rod: 0.8260m	Continuous mode: Last measuring value
S.OH.D: ↑ 3.915m	Height difference of staff upward or
N:3 δ:0.02mm	downward movement.
	δ:Standard measurement

Stake Out 2/2	
Dist: 12.008m	Sight distance of stakeout point
S.O G.H0: 2.005m	Ground height of stakeout point

Leveling measurement 4: Outward/Return

B1→F1→F 2→B 2/ F 1→B 1→B 2→F 2

Operating Procedures	Operation	Display
1. Press [MEAS] to measure the height of the backsight bench mark (Bk1) and press [ENT].	[MEAS] [ENT]	Outward BFFB 1 Bk1 BM#:B01 Press [MEAS] to meas
2. Press [MEAS] to measure the height of foresight point (Fr1) and press [ENT].	[MEAS] [ENT]	Outward BFFB 1 Fr1 PN:P01 Press [MEAS] to meas
3. Press [MEAS] to measure the height of foresight point (Fr2) and press [ENT].	[MEAS] [ENT]	Outward BFFB 1 Fr2 PN:P01 Press [MEAS] to meas
4. Press [MEAS] to measure the height of the backsight bench mark (Bk2) and press [ENT].	[MEAS] [ENT]	Outward BFFB 1 Bk2 BM#:B01 Press [MEAS] to meas
5. Press [ENT] to continue	［ENT］	

Leveling measurement.		Outward BFFB 1 ENT: Next Meas REP: Repeat MENU:End
6. Press [MEAS] to measure the height of foresight point (Fr1) and press [ENT].	[MEAS] [ENT]	Outward FBBF 2 Fr1 PN:P02 Press [MEAS] to meas
7. Press [MEAS] to measure the height of backsight point (Bk1) and press [ENT].	[MEAS] [ENT]	Outward FBBF 2 Bk1 PN:P01 Press [MEAS] to meas
8. Press [MEAS] to measure the height of backsight point (Bk2) and press [ENT].	[MEAS] [ENT]	Outward FBBF 2 Bk2 PN:P01 Press [MEAS] to meas
9. Press [MEAS] to measure the height of foresight point (Fr2) and press [ENT].	[MEAS] [ENT]	Outward FBBF 2 Fr2 PN:P02 Press [MEAS] to meas
10. Press [ENT] to continue Leveling measurement.	[ENT]	Outward BFFB 2 ENT: Next Meas REP: Repeat MENU:End

11. Press [MEAS] to measure the height of the backsight bench mark (Bk1) and press [ENT].	[MEAS] [ENT]	Outward BFFB 3 Bk1 PN:P02 Press [MEAS] to meas
12. Press [MENU] to end the Leveling measurement.	[MENU]	Outward FBBF 6 ENT: Next Meas REP: Repeat MENU:End
13. Press [ENT] to confirm	[ENT]	Outward FBBF 6 Even station, End meas? Yes: [ENT] No: [ESC]
14. Press [▲] [▼] to choose "End Outward".	[▲][▼] [ENT]	Outward FBBF 6 CP Close ►End Outward
15. Input PN (point name) and press [ENT] to confirm.	Input PN [ENT]	Outward FBBF 6 PN ? =>_
16. Input the information and press [ENT] to confirm.	Input Info [ENT]	Outward FBBF 6 Info#1 =>_

17. Press [▲] [▼] to view the measurement data.	[▲][▼]	Outward FBBF 6 1/2 ∆h CP 0.558m
18. Press [ENT] to continue the return measurement.	[ENT]	∆hΣCP 1.007m ΣD CP 52.00m
19. Press [MEAS] to measure the height of backsight point (Bk1) and press [ENT].	[MEAS] [ENT] [MEAS]	Outward FBBF 6 2/2 ΣD BM 108.05m G.H BM 5.007m
20. Press [MEAS] to measure the height of foresight point (Fr2) and press [ENT].	[ENT] [MENU]	Return BFFB 1 Bk1 BM#:P06 Press [MEAS] to meas
21. Press [MENU] to end the measurement.	 [ENT]	Return FBBF 2 Fr2 PN :P07 Press [MEAS] to meas
22. Press [ENT] to confirm.	 [▲][▼]	Return FBBF 6 ENT: Next Meas REP: Repeat MENU:End
23. Press [▲][▼] to choose.	Point name [ENT]	

24. Input the point name and press [ENT] to confirm.	Info [ENT]	Return FBBF 6 Even station, End meas Yes: [ENT] No: [ESC]
25. Input the note and press [ENT] to confirm.		Return FBBF 6 CP Close ►End Return
26. Press [▲][▼] to view the measurement data.	[▲][▼]	Return FBBF 6 PN ? =>
27. Press [ENT] to exit Return Leveling measurement.	[ENT]	Return FBBF 6 Info#1 =>
		Return FBBF 6 1/2 Δh CP 0.558m ΔhΣCP 0.003m ΣD CP 52.00m
		Return FBBF 6 2/2 ΣD BM 110.08m G.H BM 5.003m
		Menu 1/2

		Standard Mode
		► Leveling
		Adjust

After finishing outward and transition point measuring, following data will be displayed.

| outward FBBF 6   1/2 |
| △h CP 0.558m |
| △hΣCP 0.003m |
| ΣD CP 52.00m |

| return FBBF 6 2/2 |
| ΣD BM 110.08m |
| G.H BM 5.003m |

△h CP: height dif between transition points of the last and this time

△hΣCP：height dif between the start point and transition point of this time；

ΣD CP：sight distance between transition points of the last time and this time

ΣD BM：sight distance between the start point and transition point of this time

G.H BM：height of the transition of this time；

After measuring, following data will be displayed.

Press [▲] or [▼] key to switch the page

After measuring the backsight point 1(Bk 1), press [▲] or [▼] to display the following interface:

| Level BFFB   1/2 |
| B1Rod Ave:0.8259m |
| B1Dist Ave: 3.914m |

The following items only display on the N-times measuring mode:

Distance to the Backsight point

N times mode: Average value

N:3　　　δ:0.00mm	Continuous mode: Last measuring value
	N: Total measuring times
	δ: Standard offset
Level　BFFB　　2/2	
BM#:B01	Backsight point name

After measuring the foresight point 1(Fr 1), press [▲] or [▼] to display the following interface:

Level　BFFB　　1/2	Disance to the foresight point
F1Rod Ave:0.8260m	N times mode: Average value
F1Dist Ave: 3.914m	Continuous mode: Last measuring value
N:3　　　δ:0.02mm	N: Total measuring times
	δ: Standard offset
Level　BFFB　2/2	Height difference from Bk1 to Fr1
H.D 1: -0.0001m	Ground height of foresight point
Fr GH1:99.9999m	
PN　:P01	

After measuring the foresight point 2(Fr 2), press [▲] or [▼] to display the following interface:

```
Level   BFFB    1/2
F2Rod Ave:0.8260m
F2Dist Ave: 3.913m
N:3      δ:0.02mm
```

Disance to the foresight point

N times mode: Average value

Continuous mode: Last measuring value

N: Total measuring times

δ: Standard offset

```
Level   BFFB    2/2
d :0.000m
Σ:7.828m
PN   :P01
```

d: backsight distance sum-foresight distance sum

Σ:backsight distance sum+oresight distance sum

Point name of backsight point

After measuring the backsight point 2(Bk 2), press [▲] or [▼] to display the following interface:

```
Level   BFFB    1/3
B2Rod Ave:0.8260m
B2Dist Ave:3.915m
N:3      δ:0.02mm
```

Distance to the Backsight point

N times mode: Average value

Continuous mode: Last measuring value

δ: Standard measurement

```
Level   BFFB    2/3
E.V Limit:0.0mm
d:      0.001m
Σ:      7.828m
```

E.V: Elevation offset difference =
(Bk1-Fr1)-(Bk2-Fr2)

d: backsight distance sum-foresight distance sum

Σ:backsight distance sum+oresight distance sum

Foresight point name

```
Level   BFFB   3/3
H.D 2:0.0000mm
Fr GH2: 100.0000m
BM#:B01
```

Height difference from Bk2 to Fr2

Ground height of foresight point

Point name of backsight point

Introduction to point name of leveling measurement

Point Name Modification

Before measuring the foresight point, the point name can be modified, please refer to the next chapter "Modify the Point Name"

Available Characters In Point Name

Numeral, capital letters and "-"can be used for point name which is up to 8 characters. The used point name can be reused.

Auto Decreasing and Increasing of the Point Name

Please refer to the Chapter 9 "Set".

Auto Increase Stepsize

If the last character of the last inputted point name is numeral, the point name will add 1 automatically.

Auto Numeral Increasing

As if the point name is less than 8 characters, the number will move rightward and add 1 automatically.

Example：Last   ABCD-99

Now   ABCD-100

As if the point name is 8 chatacters, the number will not move.

Example：Last   ABCDE-99

          Now   ABCDE-00

Auto Decreasing Stepsize

If the last character of the last inputted point name is numeral, the point name will descend 1 automatically.

When the last character is greater than 1, the numeral character will descend 1.

Example: Last   ABC-02

          Now   ABC-01

| | Next | ABC-00 |

When the last character is 0

Next character will be "9" and up to 8 characters.

Example: Last	ABC-00
Now	ABC-9999
Next	ABC-9998

Note: When the point name is only numeral, then it will descend 1. As if the point name is 1, next one will be "99999999"。

●Modify the Point Name

User can modify the point name before measuring the foresight point 1 (Fr1)

Operating Procedures	Operation	Display
1. Press [ESC] before foresight measurement, the point name will move leftward.	[ESC]	Level BFFB Fr1 PN :P01 Press [MEAS] to meas
2. Press [ESC] (C) to delete the character.	[ESC] 3 times	Level BFFB PN ? =>P01
3. Input a new poing name ※ 1）, 2） [For example:2008];	2008	Level BFFB PN ? =>
4. Press [ENT].		

	[ENT]	Level BFFB PN ? =>2008
※1) The inputted alphabets or numerals can be up to 8 characters ※2) The used point name can be reused in the same Leveling measurement.		Level BFFB Fr1 PN :2008 Press [MEAS] to meas

Repeated Measuring key [REP]

[REP] key is used for recollecting the surveying data of backsight or foresight points when the measurement is incorrect. The saved data before repeating measuring will not influence on every calculating result.

[Leveling Measurement 1]
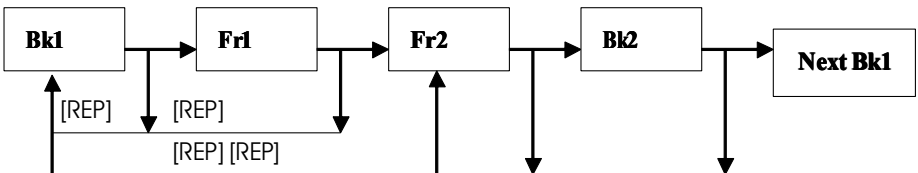
●After measuring the Bk1 or Fr1, user can repeat the measurement form Bk1.
●After measuring the Fr2 or Bk2, user can repeat the measurement from Fr2 or Bk1.

[Leveling Measurement 2]
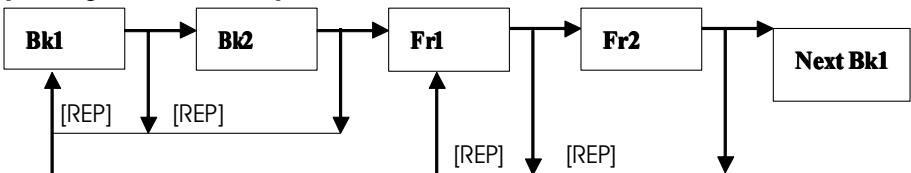
●After measuring the Bk1 or Bk2, user can repeat the measurement form Bk1.
●After measuring the Fr1 or Fr2, user can repeat the measurement from Fr1 or Bk1.
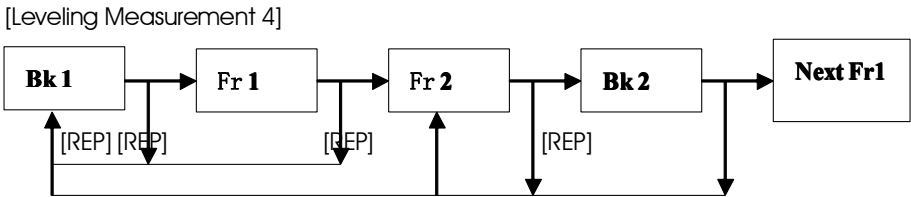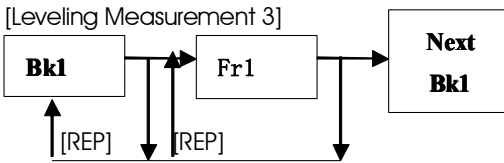
[Leveling Measurement 3]

```
┌─────────┐      ┌─────────┐      ┌─────────┐
│  Bk1    │─────▶│  Fr1    │─────▶│  Next   │
└─────────┘      └─────────┘      │  Bk1    │
     ▲   [REP]  [REP]             └─────────┘
     └──────────────────────────┘
```

[Leveling Measurement 4]

```
┌────────┐    ┌────────┐    ┌────────┐    ┌────────┐    ┌──────────┐
│  Bk 1  │───▶│  Fr 1  │───▶│  Fr 2  │───▶│  Bk 2  │───▶│ Next Fr1 │
└────────┘    └────────┘    └────────┘    └────────┘    └──────────┘
   [REP] [REP]           [REP]          [REP]
```

●After measuring the Bk1 or Fr1, user can repeat the measurement form Bk1.

●After measuring the Fr2 or Bk2, user can repeat the measurement from Fr2 or Bk1.

```
┌────────┐    ┌────────┐    ┌────────┐    ┌────────┐    ┌──────────┐
│  Fr 1  │───▶│  Bk 1  │───▶│  Bk 2  │───▶│  Fr 2  │───▶│ Next Bk1 │
└────────┘    └────────┘    └────────┘    └────────┘    └──────────┘
  [REP]         [REP]         [REP]         [REP]
```
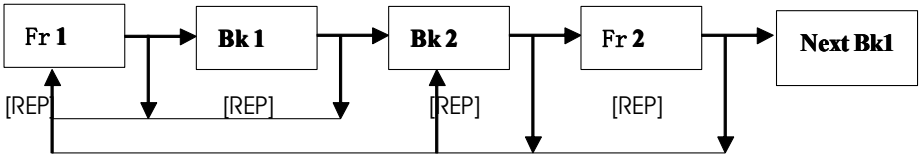
●After measuring the Bk1 or Fr1, user can repeat the measurement form Bk1.

●After measuring the Fr2 or Bk2, user can repeat the measurement from Fr2 or Bk1.

Example:[Leveling Measurement 1] After measuring Fr2, user can remeasure from Bk1

Operating Procedures	Operation	Display
1. When "Bk2" shows on the screen, press [REP].	[REP]	Level BFFB Bk2 BM#:B01 Press [MEAS] to meas
2. Press [ENT] to confirm which measurement needs to be remeasured.	[ENT]	Level BFFB Repeat meas FS2 ? PN :P01 Yes: [ENT] No: [ESC]
3. Sight at backsight point and press [MEAS] to remeasure. After that, the measured data will display for N second.	[MEAS]	Level BFFB Repeat meas BS1 ? BM#:B01 Yes: [ENT] No: [ESC]
4. Sight at foresight point and press [MEAS] to remeasure.	Sight at backsight press [MEAS]	Level BFFB Bk1 BM#:B01 Press [MEAS] to meas
5. Sight at Fr2 and press [MEAS] to remeasure.	Sight at foresight press [MEAS]	Level BFFB Fr1 PN :P01 Press [MEAS] to meas
6 Sight at Forsight and press [MEAS]	Sight at foresight press [MEAS]	Level BFFB Fr2 PN :P01 Press [MEAS] to meas

Intermediate Measurement [IN/SO]

[IN/SO] key is used for collecting the separated intermediate point and sideshot point data in Leveling measurement.

Operating Procedures	Operation	Display
1. After measuring the backsight point, press [IN/SO].	[IN/SO]	Level BFFB Fr1 PN :P01 Press [MEAS] to meas
2. Press [ENT] to set the instrument to be ready for the intermediate point measurement.	[ENT] Input PN [ENT]	Level BFFB ► InterMediate Stake Out
3. Input the point name and information of the intermediate point.	Input Info [ENT]	InterMediate PN ? =>TP01_
4. Collimate the staff in the intermediate point and press [MEAS]. After measurement, the rod average value will be displayed for M seconds.	Collimate intermediate press [MEAS]	InterMediate Info#1 =>_
5 Press [ENT], the instrument is ready for the next intermediate point measurement; after being recorded, the point name will increase	[▲] or [▼]	InterMediate PN :TP01 Press [MEAS] to meas

automatically; If user want to collect more data of intermediate point, please repeat the step 4 and 5. 6. Press [ESC] to exit and return to the Leveling measurement.	Press [REC],[ENT] or [ESC]	InterMediate 1/2 Rod Ave:2.9378m Dist Ave:32.455m N:3 δ:0.02mm InterMediate 2/2 Int GH:10.0000m PN:TP01 InterMediate SaveData [REC] Continue [ENT] Exit [ESC]

StakeOut Key [IN/SO]

In stakeout mode, user can stakeout the point with presetting ground height.

According to the record mode setting, the coordinate data of stakeout point can be saved in "Memory" or "SD card".

Move the point untill fix the required height

Height Difference

Grand Height

Stakeout

Operating Procedures	Operation	Display

1. After the backsight measurement press [IN/SO] before taking the foresight measurement.	[IN/SO]	Level BFFB Fr1 PN :P01 Press [MEAS] to meas
2. Press [▲]or[▼] to choose "Stake Out"	[ENT]	Level BFFB InterMediate ► Stake Out
3. Press [ENT], the coordinate of stakeout point can be recalled in the flash or SD card, which can be choose in the Condition Setting.	[ENT]	Stake Out Load Data ? Yes:[ENT] No:[ESC]

4. Press [▲] or [▼] to choose one job and press [ENT].	[▲] or [▼]
	[ENT]
		Select JobP02
		►J01
		  J02
		  J03

5. Press [▲] or [▼] to choose one point and press [ENT].	[▲] or [▼] [ENT]	Select PoiP01 ►P01 P02
6. Confirm the chosen point and press [ENT];	[ENT]	Select PoiP01 PN :P01 G.H:10.0011m Yes: [ENT] No: [ESC]
7．Input point name and press		

[ENT];	Input PN [ENT]	Stake Out Set G.H: 10.0011m PN :G01_
8. Input the information and press [ENT];	Input Info [ENT]	Stake Out Info#1 =>_
9. Sight at the staff in the stakeout point and press [MEAS]. After measuring, 3-times measuring value and the average value will be displayed.	[MEAS]	Stake Out Set G.H: 10.0011m PN :G01 Press [MEAS] to meas
10. Press [ENT] to stakeout next point, the point name will increase automatically; press [ESC] to exit the Stakeout mode and go back to the Leveling measurement.	[REC], [ENT] or [ESC]	Stake Out 1/2 S.O Rod: 0.0020m S.O H.D：↓1.002m N:3 δ:0.02mm
		Stake Out SaveData: [REC] Continue: [ENT] Exit: [ESC]

The presetting coordinate data is not in the "memory" or "SD card".

[Example 2] Manually input the ground height, point name and other information of the stakeout point, the measuring time is 3.

Operating Procedures	Operation	Display
1. After the backsight measurement press [IN/SO] before taking the foresight measurement.	[IN/SO] [▲] or [▼] [ENT]	Level InterMediate ► Stake Out

Use [▲] or [▼] to choose "Stake Out", then press [ENT].		
2. Press [ESC] to cancel recalling the data from memory.	[ESC]	Stake Out Load Data Yes:[ENT]　No:[ESC]
3. Input the ground height and press [ENT].	Input G.H [ENT]	Stake Out Input SO G.H =10　m
4. Input the point name and press [ENT].	Input PN [ENT]	Stake Out Set G.H:10.000m PN　:G01
5. Input the note and press [ENT];	Input note [ENT]	Stake Out Info#1 =>
6. Sight at the staff in the stakeout point and press [MEAS]. After measuring, 3-times measuring value and the average value will be displayed. 7. Press [ENT] to stakeout next	Sight at stakeout point [MEAS]	Stake Out Set G.H:10.000m PN　:G01 Press [MEAS] to meas
		Stake Out　　　　1/2 S.O Rod:0.0020m S.O H.D ↑1.002m N:3　　　δ:0.02mm

point, the point name will increase automatically; press [ESC] to exit the Stakeout mode and go back to the Leveling measurement.	Press [REC] or [ENT],[ESC]	Stake Out SaveData: [REC] Continue: [ENT] Exit: [ESC]

4.2 End the Leveling Measurement on the Transition Point

User can end the leveling measurement job on the transition point
The close job can be restarted. If user wants to continue the leveling measurement job from a transition control point, please refer to "Continue Leveling".

Please see the example next page.

Operating Procedures	Operation	Display
1. After measuring, when the screen display "Bk1", press [MENU] before next measurement.	[MENU]	Level BFFB Bk1 PN :P01 Press [MEAS] to meas

2. Press [▲] or [▼] to choose "End Leveling".	[▲] or [▼]
	[ENT]
		Leveling
		  Start Leveling
		  Continue leveling
		►End Leveling

3. Select "CP Close" and press [ENT].	[ENT]	Level BFFB ►CP Close BM Close
4. Input the transition control point (CP) name.	Input CP name + [ENT]	Level BFFB PN ? =>
5. Input information 1 and 2. ● Press [ENT] to skip inputting the information. Up to 16 characters can be inputted.	Input Info 1 [ENT]	Level BFFB Info#1 =>
6. Press [ENT].	Input Info 2 [ENT]	

Operating Procedures	Operation	Display
7. Press [▲] or [▼] to view the data	[▲] or [▼]	Level BFFB Info#2 =>
		Level BFFB 1/2 Δh CP: 0.000m Δh ΣCP: 0.002m ΣD CP: 38.950m
8. Press [ENT] to exit.	[ENT]	Level BFFB 2/2 ΣD ΣCP: 233.676m G.H.CP : 10.0002m

		Menu 1/2
		   Standard Mode
		  ► Leveling
		   Adjust

4.3 End the Leveling Measurement on the Bench Mark Point

Operating Procedures	Operation	Display
1. After measuring, when the screen display "Bk1", press [MENU] before next measurement.	[MENU]	Level BFFB Bk1 PN :P01 Press [MEAS] to meas
2. Press [▲] or [▼] to choose	[▲] or [▼]	

"End Leveling".	[ENT]	Leveling
		  Start Leveling
		  Continue leveling
		►End Leveling

3. Select "BM Close" and press [ENT].	[ENT]	Level BFFB CP Close ►BM Close
4. Input the bench mark (BM) point name and press [ENT].	Input BM name [ENT]	Level BFFB PN ? =>
5. Input information 1 and 2. ● Press [ENT] to skip inputting the information. Up to 16 characters can be inputted.	Input Info 1 [ENT]	Level BFFB Info#1 =>
6. Press [▲] or [▼] to view the data	Input Info 2 [ENT]	Level BFFB Info#2 =>
7. Press [ENT] to exit.	[▲] or [▼]	Level BFFB 1/2 Δh CP: 0.000m Δh ΣCP: 0.002m ΣD CP: 38.950m

	[ENT]	Level BFFB 2/2 ΣD ΣBM: 233.676m G.H.BM : 10.0002m

		Menu 1/2
		  Standard Mode
		► Leveling
		  Adjust

Note: If user end the Leveling measurement on the bench mark point, this leveling measurement job is over. User can not continue this job.

4.4 Continue Leveling

This function is used for continuing the leveling measurement.

●The "Out Module" in the setting mode should be "Flash" or "SD".

●The Leveling measurement job must be ended by the "CP Close".

●For saving data, the "Out Module" should be set as "Flash" or "SD".

Operating Procedures	Operation	Display

1. Select "Leveling" and press [ENT].	[MENU]	Menu 1/2
		  Standard Mode
		► Leveling
		  Adjust

2. Press [▲] or [▼] to select "Continue Leveling" and press [ENT].	[▲] or [▼]
	[ENT]
		Leveling
		  Start Leveling
		►Continue Leveling
		  End Leveling

3. Press [▲] or [▼] to select a job and press [ENT].	[ENT]	

4. Collimate the backsight point (Bk) and press [MEAS] to remeasure. After measuring, the result will be displayed for M seconds.	Collimate BK [MEAS]	Select Job ►J01 J02 J03 Level BFFB Bk1 PN :P05 Press [MEAS] to meas

5. OTHER FUNCTIONS

5.1 Manually Inputting Data Key—[MANU]

According to some causes, it can not use [MEAS] key to take measurement. User can use [MANU] to manually input the rod reading and distance from instrument to the staff.

[Example]: In the process of Leveling measurement

Operating Procedures	Operation	Display
1. When measuring the backsight, foresight or intermediate points, user can use [MANU] key instead of [MEAS].	[MANU]	Level BFFB Bk1 PN :P03 Press [MEAS] to meas
2. Input the rod value and press [ENT]. Note: The range of inputted rod value is -4.9999 ~ +4.9999 m	Input rod value + [ENT]	Level BFFB Rod ? ＝1.0410m
3. Input the distance and press [ENT]. Note: The range of distance value is 0 ~ 99.9999m.	Input distance + [ENT]	Level BFFB Dist ? ＝10.000m
		Level BFFB 1/2 B1 Rod 1.0410m B1 Dist 10.000m N:Manu
		Level BFFB 2/2 PN :P03

		Level BFFB
4. According to the previous point is foresight or backsight point, system will go to next step.		Fr1 PN :P04 Press [MEAS] to meas

[Example]: In the process of Standard Measurement

Operating Procedures	Operation	Display
1. While displaying the point name, use [MANU] instead of [MEAS].	[MANU]	Measure Press [MEAS] to meas Meas#:1
2. Input the rod value and press [ENT].	Input rod value + [ENT]	Measure Rod ? =1.0410m
3. Input the distance and press [ENT].	Input distance + [ENT]	Measure Dist ? =10.000m
4. Press [ENT] to save data. Press [ESC] to cancel saving.	[ENT] or [ESC]	Measure Record Data? Yse: [ENT] No: [ESC]
	[ENT]	Measure Rod: 1.0410m Dist : 10.000m N: MANU

	[MEAS]	Measure Press [MEAS] to meas Meas#:1

5.2 Display the Distance—[DIST]

Before measuring, user can use [DIST] to check the distance in order to make sure the distance of foresight and backsight points are the same.

5.3 Inverse Staff Mode—[-]

Inverse staff mode is used for measuring the inverse staff which aims at measuring the celling.

First of all, user should set the "Inverse Mode" in setting mode as "Use". Please refer to chapter 8 "Set Mode" for more details.

Operating Procedures	Operation	Display
1. Press [-] to set the INVERSE MODE as ON, then the screen will display the symbol 'I'.	[-]	Measure Press [MEAS] to meas PN :1
2. Collimate the inverse staff and press [MEAS].	Collimate staff + [MEAS]	Measure I Press [MEAS] to meas PN :1
		Measure 1/2 I Rod Ave:-1.9766m Dist Ave:19.008m N:3 δ:0.02mm
3. Press [-] again to return to the normal measuring mode.	[-]	Measure 1/2 Rod Ave:-1.9766m Dist Ave:19.008m N:3 δ:0.02mm

5.4 Record Data Search—[SRCH]

[SRCH] key can be used for searching and displaying the data stored in internal memory or SD card which can be set in the "Out Module".
["Out Module" is set as "Flash"]

[Example]: Searching the bench mark (BM) point

Operating Procedures	Operation	Display

1. Press [SRCH] at the main menu.	[SRCH]	Menu 1/2
		►Standard Mode
		  Leveling
		  Adjust

2. Press [▲] or [▼] to choose the search type and press [ENT].	[▲] or [▼]
	[ENT]
		Search
		  Job
		  PN
		►BM#

3. Input the search contents.	Input BM point name + [ENT]	Input BM# BM#? =>B01
	[SRCH]	Input BM# BM#? =>B01 Press [SRCH] to search
	[SRCH]	Level BFFB BM#:B01 G.H:19.008m E.V Limit:2.00mm
	[SRCH]	Level BBFF BM#:B01 G.H:10.001m E.V Limit:2.50mm

● After search the bench mark point, press [▲] or [▼] to display the last or next data.

● If the searching goes to the end, the screen will display "No data, EOF".

● Press [ESC] once or twice to return.

["Out Module" is set as "SD"]

Only the files in the same group can be searched.

[Example]: Searching the bench mark (BM) point

Operating Procedures	Operation	Display

1. Press [SRCH] at the main menu.	[SRCH]	Menu 1/2
		►Standard Mode
		  Leveling
		  Adjust

2. Press [▲] or [▼] to choose the group and press [ENT].	[▲] or [▼] [ENT]	Group ►AAA BBB

3. Press [▲] or [▼] to choose the search type and press [ENT].	[▲] or [▼]
	[ENT]
		Search
		  Job
		  PN
		►BM#

4. Input the search contents.	Input BM point name	Input BM# BM#? =>B01
	[SRCH]	

| | [SRCH] | Input BM#
BM#?
=>B01
Press [SRCH] to search |
| | | Level BFFB
BM#:B01
G.H:19.008m
E.V Limit:2.00mm |
| | [SRCH] | Level BBFF
BM#:B01
G.H:10.001m
E.V Limit:2.50mm |

6 HORIZOTAL ANGLE MEASUREMENTS

This instrument is equipped with a horizontal dial which can be used for horizontal angle measurement. Every 1° with a graduation, every 10° with a mark in the dial, and the graduation increases from 0° to 350° in clockwise direction.
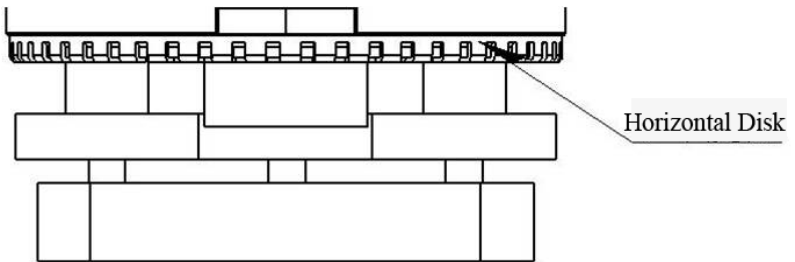
Horizontal Disk

(1)First，set up and level the instrument in start point C. Second, sight the telescope to backsight point A, and rotate the horizontal tangent screw until crosshair is accurately on the staff at point A. Rotate the horizontal dial at 0°.

(2)Sight the telescope to point B, and adjust the horizontal tangent, until the crosshair is accurately on the staff at point B. And the angle reading is angle between target A and target B, i.e. ∠ACB.

A   30°   B

10   0   350   40   30   20

A   B

C

Horizontal disk 30°
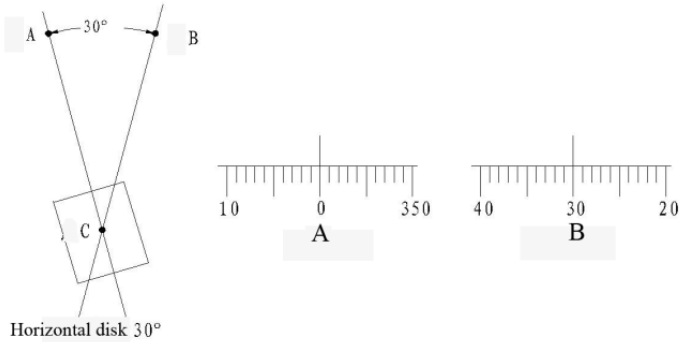
Optical Distance Measure

With the stadia hair of the instrument and the graduation on the staff, you can measure the distance easily. The stadia interval on the staff multiplies 100 is the distance. The stadia interval is the interval between the upper hair and the lower hair on the reticle.

(1) Set up the staff on the target point.

(2) Set up and level the instrument. Sight the telescope to the staff. Record the stadia interval between upper hair and lower wire as "1".

(3) The distance "L" between instrument and staff is L=100x1.

stadia
wires

L

L=100 × 1

82
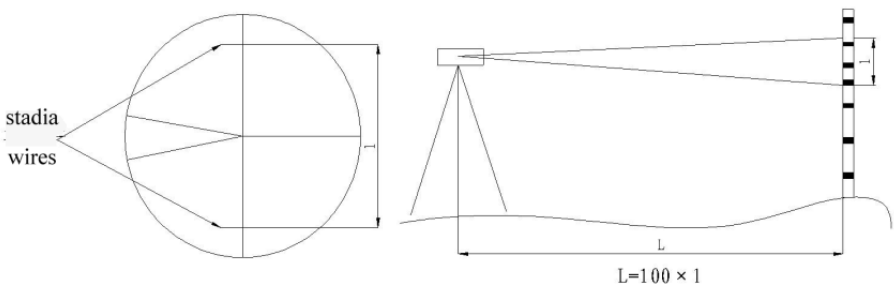
7. FORMAR FLASH OR SD CARD

This function is used for deleting the all files in the memory or SD card, which can not be recycled after formatting. In order to avoid the mistake in deleting the data, the system requires to input the password while formatting. The password is set by the factory and user can not modify it. Please note that this is the only page where record the code.

<u>Password: 519</u>

SD Card Formating

Operating Procedures	Operation	Display

1. Press [MENU] and use [▲]or [▼] to choose "Format" and press [ENT].	[▲] or [▼] [ENT]	Menu 2/2 Data Manage ►Format
2. Input the password:519, then press [ENT].	Password: 519 + [ENT]	Format Input password =>
3. Press [▲] or [▼] to choose "SD" and press [ENT].	[▲] or [▼]	Format Format Flash ►Format SD
4. Confirm the information and press [ENT].	[ENT]	Format SD Format OK? Yes:[ENT] No:[ESC]
		Format SD Format…
		Format SD Formated

| | | Format
SD
Power off
Auto Power Off. |
| | | |

Memory Formating

Operating Procedures	Operation	Display
1. Press [MENU] and use [▲]or [▼] to choose "Format" and press [ENT].	[▲] or [▼] [ENT]	Menu 2/2 Data Manage ►Format
2. Input the password:519, then press [ENT].	Password: 519 [ENT]	Format Input password =>
3. Press [▲] or [▼] to choose "Flash" and press [ENT].	[▲] or [▼]	Format ►Format Flash Format SD
4. Confirm the information and press [ENT].	[ENT]	Format Flash Format OK? Yes:[ENT] No:[ESC]

		Format Flash Format…
		Format Flash Formated
		Format Flash Power off Auto Power Off.

8. DATA MANAGE

This chapter will introduce how to use "Data Manage" of main menu to manage the memory (RAM) and SD card. The following functions are included:

● Make goup in the SD card

● Search (this function is the same as "SRCH")

● Copy Job (Two ways: one is from memory to SD card, the other is from SD card to memory)

● Delete job in the memory or SD card

● Check the capacity of memory or SD card

● Export file to the computor

Files in the Memory and SD Card

Job and coordinate data can be saved in the memory or SD card in the following way.

Flash

    JOB01.M

    JOB02.L

    JOB021.A

    JOB022.L

            .

            .

SD card   G01

    JOB01.M

    JOB02.L

    JOB021.M

    JOB022.L

            .

            .

        G02

    JOB01.M

    JOB02.L

    JOB021.M

    JOB022.L

       .   .

●No file in the internal memory.

●The file can not be created in the SD card when, in a group, it exits a file with same name.

●According to the file type, the file will add the extension name in the following order:

.L: Leveling measurement data file

.M: Standard measurement data file

.A: Adjustment data file

.H: Ground height file

.T: Inputted point file

According to the file type, user can transfer the inputted points file, standard measurement file, leveling measurement file and ground height file to the computer with USB connector. The default communication port setting is as following:

Band Rate: 9600, Data Bits: 8 Stop Bits: 1, Parity: None.

8.1 Create Group

User can create one or more group which is convenient for view and check.

Operating Procedures	Operation	Display
1. Press [▲] or [▼] to choose "Data Manage".	[▲] or [▼]	Menu　　　　　　2/2 ►Data Manage 　Format
2. Press [ENT] to enter, then press [▲] or [▼] to choose "Make Group" and press [ENT].	[ENT] [▲] or [▼]	Data Manage　　　1/3 ►Make Group 　Input Pt 　Search
3. Input the group name and press [ENT]. After the screen display "OK!", it will return to the "Data Manage" screen.	Input Group Name [ENT]	Data Manage Group Name? =>G01
		Data Manage Making Group…… G01
		Data Manage OK!
		Data Manage　　　1/3 ►Make Group 　Input Pt 　Search

8.2 Search Job

Beside coordinate data, user can easily search the job in the file of SD card or internal memory according to the "Out Module" setting.

Operating Procedures	Operation	Display
1. Press [▲] or [▼] to choose "Data Manage".	[▲] or [▼]	Menu　　　　　　2/2 ►Data Manage 　Format
2. Press [ENT] to enter, then press [▲] or [▼] to choose "Search" and press [ENT].	[ENT] [▲] or [▼]	Data Manage　　　1/3 　Make Group 　Input Pt ►Search
3. Press [▲] or [▼] to choose a group and press [ENT].	[▲] or [▼] [ENT]	Select Group　　　　1 ►G01 　G02 　G03
4. Press [▲] or [▼] to choose the the type of job, and press [ENT].	[ENT]	Search ►Srandard Mode 　Leveling 　Adjust
5. Press [▲] or [▼] to choose a job.	[ENT]	

● Press [ESC] to return to the Menu screen.		Select JobP01 ►J01 　J02 　J03

8.3 Copy Job

The job in the SD card can be copied to the internal memory, vice versa.

Operating Procedures	Operation	Display
1. Press [MENU] and [▲] or [▼] to choose "Data Manage".	[▲] or [▼] [ENT]	Menu　　　　　　2/2 ►Data Manage 　Format
2. Press [MENU] and [▲] or [▼] to choose "Copy Job", then press [ENT].	[▲] or [▼] [ENT]	Data Manage　　2/3 ►Copu Job 　Delete Job 　Check Capacity
3. Press [▲] or [▼] to choose "SD" and press [ENT].	[▲] or [▼] [ENT]	Copy from 　Flash ►SD

4. Press [▲] or [▼] to select a group and press [ENT].	[ENT]	Select GroP01
		►G01
		  G02
		  G03

5. Press [▲] or [▼] to select the job type and press [ENT].	[ENT]	Job Type 1/2
		►Standard Mode
		  Leveling
		  Adjust

6. Press [▲] or [▼] to select a job and press [ENT].		Select JobP01
		►J01
		  J02
		  J03

7. Press [▲] or [▼] to choose "SD" and press [ENT].	[ENT]	Copy to Flash ►SD

8. Press [▲] or [▼] to select a group and press [ENT].	[▲] or [▼]
	[ENT]
		Select GroP01
		  G01
		►G02
		  G03

	[▲] or [▼] [ENT]	Data Manage Complete

		Data Manage 2/3
		►Copu Job
		  Delete Job
		  Check Capacity

8.4 Delete Job

According to the "Out Module" setting, user can delete the job data which is saved in SD card or internale memory.

Operating Procedures	Operation	Display

1. Press [MENU] and [▲] or [▼] to choose "Data Manage".	[▲] or [▼] [ENT]	Menu 2/2 ►Data Manage Format

2. Press [MENU] and [▲] or [▼] to choose "Delete Job", then press [ENT].	[▲] or [▼]
	[ENT]
		Data Manage 2/3
		  Copu Job
		►Delete Job
		  Check Capacity

3. Press [▲] or [▼] to select a group and press [ENT].	[▲] or [▼]
	[ENT]
		Select GroP01
		►G01
		  G02
		  G03

4. Press [▲] or [▼] to select the job type and press [ENT].	[ENT]	Job type 1/2
		  Standard Mode
		► Leveling
		  Adjust

5. Press [▲] or [▼] to select a job and press [ENT].	[ENT]	Select JobP01
		►J01
		  J02
		  J03

6. Press [ENT] to confirm.	[ENT]	Data Manage Delect? Standard:J01 Yes:[ENT] No:[ESC]

| | [ENT] | Data Manage
Completed |
| | | Select GroP01
▶ G01
  G02
  G03 |

8.5 Check the Capacity of Flash or SD Crad

User can check the capacity of flash or SD card by the following method.

Operating Procedures	Operation	Display
1. Press [MENU] and [▲] or [▼] to choose "Data Manage".	[▲] or [▼] [ENT]	Menu 2/2 ▶ Data Manage Format

2. Press [MENU] and [▲] or [▼] to choose "Capacity", then press [ENT].	[▲] or [▼]
	[ENT]
		Data Manage 2/3
		  Copu Job
		  Delete Job
		▶ Check Capacity

3. Press [▲] or [▼] to choose "Flash" and press [ENT].	[▲] or [▼] [ENT]	Check Capacity ▶ Flash SD
4. Press any key to go back to the previous screen.	[ENT]	

| | [ENT] | Check Capacity

  Flash:96%

Press Any Key exit |
| | | Check Capacity
►Flash
  SD |

8.6 File Out

The jobs in files or internal memory can be transferred to external instrument.

Operating Procedures	Operation	Display
1. Press [MENU] and [▲] or [▼] to choose "Data Manage".	[▲] or [▼] [ENT]	Menu 2/2 ►Data Manage Format
2. Press [MENU] and [▲] or [▼] to choose "File Out", then press [ENT].	[▲] or [▼] [ENT]	Data Manage 3/3 ►File Out
3. Press [▲] or [▼] to choose Flash and press [ENT].	[▲] or [▼] [ENT]	Select Memory ►SD Flash

4. Press [▲] or [▼] to select job type and press [ENT].	[▲] or [▼]
	
	[ENT]
		Job Type
		► Standard Mode
		  Leveling
		  Adjust

5. Press [▲] or [▼] to select the job and press [ENT].	[▲] or [▼]
	
	[ENT]
		Select JobP01
		►J01
		  J02
		  J03

6. Press [ENT] to confirm.	[ENT]	Data Manage
		  Send Data?
		  J01
		Yes:[ENT] No:[ESC]

7. After sending, the screen will go back to "Data Manage".		Data Manage Sent

9. SET

The "Set" mode is used for setting the parameters of leveling measurement, for example, user can set the unit, communication parameter etc. The setting will remain after switching off.

9.1 Set Menu

```
┌─────────────────────────┐
│ Menu           1/2      │
│ ►Standard Mode          │
│   Leveling              │
│   Adjust                │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│ Setting                 │
│ ►Measurement            │
│   Condition             │
│   Instrument            │
└─────────────────────────┘
```

```
┌──────────────────────┐  ┌──────────────────────┐  ┌──────────────────────┐
│ Measurement   1/2    │  │ Condition      1/2   │  │ Instrument           │
│ ►Measure Mode        │  │ ►Point No.           │  │ ►Contrast            │
│   Minimum Reading     │  │   Wait Time          │  │   Backlight          │
│   Inverse Mode        │  │   Out Module         │  │   Instrument Info    │
└──────────────────────┘  └──────────────────────┘  └──────────────────────┘

┌──────────────────────┐  ┌──────────────────────┐
│ Measurement   2/2    │  │ Condition      2/2   │
│ ►Unit                │  │ ►Communication       │
│                      │  │   Auto OFF           │
└──────────────────────┘  └──────────────────────┘
```
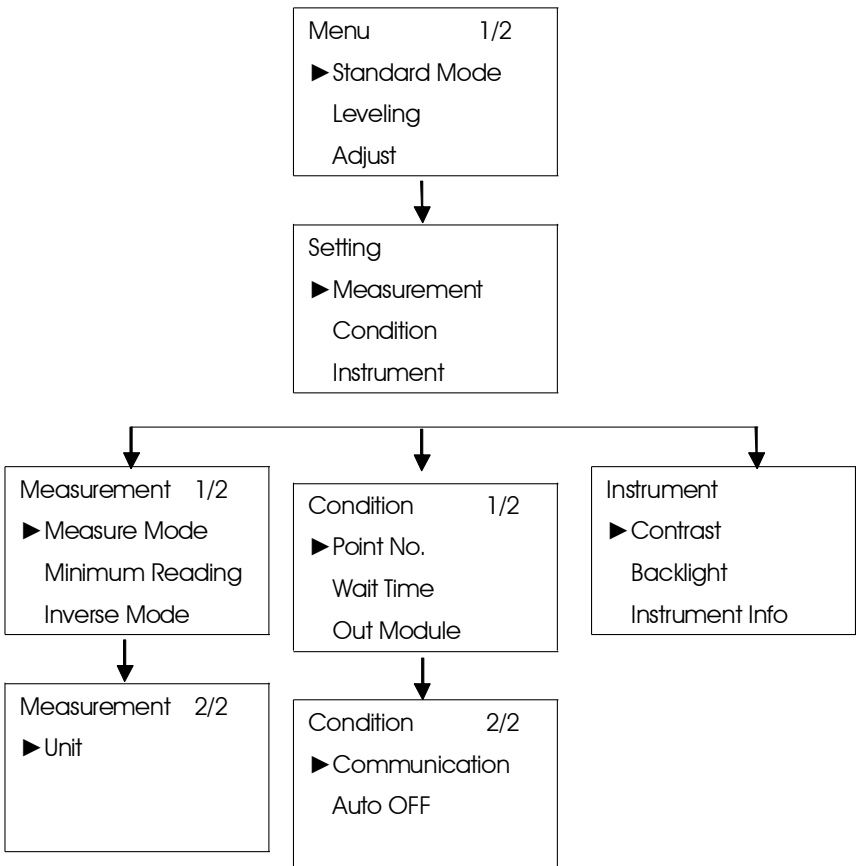
1. Measurement Mode:

In "Measurement Mode" user can select one of the following measure modes. Single, N Times and Continuous. It is recommended to increase the number of measurements to carry out a high-accuracied result.

Option	Function
N Times	Set the N times measurement mode. The range of N is 1 to 99
Single	Single measurement mode
Continuous	Continuous measurement mode

2. Minimum Reading:

"Minimum Reading" is used for setting the minimum reading unit

Option	Function
Standard	1mm
Precise	0.1mm

3. Inverse Mode:

"Inverse Mode" is used for setting the inverse staff measurement. Please refer to the "Inverse Staff Mode"

Option	Function
No Use	No use the "inverse Mode"
Use	Use the "Inverse mode"

4. Unit:

"Unit" is used for setting the unit.

Option	Function
m	Measurement unit: m(meter)
ft	Measurement unit: US.ft(US.Feet) 1m＝3.280833333333333ft

5. Out Module:

"Out Module" is used for setting whether to save the data and the place where it will

be save.

Please refer to the: Setting the Data Out Module"

Option	Function
Flash	To save data in internal memory
SD	To save data in SD card
USB	To connect the instrument with computer
OFF	Do not save the data

6. Point No.

"Point No." is used to selecting the point name increasing or decreasing.

7. Wait Time:

"Wait Time " is used for setting the display time which is from a certain screen to the next screen.

Option	Function
M Second	1～9 seconds optional

8. Communication

"Communication" is used for setting the parameters of communication.

1st Menu	2nd Menu	Function
Standard	--------	Standard setting: Baudrate:9600, Date Bits:8, Stop Bits:1, Parity: None
User	Baudrate	Baudrate:300/600/1200/2400/4800/9600
	Parity	Parity unit: Even, Odd and None optional

9. Auto OFF:

"Auto OFF" is used for setting whether to use the "Auto Off" function.

If this function is on, the instrument, without any operation, will be off in 5 minutes.

Option	Function
ON	To set the "Auto OFF" as ON
OFF	To set the "Auto OFF" as OFF

10. Contrast:

"Contrast" is used for setting the contrast of the screen which has 9 degrees.

Option	Function
Contrast	To set one of the 9 degrees contrast.

11. Backlight:

"Backlight" is used for setting whether to open the backlight.

12. Instrument Infor:

In this function, user can check the instrument information such as: Model, serial number and produce date.

9.2 Alter the Setting Mode

Example 1: To set the measurement time as 3.

Operating Procedures	Operation	Display
1.Before measuring or at the menu, press [SET] to display the "Setting" interface.	[SET]	Menu 1/2 ►Standard Mode Leveling Adjust
2. Press [▲] or [▼] to select "Measurement" and press [ENT].	[▲] or [▼] [ENT]	Setting ►Measurement Condition Instrument
3. Press [▲] or [▼] to select "Measure Mode" and press [ENT].	[▲] or [▼] [ENT]	Measurement 1/2 ►Measure Mode Minimum Reading Inverse Mode

4. Press [▲] or [▼] to select "N Times" and press [ENT].	[▲] or [▼] [ENT]	Measure Mode 　Single ►N Times 　Continuous
5. Input 3 and press [ENT].	3 + [ENT]	Measure Mode Measuring times? 　N＝3_ (1-99)

● Using the everage value of N-times measurement can improve the measuring accuracy.

10. BATTERY AND CHARGER

The on-board battery is NB-21.

Charging

(1) The output voltage of the charger is AC110V~220V. The electric current is 450mA.

(2) Red light means the battery is being charged. Green light means charging is finished.

(3) It will take 5 hours to charge the battery.

(4) Unplug the power plug after charging.

Note: a. Battery-charging should be in the temperature of 10℃~40℃

b. When the charging time exceeds the suggested charging time, the battery life might be shortened.

c. The battery may discharge in storage. Inspect the battery before use if the instrument is stored for a long time.

d. The battery should be stored in a temperature below 30℃, and should be recharged every three or four months.
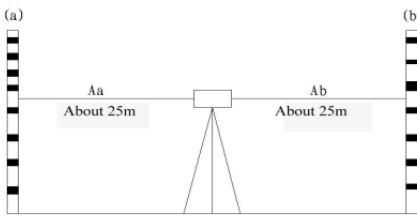
11. ADJUSTMENT

Circular Vial Adjustment

1. Mount the instrument on a tripod. Center the circular vial precisely by rotating the 3 tribrach screws.

2. Rotate the instrument 180°. If the bubble is not in the center, the circular vial should be calibrated as follow:

a. Firstly, identify the bubble moving direction, and adjust the corresponding screws to move the bubble half of the offset.

b. Level the circular vial with the 3 tribrach screws again.

c. rotate the instrument around again to check whether the bubble is centered in every direction. If not, please repeat the steps a & b until the bubble is centered.
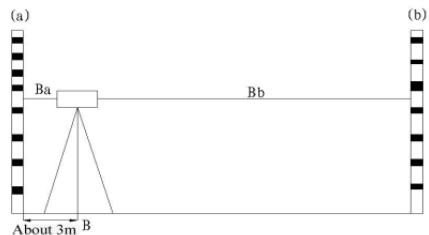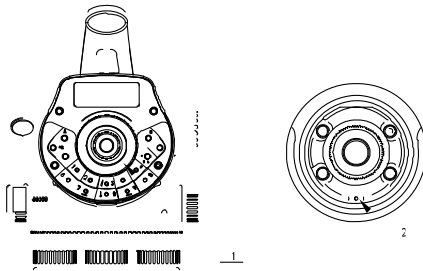
Difference of Line of Sight

11.1 Method A

1. Two staffs are about 50m away, set up the tripod in the center and attach the instrument on it.

2. Leveling the instrument;

3. The inspectations are as follow:

Picture 1

Picture 2

Operating Procedures	Operation	Display
1. Select "Adjust" according to the screen display and press [ENT].	[▲] or [▼] [ENT]	Menu　　　　　　1/2 　Standard Mode 　Leveling ►Adjust
2. Press [▲] or [▼] to choose "Method A" and press [ENT].	[▲] or [▼] [ENT]	Adjust ►Method A 　Method B
3. Input the job name and press [ENT].	Job name [ENT]	Adjust Job Name? =>J01
4. Input the information 1 and press [ENT].	Info 1 [ENT]	Adjust Info #1 =>1
5. Input the information 2 and press [ENT].	Info 2 [ENT]	Adjust Info #2 =>2

6. Input the information 3 and press [ENT].	Info 3 [ENT]	Adjust Info #3 =>3
7. Collimate the staff in point a and press [MEAS] (As shown in the figure 1), meanwhile, take measurement and the screen will display Aa.	[MEAS]	Adjust　　　A Point:A　Rod:a a←----A ----→b Press [MEAS] to meas
		Adjust　　　A Point:A　Rod:a Aa Rod:1.0567m N:3　　　δ:0.02mm
8. Collimate the staff in point b and press [MEAS] (As shown in the figure 1), meanwhile, take measurement and the screen will display Ab.	[MEAS]	Adjust　　　A Point:A　Rod:b a----→A----→b Press [MEAS] to meas
9. Move the instrument to point B and level it (As shown in the figure 2). At this time, user can switch off the instrument to save power.		Adjust　　　A Point:A　Rod:b Ab Rod:1.0567m N:3　　　δ:0.02mm
10. Collimate the staff in point a and press [MEAS] (As shown in the figure 2), meanwhile, take measurement and the		Adjust Method A Move A-------→B Relocate

|		
screen will display Ba.		Adjust A Point:B Rod:a a←-B----→----→b Press [MEAS] to meas
11. Collimate the staff in point b and press [MEAS] (As shown in the figure 2), meanwhile, take measurement and the screen will display Bb.	[MEAS]	Adjust A Point:B Rod:a Ba Rod:1.0567m N:3 δ:0.02mm
12.Display the adjusting value. If user wants to continue adjustment, press [ENT].		Adjust A Point:B Rod:b a←-B----→----→b Press [MEAS] to meas
13. Press [ENT] to display the rod reading of point b.		
14. Rotate the rod reading of point b and remove the eyepiece cover 1, use adjusting pin to rotate the crosshair adjusting screw 2 under the eyepiece. Note: This adjustment must be carried out by the professional person.	[MEAS]	Adjust A Point:B Rod:b Bb Rod:1.0567m N:3 δ:0.02mm
		Adjust A Adjusting value +0.0000m(+0.1") Save[ENT] No[ESC]
15. Collimate the staff and read the value manually. Move the crosshair up and down until the horizontal line is	[ENT]	Adjust Method A Adjust Crosshair? Yes:[ENT] No:[ESC]

consistent with the correct reading.
 	
16. Press [ENT] to return to the "Adjust" interface.
	[ENT]	Adjust
		Method A
		Adjust Crosshair?
		Bb Rod:1.0567m
		
		Menu 1/2
		  Standard Mode
		  Leveling
		▶Adjust

●To cancel the inspection, user just needs to press [ESC] among step 1 to 11.

●When the instrument displays the error information; press [ESC] to continue the inspectation.

11.2 Method B

1. As shown in figure 1, attach the instrument on the tripod and set the tripod on the point A and B which trisect the distance between the two staffs.

2. Leveling the instrument.
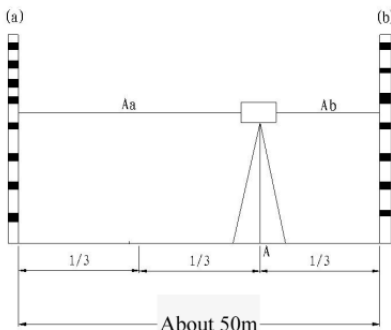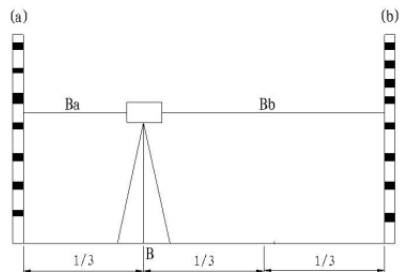
Picture 1   Picture 2

3. The inspection process is the same with Method A

12. TRANSPORTATION, STORING AND CLEANING

Transportation

(1) In outdoor operation, the instrument should be stored in the carrying case, or fixed on the tripod and carried on the shoulder. Make sure not to carry the instrument upside down.

(2) In road transportation, do not leave too much space between instrument cases. Normally, the instrument should be stored in a special case in road transportation.

(3) In plane, train or ship transportation, the instrument should be stored in original carrying case and carton.

(4) Delivering the battery: related law and rules should be totally understood. Inform the carrier before the shipment.

Storage

(1) Notice the temperature when storing the instrument, especially the temperature inside the car in hot summer.

(2) The battery should be removed if the instrument will be stored for a long time.

(3) Do not store the wet instrument into the case before it is wiped dry.

Clean

(1) Clean the instrument after use.

a. If the instrument is wet by seawater, it should be wiped with a wet cloth and then be dried by a dry cloth.

b. Wipe the dust on the instrument with a clean brush and a soft cloth. Do not blow it with compressed air.

c. Wipe the dust on the objective lens with a clean brush, and wipe it with cotton with mixture of alcohol and ether.

(2) When cleaning the plastic parts of the instrument, do not use volatile liquid such as thinner and benzene. Neutral cleansing is suggested.

(3) Check each parts of the tripod after long-term use; make sure the screw and brake parts are tighten.

(4) Clean the staff after use; otherwise it will influence on the accuracy. Do not use volatile liquid such as thinner and benzene to clean the staff.

(5) Store the staff in safe place. And cover the joints of the staff with cloth.

13. SPECIFICATION

Model Specification		DL-201	DL-2007
height accuracy (standard deviation for 1km double run leveling)	digital reading	1.0mm	0.7mm
	optic reading	2.0mm	
distance accuracy	digital reading	D≤10m:10mm;D>10m:D*0.001	
distance range	digital reading	1.5m~105m	
minimum display	HD	1mm/0.1mm	
	distance	0.1/1cm	
measuring time		within 3s in normal condition	
telescope	magnification	32×	
	resolving power	3″	
	field of view	1°20′	
	multi-constant	100	
	add-constant	0	
compensator	type	magnetic-damped	
	range	>±12′	
	accuracy	0.30″/1′	
data storage	storage	16MB	
	point name	increasing/decreasing/user-defined	
	connection	USB	
	External Storage	SD Card	
circular vial accuracy		8′/2mm	
auto power off		5minutes/OFF	
horizontal dial	graduation	1°	
display		LCD display of160*64dpi with illuminator	
Working temperature		-20℃~50℃	
dimension		230mm(L)×150mm(W)×210mm(H)	
weight		2.5kg	