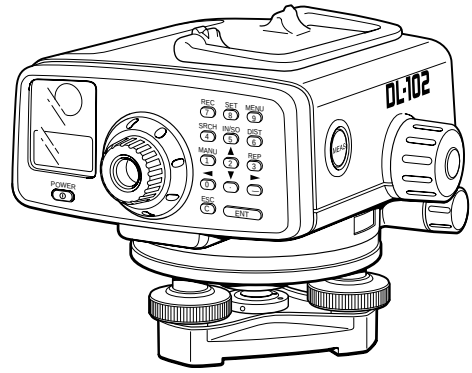
TOPCON



INSTRUCTION MANUAL

ELECTRONIC DIGITAL LEVEL

DL-101C
DL-102C

FOREWORD

Thank you for purchasing the TOPCON Electronic Digital Level DL-101C/DL-102C. For the best performance of the instruments, please carefully read these instructions and keep them in a convenient location for future reference.

General Handling Precautions

Before starting work or operation, be sure to check that the instrument is functioning correctly with normal performance.

- **Precautions are needed to avoid to be dirt or hurt of Pattern Staff surface or connected part of each staff.**

  The pattern surface or the connected part is possible to be touched and injured on the occasion of storage or transportation.
  If the patterns dirtied or injured, accurate read out or measurement can not be expected because the instrument reads out the white and black patterns of the staff as electrical signals. Otherwise the quality of accuracy of the instrument reduces or sometimes measurement can not be done.
- **Tripod**

  Use a wooden tripod with the level when possible. A metallic tripod can cause vibrations which can affect measuring precision. The screws on each leg of the tripod must be tightened firmly.
- **On tribrach**

  If tribrach is not installed correctly, measuring precision may be effected. Occasionally check adjusting screws of the tribrach. Tighten the Base Fixing Screw.
- **Guarding the instrument against shocks**

  When transporting the instrument, provide some protection to minimize risk of shocks. Heavy shocks may cause the measurement to be faulty.
- **Carrying the instrument**

  When carrying the instrument at the site, always grip its hand grip.
- **Do not expose the instrument directly to the sunlight**

  Never leave the instrument in extreme heat (+122 degrees F) longer than necessary. Heat can adversely affect its performance. Never expose the instrument's objective lens to direct sunlight. Sunlight may damage the components inside the instrument.
- **Sudden changes of temperature**

  Any sudden change of temperature to the instrument may result in a reduction of the measuring range. When taking the instrument out from a heated vehicle let instrument acclimate itself to the ambient temperature.
- **Battery level check**

  Confirm battery level remaining before operating.
- **Memory back up**

  The instrument has a built in battery for memory back up. If the battery power is too low to back up the memory, error code “E98” will display. Contact your dealer, to replace the back up battery.
- **Pattern staff**

  Put gloves on if use pattern staff.

Display for Safe Use

In order to encourage the safe use of products and prevent any danger to the operator and others or damage to properties, important warnings are put on the products and inserted in the instruction manuals.
We suggest that everyone understand the meaning of the following displays and icons before reading the “Safety Cautions” and text.

Display	Meaning
⚠ WARNING	**Ignoring or disregard of this display may lead to the danger of death or serious injury.**
⚠ CAUTION	**Ignoring or disregard of this display may lead to personal injury or physical damage.**

•Injury refers to hurt, burn, electric shock, etc.
•Physical damage refers to extensive damage to buildings or equipments and furniture.

Safety Cautions

⚠ WARNING
• **Aiming the instrument directly into the sun can result in serious damage to your eye.** Do not aim the instrument directly into the sun. It is suggested to pay care specially at the time the position of the sun is low such in the morning or evening, or at the time the sunlight is coming directly to the objective lens of the instrument, cut off the sunlight by your hand or use an umbrella in such case.
• **May ignite explosively.** Never use an instrument near flammable gas, liquid matter, and do not use in a coal mine.
• **Keep the pattern staff away from electric facilities such as a high voltage wire or substation.** As this is an electric conductor, there is danger of electric shock.
• **Do not use the pattern staff in conditions of thunder and lightening.** As this is an electric conductor, thunderbolt can cause serious injury or death.
• **There is a risk of fire, electric shock or physical harm if you attempt to disassemble or repair the instrument yourself.** This is only to be carried out by TOPCON or an authorized dealer, only!
• **High temperature may cause fire.** Do not cover the charger while it is charging.
• **Risk of fire or electric shock.** Do not use damaged power cable, plug and socket.
• **Risk of fire or electric shock.** Do not use a wet battery or charger.
• **Battery can cause explosion or injury.** Do not dispose in fire or heat.
• **Risk of fire or electric shock.** Do not use any power voltage except the one given on manufacturers instructions.
• **Battery can cause outbreak of fire.** Do not use any other type of charger other than the one specified.
• **The short circuit of a battery can cause a fire.** Do not short circuit battery when storing it.

⚠ CAUTION
Do not connect or disconnect equipment with wet hands, you are at risk of electric shocks if you do!
Risk of injury by overturn the carrying case. Do not stand or sit on the carrying cases.
Please note that the tips of tripod can be hazardous, be aware of this when setting up or carrying the tripod.
Risk of injury by falling down the instrument or case. Do not use a carrying case with a damaged which belts, grips or latches .
Ensure that you mount the Tribrach correctly, failing to do so may result in injury if the tribrach were to fall over.
It could be dangerous if the instrument falls over, please check that you fix the instrument to the tripod correctly.
Risk of injury by falling down a tripod and an instrument. Always check that the screws of tripod are tightened.

User

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

Exceptions from Responsibility

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

Standard set composition

- •Instrument DL-101C/102C (with lens cap) ..... 1pc.
- •Carrying case ..... 1pc.
- •Plastic rain cover ..... 1pc.
- •Silicon cloth ..... 1pc.
- •Plumb bob set 1set
- •Adjusting pin ..... 1pc.
- •Instruction manual ..... 1vol.
- •Battery Unit* ..... 1pc.

• Make sure that all of the above items are with the instrument when purchased.

* The following are battery configurations. Included battery configurations very by package.

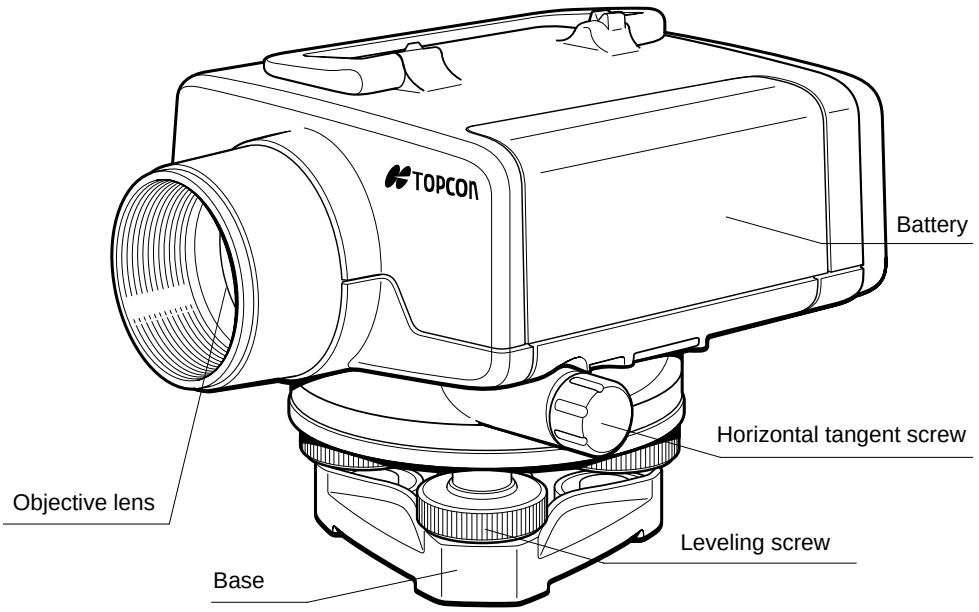
Rechargeable battery type:	Dry battery type:
Rechargeable battery (BT-31Q) ..... 1pc. Battery charger BC-23B or BC-23C .. 1pc.	Dry battery holder (DB-31) ..... 1pc. AA- cell .....6pcs.

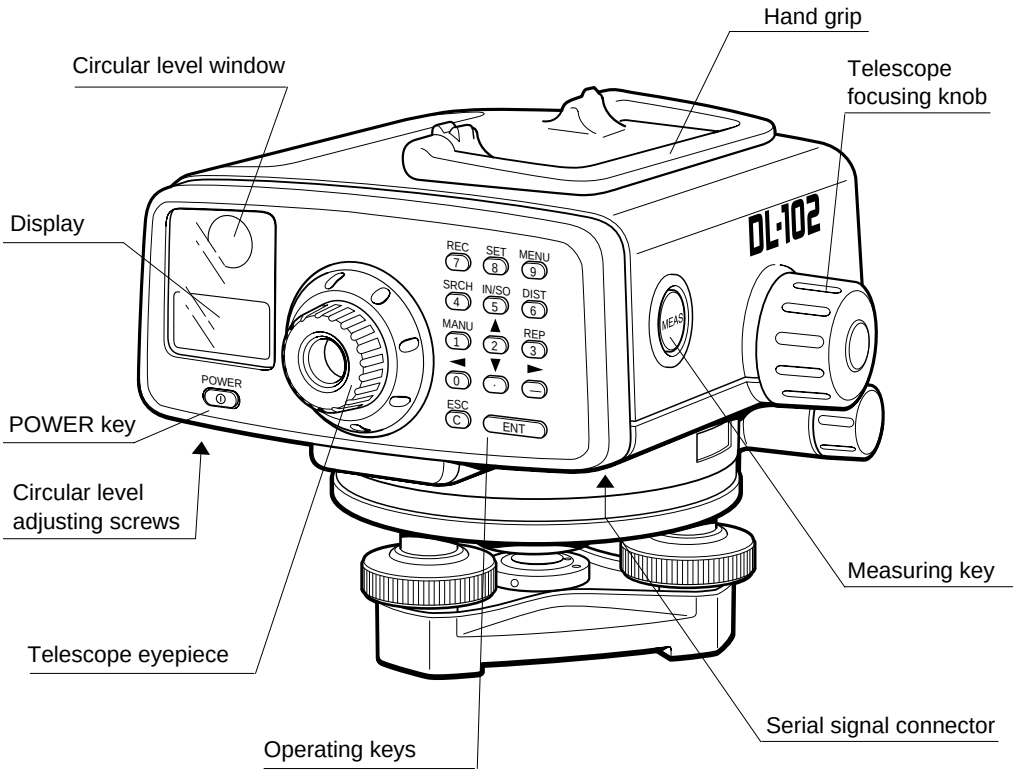
Remark :The battery charger BC-23B is for AC120V and the BC-23C is for AC230V use.

Contents

1 NOMENCLATURE AND FUNCTIONS

Nomenclature





Operating Keys and Functions

Keys	Name of key	Functions
REC	Record key	Records the measured data or enters the displayed data to the instrument. The displayed data are recorded by pressing this key.
SET	Set key	This key initiates the set mode. The set mode is used to set measuring mode, record mode and other parameters.
MENU	Menu key	This key initiates the menu mode. The menu mode has the following options; Standard measuring, Formatting Ram/Card, Adjusting and Utility modes, Adjust mode.
SRCH	Search key	This key allows for the searching and display of recorded data.
IN / SO	Intermediate point / Set out mode key	This key is used to initiate intermediate point or set-out mode collection during line leveling.
DIST	Distance measuring key	Distance data is measured and displayed when this key is pressed.
MANU	Manual entry key	When measurement with the [MEAS] key is not possible, the manual key can be used to input the data from the keyboard.
▲ ▼	Select key	This key is used to page through menu screens or data display screens.
◄ ►	Digit shift key	If the displayed value overflows the screen this key can be used to shift the display to the right or left in the screen.
REP	Repeat measurement key	This key is used to remeasure the previous backsight or foresight point during line leveling.
ESC/C	Escape/clear key	This key can be used to escape from the menu mode or any of the setting modes. This key can be used as a back-space key when inputting data.
0 ~ 9	Numerical key	These keys are used to input numeric values.
▪ (▼)	Numeric, symbol alpha key	When in alpha mode this key will change between numeric, alpha, or symbol input mode.
- [►]	Inverse staff mode key	This key can be used to measure with a inverse staff. Inverse staff mode is necessary to set “USE” within the set mode beforehand.
ENT	Enter key	Use this key to confirm mode parameters and to enter displayed data values.
MEAS	Start measuring key	This key is used to initiate a measurement.
POWER	Power key	This key is used to cut the instrument ON or OFF.

Display

Display

The Display is a 2 line dot matrix LCD having eight digits per line.

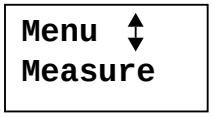
Turn display back light ON/OFF

The display back light option can be available. Refer to chapter “SET MODE” to see how to turn the back light ON/OFF.

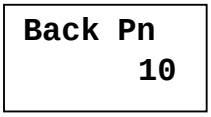
Luminance adjusting

The brightness of the display can be adjusted to one of nine settings. Refer to chapter “SET MODE” to see how to set the brightness.

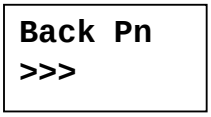
Example:



Standard measurement



Line Leveling



Measuring

Display marks

Display	Contents	Display	Contents
REC	Indicates that record mode is on		There are other pages or menu that can be viewed by pressing the [▲] [▼]key.
	Battery power indicator		Pressing [▲] [▼]key to display the next menu.
So	Set out mode	Inst Ht	Instrument height
BM	Benchmark	CP	Changing point
Bk	Backsight	GH	Ground height
Fr	Foresight	Int	Intermediate point measurement, sideshot.
i	Inverse staff mode		

*The following display marks are omitted in this manual.

REC

2 PREPARATION FOR MEASUREMENT

Setting Up the Instrument for Measurement

Setting up the Tripod

Use a tripod with a tripod screw of 5/8" diameter and 11 threads per inch, such as the TOPCON Type E aluminum tripod or wide-frame tripod or the dome head aluminum tripod.

1 Extend the legs to a suitable length and tighten the wing nuts at the legs mid-sections.

2 Tighten the hexagonal nut located on the side of the tripod head such that the tripod legs are not too loose. Place the tripod over the required point, with the legs spread about a meter apart or at such an angle to insure the stability of the tripod. Place one tripod leg in position and then used the other two legs to approximately level the tripod head. If necessary adjust the tripod leg extension.

3 Press the shoes of the tripod legs firmly into the ground to anchor the tripod securely.

Attaching the Instrument to the Tripod Head

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

1 Align the tripod screw with the socket on the base of the instrument, and screw in the tripod screw until the instrument is securely fixed to the tripod head.

2 If the horizontal circle is being used for measuring an angle or establishing a line, the instrument must be set up exactly over the point with the plum bob.

3 Use the three leveling screws to center the circular bubble level in other to level the instrument. If a dome head tripod is being used, loosen the tripod screw slightly and move the instrument around on top of the tripod head to center the circular level bubble vial. When the bubble is within the red circle, tighten the tripod socket.

Setting the Instrument Up Over the Point

When the instrument is used to measure angles or to establish a line, the instrument must be set up exactly over a particular point with the plumb bob.

1 Hang the plumb bob hook on the plumb bob hanger of the tripod screw.

2 Next suspend the plumb bob string from the plumb hook and adjust the string length with the slipping device so that the plumb bob is at a suitable height.

3 If the instrument is not set up over the required point, move the instrument over the point without disturbing the relation between the tripod legs and the tripod head. Place the tripod in position so that the plumb bob is within one centimeter or so of the point. Grasp two of the tripod legs and adjust with respect to the third leg so that the tripod head is level at a convenient height with sufficient spread of the legs when the two legs are allowed to touch ground.

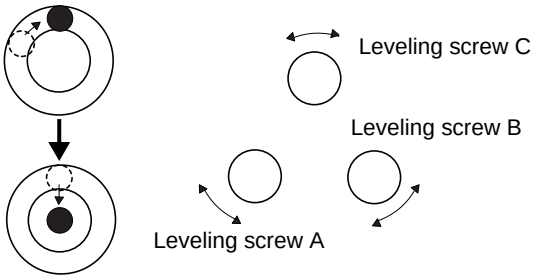
4 Finally press each leg firmly into the ground while watching the plumb bob and tripod head.

5 Loosen the tripod screw slightly and slide the instrument on the tripod head in order to position the plumb bob directly over the point and tighten the tripod screw.

Leveling the Instrument

1 Use the two leveling screws furthermost from the circular level to move the bubble of the circular level vial. Rotate the screws in the direction which will shift the bubble of the circular level vial so that the bubble is located on a line perpendicular to a line running through the center of the two leveling screws being adjusted, as illustrated.

2 Next, revolve the remaining leveling screw to shift the bubble towards the center of the circular level vial.



If the bubble is still not centered properly, repeat the operation from the beginning.
NOTE: Do not touch the telescope during this procedure.

Adjusting the Eyepieces

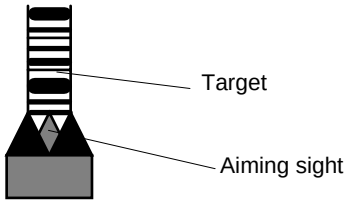
The telescope eyepiece should be adjusted to the user's eyesight before conducting surveying operations.

1 First, rotate the eyepiece adjustment ring by revolving it in a counterclockwise direction. The reticle cross-hairs may be blurred and indistinct at this time.

2 Next, slowly rotate the eyepiece ring in a clockwise direction until the cross-hairs are seen clearly and distinctly.

Sighting and Focusing

1 Point the telescope in the direction of the target. Sight through the telescope and align the target to the apex of the triangular mark as illustrated.



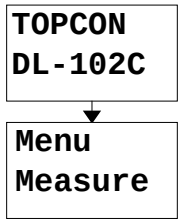
2 Next, revolve the focusing knob in either direction until the target is in focus.

3 Finally, use the horizontal tangent screw for precise alignment of the target.
For further information, see section "Focusing and Collimation of Staff" on page 9 .

NOTE:
Once the level has been focused and aligned on the target, shift the eye to the left and right while looking through the telescope eyepiece. There should be no deviation between the reticle cross-hairs and the target. If there is deviation, parallax, then either focus the instrument or adjust the eyepiece. The focusing error can be eliminated by careful adjustment of the eyepiece and focusing.

POWER Switch Key ON

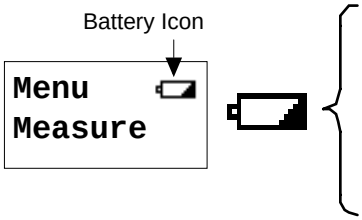
When the power switch is pressed, the level will first display the title. The screen will then display the menu that was displayed prior to shutting the level off.



Battery Power Remaining Display

Battery Icon

The battery icon displays the battery capacity.



No light:The battery level is sufficient for measuring.

Light:Measuring is possible but the battery is partly discharged.

Flash:A flashing indicates the battery will soon be discharged. Charge to a new battery as soon as possible.

Battery Voltage Check

Battery voltage can be displayed using one of the “Set Menu” options

Operating procedure	Operating	Display
		Fore Pn 40
1 Press the [SET] key while the screen displays MENU or before measurement. After a few seconds the “Check Battery” screen will be displayed	[SET]	Set Mode ↓ Check Battery
2 Press the [ENT] key. The screen displays the voltage level for N-seconds. The screen returns to “Check Battery” screen. Refer to Chapter six to see how to set the N-display time.	[ENT]	Battery 7.20 V ↓ Check Battery
3 Press the [ESC] key. The level returns to the screen that was displayed prior to pressing the [SET] key.	[ESC]	Fore Pn 40

Note :
1)The battery operating time varies depending on environmental conditions such as ambient temperature, charging time, and the number of charges and discharges.
The batteries should be charged before use and spare batteries should be available.
2)See Chapter " Power Source and Charging " for an explanation of battery use.

Setting of Record Mode (Out Module)

To store the measured data to the internal memory (RAM) of the instrument or Data card, “Out Module” in the Set Menu should be set to “RAM” or “Card”. Before the Line Level option can be run, “Out Module” has to be set to “RAM” or “Card”.

1) Module RAM :

The measured data (Job) is stored in the instrument (RAM).

- •To output the stored data to external device, carry out “SET MODE (File Out)” or DL-101C/ 102C interface manual. (See Chapter “SET MODE”)
- • Maximum 8,000 points data can be stored in RAM.
- • The job number within the RAM can be maximum 256 jobs.
- •“Group” can not be made within RAM.

2) Module Card :

The measured data (Job) can be stored in Memory card directly.

- •To output the stored data to external device, carry out “SET MODE (File Out)” or DL-101C/ 102C interface manual. (See Chapter “SET MODE”)
- •The group number within Card can be maximum 256 groups. (To make groups into card, see Chapter “MEMORY MANAGER”)
- •The job number in one group within a card can be maximum 256 jobs each. (See Chapter “MEMORY MANAGER”)

3) Module RS-232C :

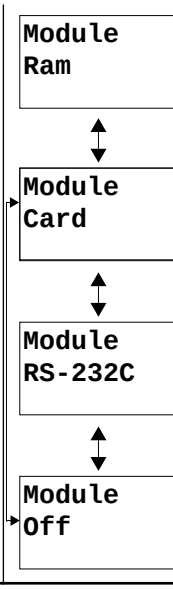
Connect DL-101C/102C to external device and out put the data every time measured.

- •The measurement in this mode can be Standard Measurement (Menu Measure) only.

4) Module off :

The measured data is displayed only but not stored or out put.

Operating procedure	Operating	Display
		Menu Measure
1 While menu is displaying, press [SET] key to be set mode. Refer to "Set mode" for further information of set mode.	[SET]	Set Mode ↓ Check Battery
2 Press [▲] or [▼] key several time to be Out Module menu.	[▲] or [▼]	Out Module

3 Press [ENT] key.	[ENT]	
4 Select Module mode by [▲] or [▼] key and press [ENT] key.	Select Mode [▲] or [▼]	
5 Press [ESC] key.	[ENT] [ESC]	

Data Card

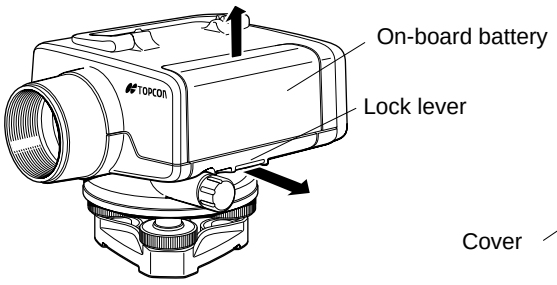
You can use Data Card to store data copy job or refer the coordinate data.
To use Data Card, “Out Module” in the Set Menu should be set to “Card”.
In Data card, maximum 256 groups can be made and each group is able to have maximum 256 jobs. (See Chapter “MEMORY MANAGER”)

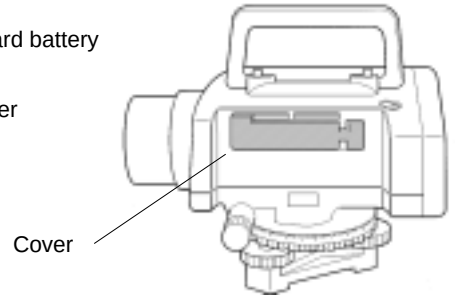
Data Card

Use the PC card based on PCMCIA.
The capacity of a card must be **less than 2 Mbytes**.

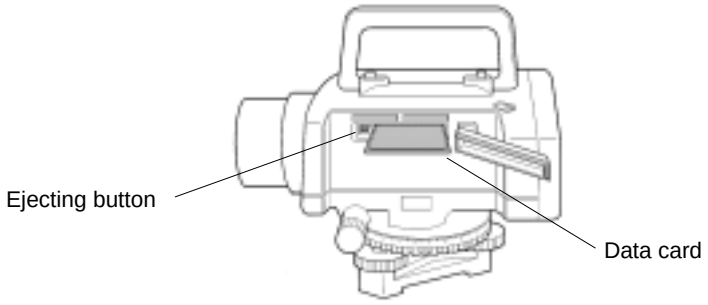
How to set Data Card

1)Lift up the on-board battery while pulling the lock lever.
2)Pull off the cover as shown bellow.
3)Insert a Data Card into the instrument.





How to eject Data Card



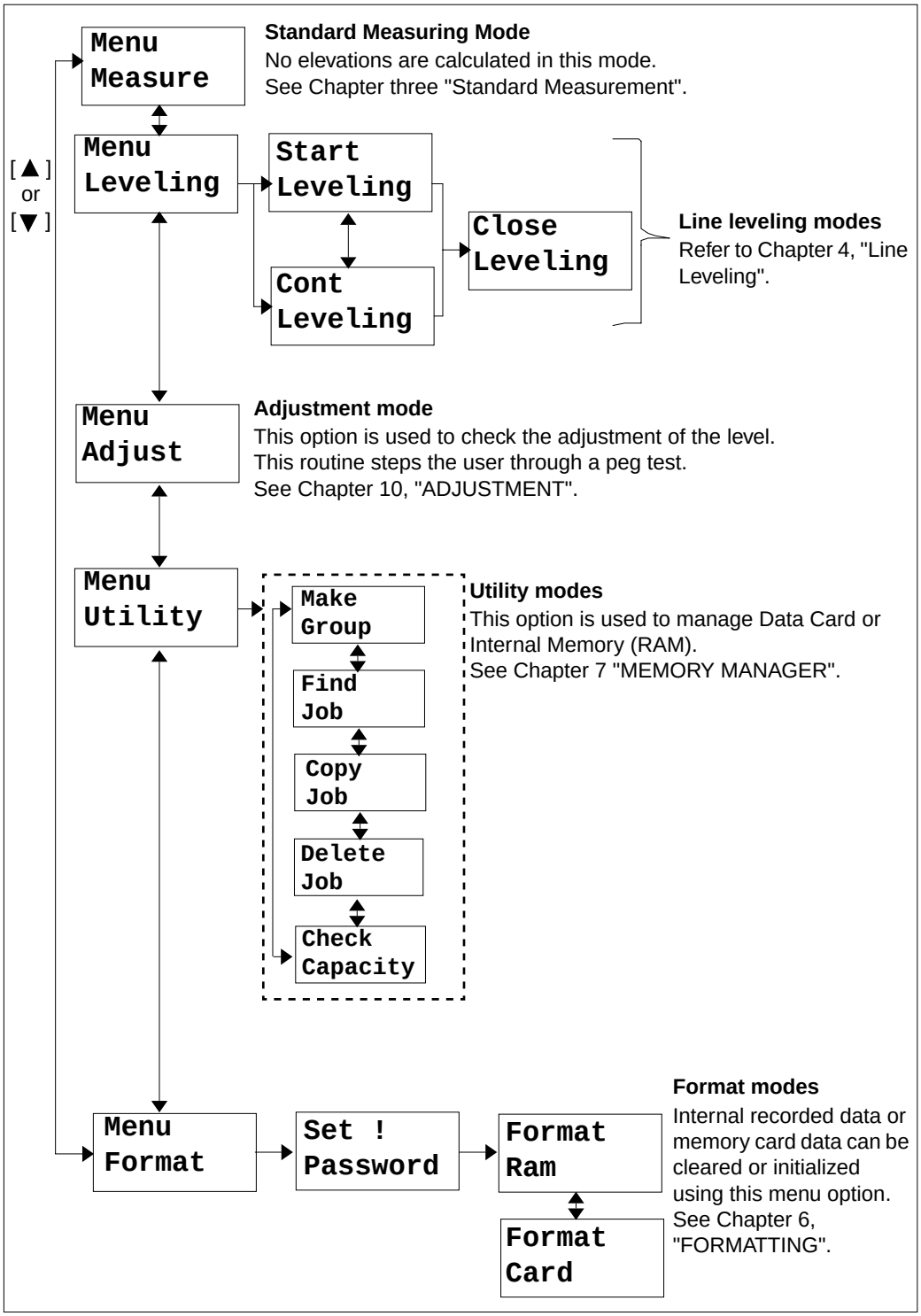
Push the ejecting button and pull off the data card.

To format Data Card, refer to Chapter 6 “Formatting Data Card / Internal Memory”.
To manage Data Card, refer to Chapter 7 “MEMORY MANAGER”.

Note:
Data stored will be destroyed.
Do not take off the battery while data is being written into data card.

Main Menu Contains

The menu mode contains the following items. Not all the menu option available at the same time. For example: If “REC” mode is set to “RS-232C” then none of the Line Leveling options are available. If you are in the line level routine then Start Loop and Continue Loop are not available at the same time.



Entering Characters While in Alpha Mode

When record mode is on, alphanumeric characters can be entered when entering fields such as remarks.

Small letters and symbol marks can be input only in input of Remarks. In other input, only capital letters and numeric characters can be input as follows

The word ‘RAM’ can not be used for the group name.

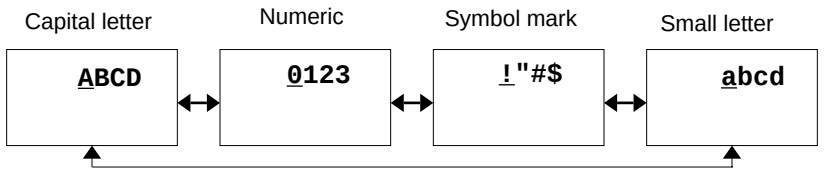
Item	Characters	Maximum length
Group name (only for card)	Capital letters, numeric characters and "-" can be input.	8 characters
Job name	Capital letters, numeric characters and "-" can be input.	8 characters
Info	Capital and small letters, numeric characters and all symbol marks can be input.	16 characters

[Example] Enter "Tp#7" at the " Info1" prompt.

Operating procedure	Operating	Display
		`Info1 ?`
1 Press the [▼] key to enter the capital alphabet letter mode.	[▼]	`ABCD`
2 Press the [◀] or [▶] key until the letter "T" is located at the flashing cursor.	[◀] or [▶]	`QRSTUVW`
3 Press the [ENT] key. The "T" is entered and displayed on the bottom line.	[ENT]	`QRSTUVW` `T`
4 Press the [▲] or [▼] key to enter the small letter mode.	[▲] or [▼]	`abcd` `T`
5 Press the [◀] or [▶] key several times until "p" is located at the flashing cursor. Press [ENT].	[◀] or [▶] [ENT]	`mnopqrs` `Tp`
6 Press the [▲] or [▼] key to enter the symbol mode.	[▲] or [▼]	`!"#$` `Tp`
7 Press the [◀] or [▶] key several times until "#" character is located at the flashing cursor. Press [ENT] .	[◀] or [▶] [ENT]	`!"#$%&` `Tp#`
8 Press the [▲] or [▼] key to enter the numeric mode.	[▲] or [▼]	`0123` `Tp#`

9 Press the [◀] or [▶] key several times until the "7" character is located at the flashing cursor. Press [ENT].	[◀] or [▶] [ENT]	456789 Tp#7
10 Press the [ESC] key.	[ESC]	Info1 ? Tp#7
11 Press the [ENT] key after confirming the contents of the displayed string.	[ENT]	

Press [▲] or [▼] to change between the different modes.



The symbols can be input are as follows:

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

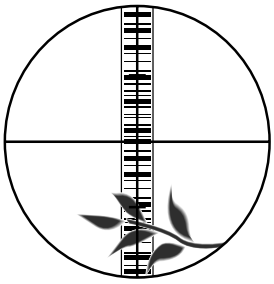
Focusing and Collimation of Staff

Focusing

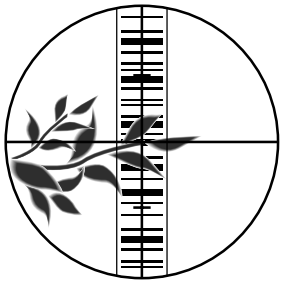
The scale pattern of staff does not have to be in perfect focus in order for the instrument to take a measurement, but accurate focusing shortens the measurement time.

Obstructions

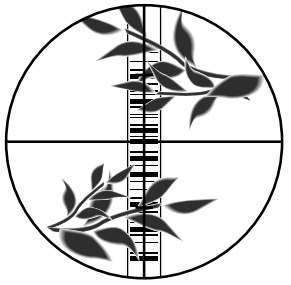
As long as the staff is not hidden by obstructions, such as tree branches by more than 30percent, measurement can be taken. Even if the point of intersection of the cross-hair is obscured, measurements can be taken if the obstruction covers less than 30 percent of the view.



Measuring is possible



Measuring is possible

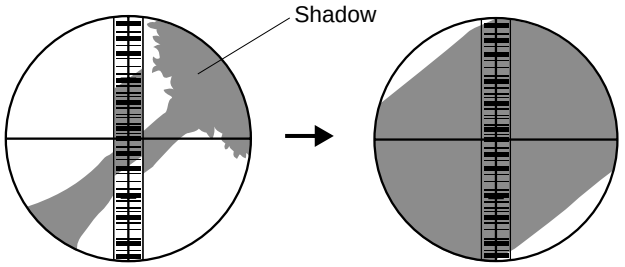


Measuring is impossible

Measurement is impossible even through the point of intersection of cross-hair is not hidden.

Shadow

It may not be possible to rarely measure when the staff is covered with a shadow as shown below. In that case, cover the whole of the staff with a shadow.



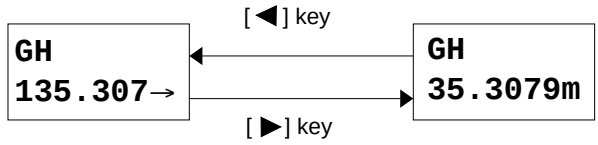
Cover the whole of the staff with a shadow.

Data Digits Displays Over Flow

If the displayed data overflows the screen press the [◀] key to shift the display to the left.

Key [▶] to shift the display back to the right.

Example: The calculated elevation is 135.3079m.



Measuring Precaution

The followings are offered to take over full functions from the unit.

1)Set up the staff in the sufficient daylight. Even the illumination is used whole the staff should be illuminated.

2)The minimum distance possible measurement between instrument and staff is 2m.

3)No matter in measuring functions if the staff is in the shade, but if the scale pattern is covered by the shadow of tree branch or leaf, error may displays and measuring will be disturbed.

4)When error displays because of darker at staff side than eyepiece side, cover the eyepiece by hand.

3 STANDARD MEASUREMENT [MENU MEASURE]

(Measuring samples in this Instruction Manual are indicated by DL-102C.)
Standard measurement mode is used to take measurements to the staff without having an elevation calculated.
If “Out Module” is set to ‘Ram’ or ‘Card’, you will be prompted to enter remarks and job number, and all measurements will be recorded to Ram or Card. See section “Setting of Record Mode (Out Module)” for an explanation of the record mode.
For an explanation of the single/continuous measuring mode refer to Chapter eight, SET MODE.

[Measuring example]: Out Module:Module Ram, 3-measurement per collection.

Operating procedure	Operating	Display
		Menu Measure
1 Press the [ENT] key.	[ENT]	Job No? J01
2 Enter the job No. and press [ENT]. *1),3)	Job. No. [ENT]	MeasNo? 1
3 Enter the measuring No. and press the [ENT] key. *2),3)	Meas No.Input [ENT]	Info1 ?
4 Enter remarks 1-3 and press the [ENT] key. *1),3) To bypass the remark prompts and go directly to step five press [ENT] at the “Info 1” or “Info 2” prompt.	Remark 1 [ENT] Remark 2 [ENT] Remark 3 [ENT]	Info2 ? Info3 ? Meas Mn 1
5 Collimate on the staff. ***6*** Press the [MEAS] key. Three measurements will be taken and the average will be displayed for N-seconds. * 4),5) If the level is set for continuous measuring, press the [ESC] key. The screen then displays the last measured data for N-seconds. ***7*** Press the [REC] key. The displayed data will be stored. * 6)	Collimate [MEAS] Continuous measuring [ESC] [REC]	Rod 3 1.6983m ↓ Rod Avg 1.69837m Meas Mn 1

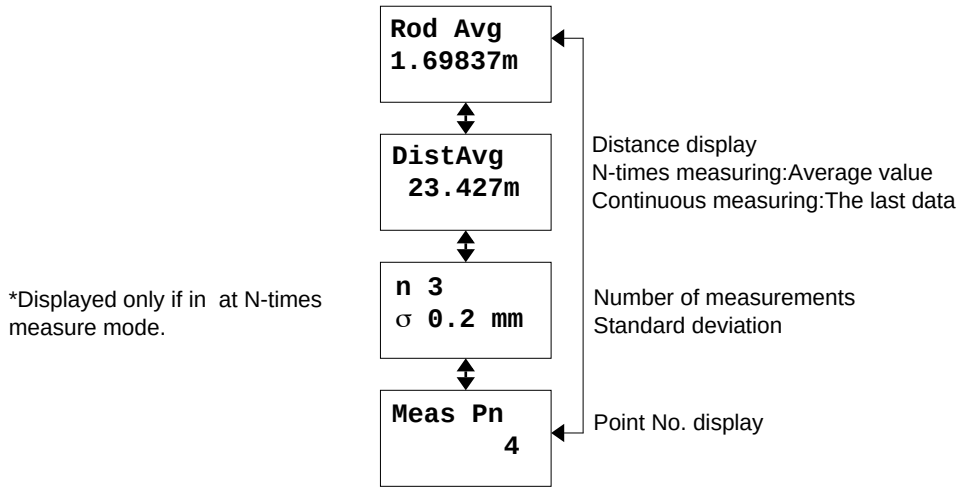
*1)The job no.field is limited to eight alphanumeric characters. The remarks field is limited to 16 alphanumeric characters.
*2)The measuring no. field is limited to eight numeric characters.
*3)The job no., measuring no., and remarks are not entered when the record mode is off.
*4)The duration of display is set in the set mode. Refer to Chapter 8 "SET MODE".

The relation between Meas Mn (Measurement No.) and Meas Pn(Point No.) is as follows.

Mn 11	Pn 1	Mn 12	Pn 1	Mn 13	Pn 1
	Pn 2		Pn 2		Pn 2
	Pn 3		Pn 3		Pn 3
	⋮		⋮		⋮

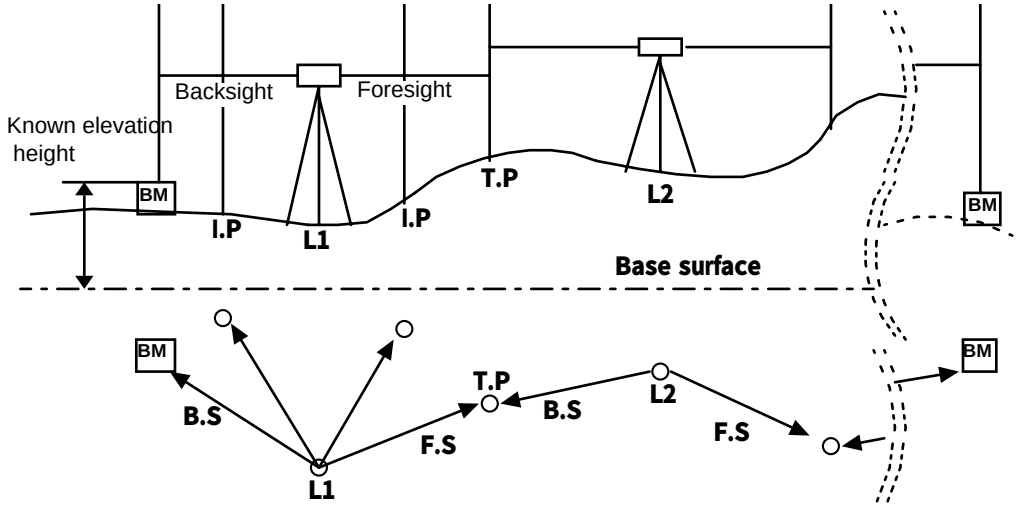
*5)The following data is displayed when measurements are completed. Press the [▲] and [▼] keys to view the alternate screens.
*6)Meas No. increments whenever "MEASURE MODE" changes to another mode.

Display When [▲] or [▼] key is pressed after measuring completed.



4 LINE LEVELING

(Measuring samples in this Instruction Manual are indicated by DL-102C.)
Record mode (Out Module) must be set to “Ram”, ”Card” or “OFF” to run line leveling. The example in this chapter assumes that record mode is set to “RAM”.
If you want to save the line leveling data into Data card directly, record mode (Out Module) must be set to “Card”.



Line Level Menu Screens

Menu Leveling

Main menu loop

Start Leveling

Start of line leveling
•Input Job No. •Input Benchmark •Input remarks

Cont Leveling

Continue a loop. Collect foresights and backsights in line leveling.
There are three patterns of line leveling as follows.
To continue a Line Leveling, first select one of jobs in RAM.

Level1: Backsight 1→ Foresight 1→ Foresight 2 → Backsight 2
Level2: Backsight 1→ Backsight 2 → Foresight 1→ Foresight 2
Level3: Backsight → Foresight

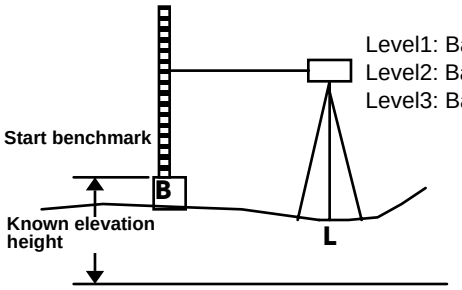
- [REP] key :Remeasure the foresight or backsight.
- [MANU] key :Manual entry of rod height and rod distance
- [DIST] key :Measure a distance
- [INT/SO] key :Intermediate point collection (Intermediate)
  Set out measuring (Set out)

Close Leveling

This option is used to end a job or create a change point.
CHANGE POINT end mode
• Input of change point no. • Input of remarks
Benchmark end mode
• Input of remarks • Input of ending benchmark number.

Start of Line Leveling [Start Leveling]

Start of line leveling is used to enter the job no.,benchmark no., and benchmark elevation. After this data has been entered the measurement to the backsight is taken.



Level1: Backsight 1→ Foresight 1→ Foresight 2 → Backsight 2
Level2: Backsight 1→ Backsight 2 → Foresight 1 → Foresight 2
Level3: Backsight → Foresight

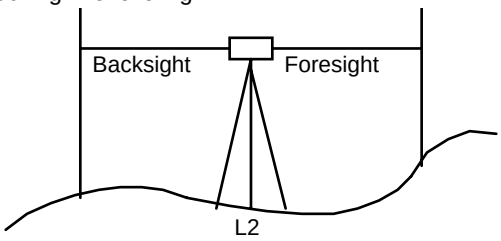
Operating procedure	Operating	Display
		Menu Leveling
1 Press the [ENT] key.	[ENT]	Start Leveling
2 Press the [ENT] key. The previously used job number will be displayed as the default.	[ENT]	Job No? J01
3 Enter job no., and press [ENT]. *1),2)	Job. No. [ENT]	Level1 B1F1F2B2
4 Select a measuring pattern of line leveling by pressing the [▲] or [▼] key and press [ENT] key.	[▲]or [▼] [ENT]	EVlimit 0.0 mm
5 Enter the limit of discrepancy (EV limit), and press [ENT] key. *3)	EV limit [ENT]	BM No? B01
6 Enter benchmark No. and press [ENT] key. *1),2)	BM. No. [ENT]	GH ?
7 Enter benchmark elevation and press the [ENT] key. (Input range: -999.9999~9999.9999m)	BM. elevation [ENT]	Info1 ? Info2 ? Info3 ?

8 Enter remarks 1-3 and press the [ENT] key. *2),4) • To bypass the remark prompts and go directly to step seven press [ENT] at the "Info 1" or "Info 2 " prompt. Screen displays measurement of backsight point (benchmark).	Remark 1 [ENT] Remark 2 [ENT] Remark 3 [ENT]	**Back Pn** **B01**

*1)Input is limited to eight alphanumeric characters.
*2)When record mode is off (Out Module is OFF), the input of job no., Benchmark no.and remarks is bypassed.
*3)When "Level 3 " is selected, the input of limit of discrepancy is bypassed.
Discrepancy (EV) :First (Backsight-Foresight)-Second (Backsight-Foresight)
*4)Input is limited to 16 alphanumeric characters.

Line Leveling - Foresight, Backsight Collection [Level1/2/3]

The “Level1,2,3”, continue loop, mode is used to collect the backsight and foresight measurement during line leveling.



Level1: Backsight 1 → Foresight 1 → Foresight 2 → Backsight 2

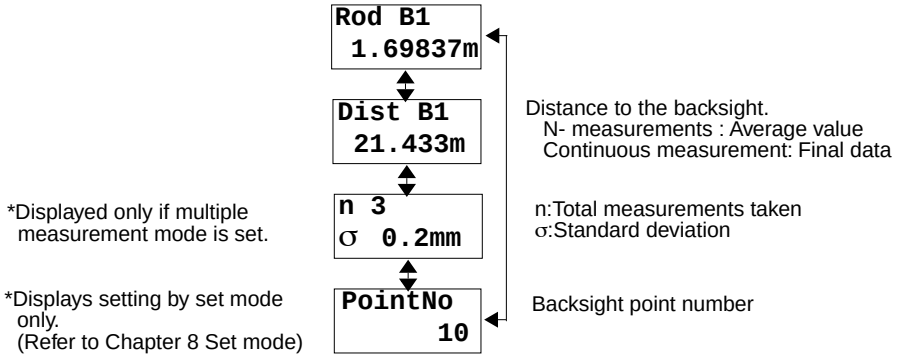
Operating procedure	Operating	Display
1 Proceed “Start of Line Leveling [Start L]”. The screen then displays the “Back Pn” prompt. If the previous step had been Start of Line Leveling then the benchmark number would be displayed.		**Back1Pn 10**
2 Collimate to the staff on backsight point. **[Backsight 1]**	Collimate Bk1 [MEAS]	**RodB1 3 1.6983m**
3 Press the [MEAS] key. [Example] Number of measurements : 3 When the measurement is completed, the average value will be displayed for N-second. *1)	Continuous measuring [ESC]	↓ **Rod B1 1.69837m**
•When the setting mode is continuous measuring, press the [ESC] key. The final measured data will be displayed for N-seconds. The display then changes to the “Fore 1 Pn” prompt and the foresight point number is automatically increased or decreased.		↓ **Fore1Pn 11**
4 Collimate the instrument to the staff located on the foresight. **[Foresight 1]**	Collimate Fr1	
5 Press the [MEAS] key. After the measurement has been completed, the average value will be displayed.	[MEAS] Continuous measuring [ESC]	**RodF1 3 1.5235m** ↓ **Rod F1 1.52387m**
6 Collimate the instrument to the staff located on the foresight and press the [MEAS] key. **[Foresight 2]**	[Collimate Fr2 [MEAS]	**Fore2Pn 11** ⋮

7 Collimate to the staff on backsight point and press the [MEAS] key. [Backsight 2]	Collimate Bk2 [MEAS]	**Back2Pn** **10**
8 Continue to step two as long as there are more backsights and foresights to collect.		**Back1Pn** **11**

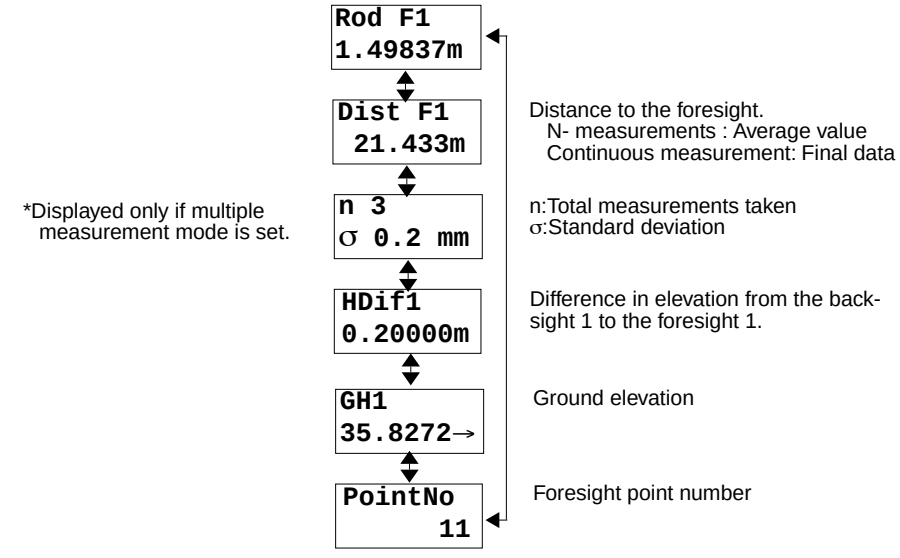
*1) Setting the display duration is done from within the set mode. Refer to Chapter 8 "SET MODE".

•The following data can be displayed after the measurement has been completed. The [▲] and [▼] key will alternately display the different screens.

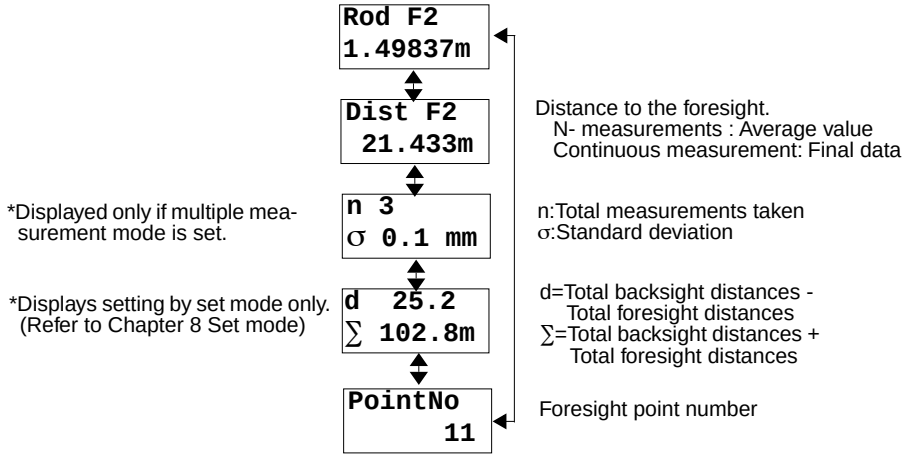
The following screens are displayed when the [▲] or [▼] key is pressed after the measurement to the **Backsight 1** is completed.



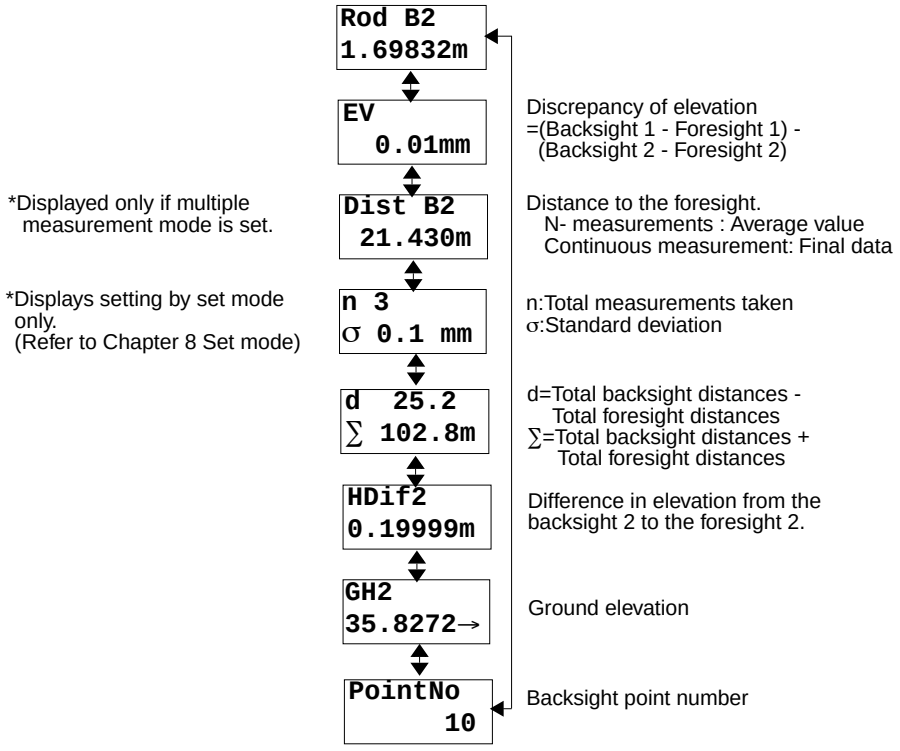
The following screens are displayed when the [▲] or [▼] key is pressed after the measurement to the **Foresight 1** is completed.



The following screens are displayed when the [▲] or [▼] key is pressed after the measurement to the **Foresight 2** is completed.



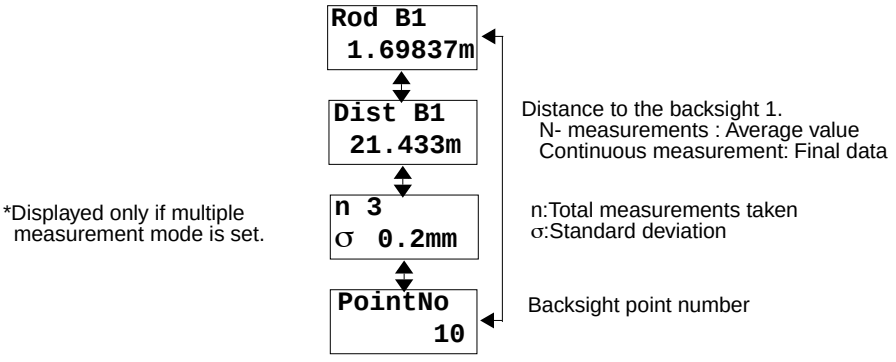
The following screens are displayed when the [▲] or [▼] key is pressed after the measurement to the **Backsight 2** is completed.



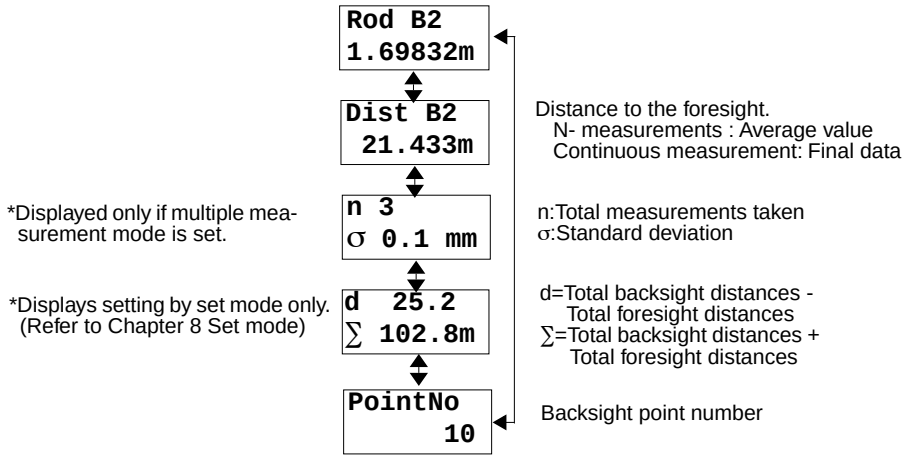
Level2: Backsight 1 → Backsight 2 → Foresight 1 → Foresight 2

Operating procedure	Operating	Display
1 Proceed “Start of Line Leveling [Start L] ”. The screen then displays the “Back Pn ” prompt. If the previous step had been Start of Line Leveling then the benchmark number would be displayed.		**Back1Pn 10**
2 Collimate to the staff on backsight point. **[Backsight 1]**	Collimate Bk1	
3 Press the [MEAS] key.	[MEAS]	
4 Collimate the instrument to the staff located on the foresight. **[Backsight 2]**	Collimate Bk2	**Back2Pn 10**
5 Press the [MEAS] key.	[MEAS]	
6 Collimate the instrument to the staff located on the foresight and press the [MEAS] key. **[Foresight 1]**	Collimate Fr1 [MEAS]	**Fore1Pn 11**
7 Collimate the instrument to the staff located on the foresight and press the [MEAS] key. **[Foresight 2]**	Collimate Fr2 [MEAS]	**Fore2Pn 11**
8 Continue to step two as long as there are more backsights and foresights to collect.		**Back1Pn 11**

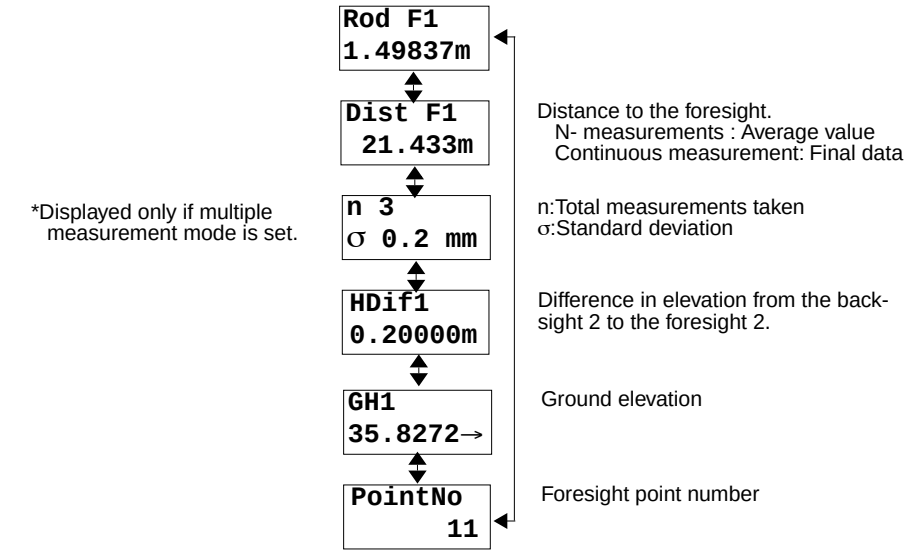
The following screens are displayed when the [▲] or [▼] key is pressed after the measurement to the **Backsight 1** is completed.



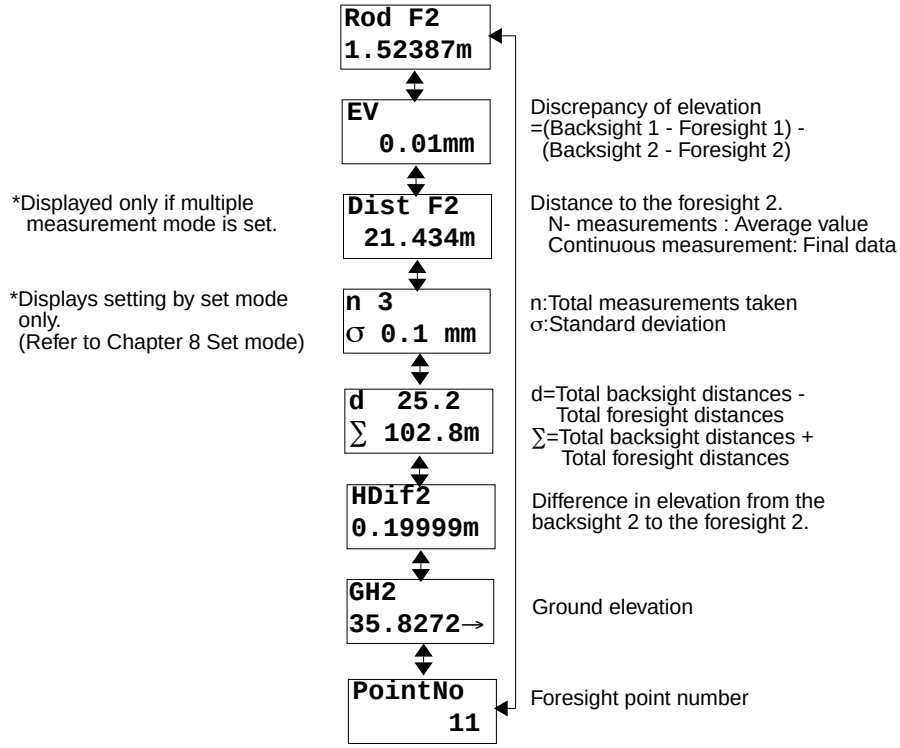
The following screens are displayed when the [▲] or [▼] key is pressed after the measurement to the **Foresight 2** is completed.



The following screens are displayed when the [▲] or [▼] key is pressed after the measurement to the **Foresight 1** is completed.



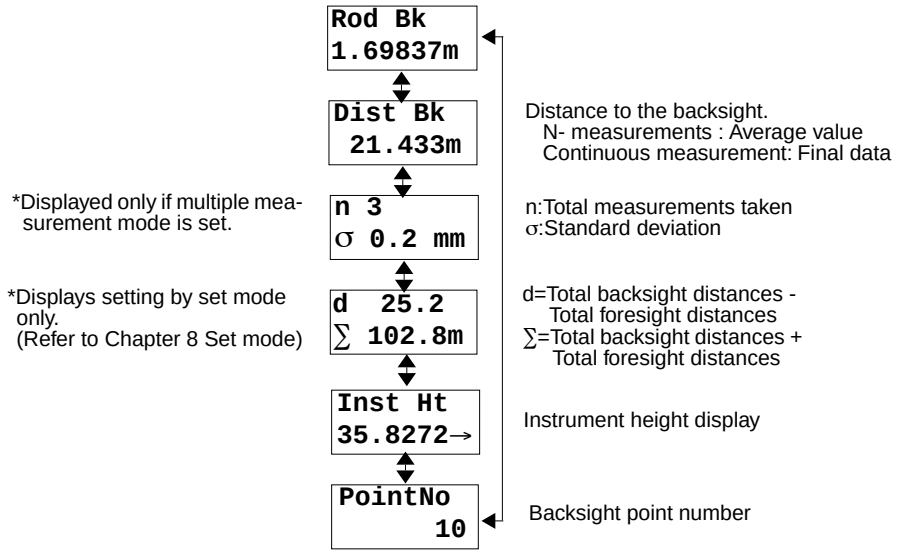
The following screens are displayed when the [▲] or [▼] key is pressed after the measurement to the **Backsight 2** is completed.



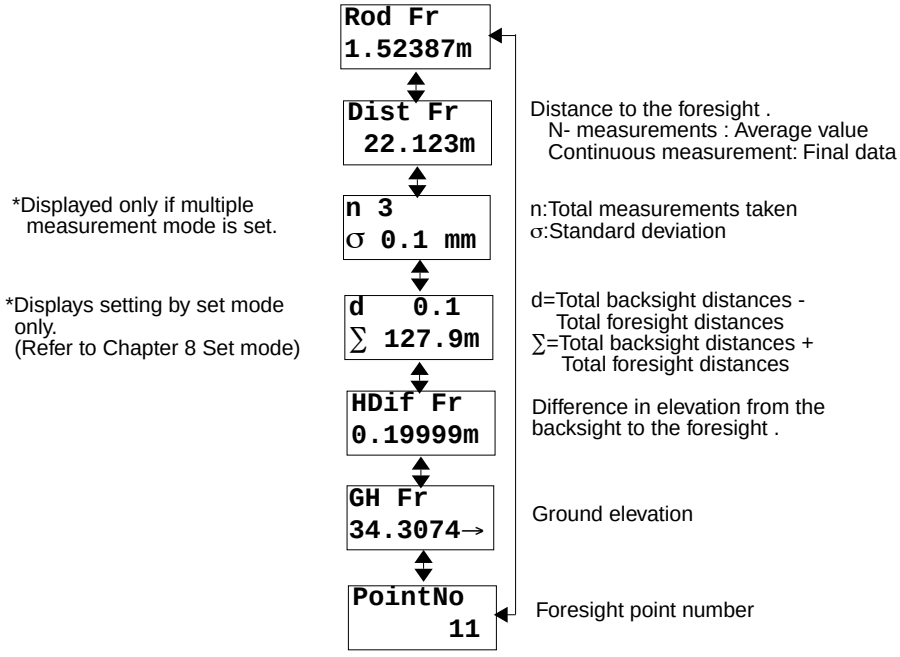
Level3: Backsight → Foresight

Operating procedure	Operating	Display
1 Proceed “Start of Line Leveling [Start L] ”. The screen then displays the “Back Pn ” prompt. If the previous step had been Start of Line Leveling then the benchmark number would be displayed.		Back Pn 10
2 Collimate to the staff on backsight point. **[Backsight]**	Collimate Bk1	
3 Press the [MEAS] key.	[MEAS]	
4 Collimate the instrument to the staff located on the foresight. **[Foresight]**	Collimate Fr	Fore Pn 11
5 Press the [MEAS] key.	[MEAS]	
6 Continue to step two as long as there are more backsights and foresights to collect.		Back1Pn 11

The following screens are displayed when the [▲] or [▼] key is pressed after the measurement to the **Backsight** is completed.



The following screens are displayed when the [▲] or [▼] key is pressed after the measurement to the **Foresight** is completed.



About the Point Number (PN) in Line Leveling

Point number modifying

Point number can be changed before foresight measurement.
Refer to next page to modify the point number.

About characters usable in the point number

In point number, numeric characters and the capital letter alphabets and " - " are usable to 8 characters.
The point number used once can be used again.

About auto increment, auto decrement

It is possible to set up auto increment, auto decrement. Refer to Chapter 8 "SET MODE" .

Auto increment

If there is numeric character at the end of the point number which it was input into in the last time, point number of this time is indicated with last value+1.

Figure shift in auto increment

1)When overall length of point number is less than 8 characters.

Digit sequence will shift right, and increase by 1 figure.
Example;

Last time	**ABCD-99**
This time	**ABCD-100**

2)When overall length of point number is 8 characters.

Figure shift is ignored.
Example;

Last time	**ABCDE-99**
This time	**ABCDE-00**

Auto decrement

If there is numeric character at the end of the point number which it was input into in the last time, point number of this time is indicated with last value - 1.

1)Numeric character is decreased by 1 in case of more than 1.

Example;

Last time	**ABC-02**
This time	**ABC-01**
Next time	**ABC-00**

2)When numeric character section is 0 entirely

" 9 " are indicated till overall length is 8figures.
Example;

Last time	**ABC-00**
This time	**ABC-9999**
Next time	**ABC-9998**

Note;

When point number is only numeric character, the numeric character will be just decreased.
Only when point number of this time is just " 1 " , next point number will be " 99999999 ".

How to modify the point number

You can modify the point number before foresight measurement.

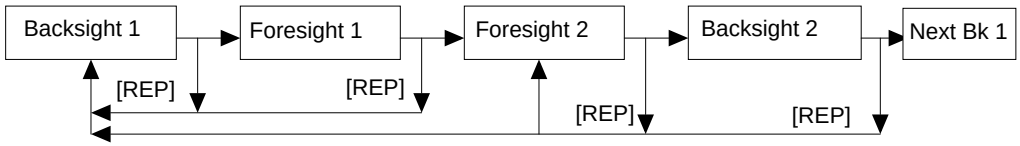
Operating procedure	Operating	Display
		Fore Pn 11
1 Press the [ESC] key before foresight measurement.The point number moves to the left side.	[ESC]	Fore Pn 11
2 Press the [ESC](C) key to clear the number.	[ESC] Twice	Fore Pn
3 Enter new point number. *1),2) [Example: 1001]	1001	Fore Pn 1001
4 Press the [ENT] key.	[ENT]	Info1 ?
5 Enter remarks 1 and press the [ENT] key. *3) (Example: CKPOINT)	Remark 1	Info1 ? CKPOINT
	[ENT]	Fore Pn 1001

*1)Input is limited to eight alphanumeric characters.
*2)In the same line leveling, the point number used already can be input.
*3)Input is limited to 16 alphanumeric characters.

Repeat Measurement [REP] key

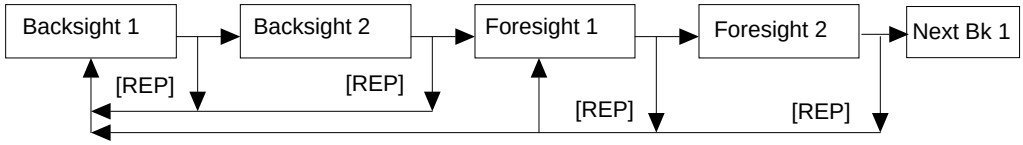
The [REP] key is used to recollect either the previous backsight or foresight point in the event that the point was collected in error.
The data which stored before remeasuring, will not affected on the result of each data calculations.

[Level1]



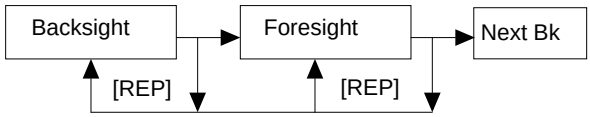
•After finishing backsight 1 or foresight 1 measurement : It is possible to remeasure from backsight 1.
•After finishing foresight 2 or backsight 2 measurement : It is possible to remeasure from foresight 2 or backsight 1.

[Level2]



•After finishing backsight 1 or backsight 2 measurement : It is possible to remeasure from backsight 1.
•After finishing foresight 1 or foresight 2 measurement : It is possible to remeasure from foresight 1 or backsight 1.

[Level3]



•After finishing backsight measurement : It is possible to remeasure from backsight .
•After finishing foresight measurement : It is possible to remeasure from foresight or backsight.

Example :[Level1]

The process in case to remeasure for backsight 1 after foresight 2 measurement is completed.

Operating procedure	Operating	Display
		Back2Pn 29
1 Press the [REP] key at the “Back2Pn” prompt. *1)	[REP]	Rep Fr? 30
2 Press the [ENT] key to confirm that you wish to recollect the measurement.	[ENT]	Rea REP EV err
3 Press the [▲] or [▼] key to select a reason and press [ENT]. *2)	[▲] or [▼] [ENT]	Fore2Pn 30
4 Press the [REP] key again. The display returns to the “Back1Pn” prompt.	[REP]	Back1Pn 29
5 Collimate to the backsight and press [MEAS] to recollect the measurement. When the measurement is completed the measured data is displayed for N-seconds.	Collimate Bk [MEAS]	Fore1Pn 30
6 Collimate to the foresight and press [MEAS] to recollect the measurement.	Collimate Fr [MEAS]	
7 Collimate to the foresight and press [MEAS] to recollect the measurement. The display returns to “Back 2 Pn” prompt. *3)	Collimate Fr [MEAS]	Fore2Pn 30 Back2Pn 29

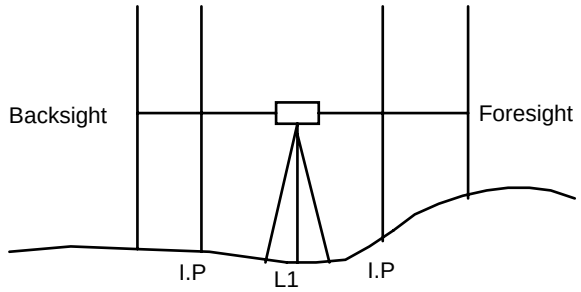
*1)Press the [▲] or [▼] key to view the measured data.

*2)You can select one of the following 3 reasons.
OP err : Operation error, **EV err**: Discrepancy of elevation error, **RD err**: Reading error

*3)Press the [▲] or [▼] key to display the measured and calculated data of the previous point.
Display of reason measured again is added, and contents except it are same as “ Measuring Start ”. (Refer to “Measuring Start” for the contents of display)

Measuring of Intermediate Point [IN/SO] key

The [IN/SO] key is used to collect intermediate points, sideshots, during line leveling.

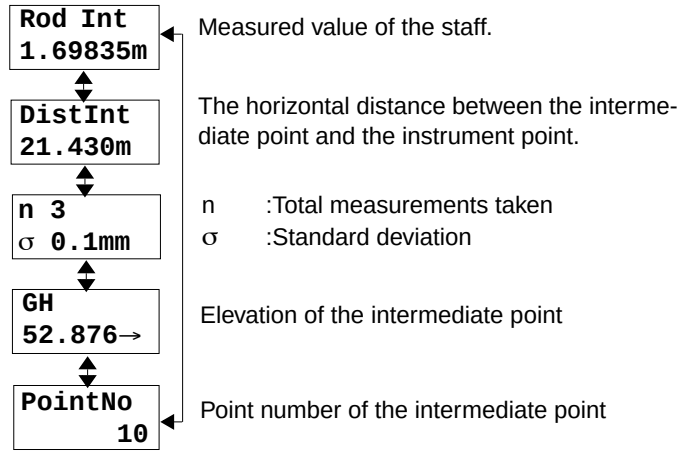


[Example] Number of measurements is three

Operating procedure	Operating	Display
		Fore Pn 40
1 After completing the measurement to the backsight and before measuring to the next foresight press the [IN/SO] key.	[IN/SO]	Inter- mediate
2 Press the [ENT] key. The instrument is now ready to collect the measurement to the intermediate point.	[ENT]	Int Pn 1
3 Collimate the instrument on the staff which should be set on the intermediate point and press the [MEAS] key. When the measurement is completed, the average rod height will be displayed for N-seconds. *1)	Collimate Int [MEAS]	RodIn 3 1.6983m ↓ Rod Int 1.69837m ↓ End=ENT Cont=ESC
4 Press the [ESC] key to return to step 1. The instrument is ready to collect the next intermediate point. The intermediate point number is automatically increased or decreased.	[ESC]	Int Pn 2
5 Repeat step three and four for each intermediate shot that needs to be collected from the present setup.	Collimate Int [MEAS]	⋮ End=ENT Cont=ESC

6 Press the [ENT] key to collect the next foresight point.	[ENT]	Fore Pn 3

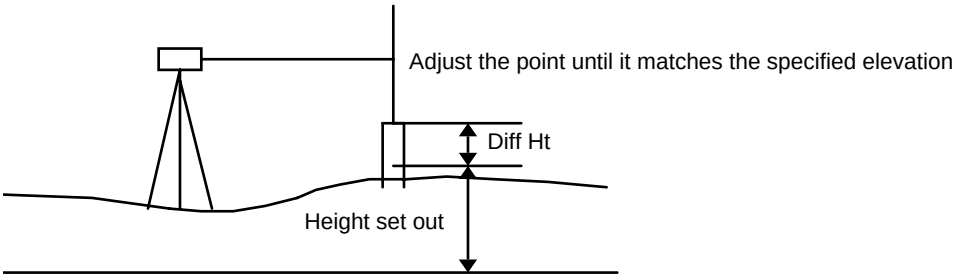
*1)The following screens displayed when the [▲] or [▼] key is pressed after the measurement.



*Displayed only if multiple measurement mode is set.

Setout Measurement [IN/SO] key

The Setout mode can be used to set points at a specified elevation.
Coordinate file used will be within Ram or Group (Card) which is selected in “Out module.

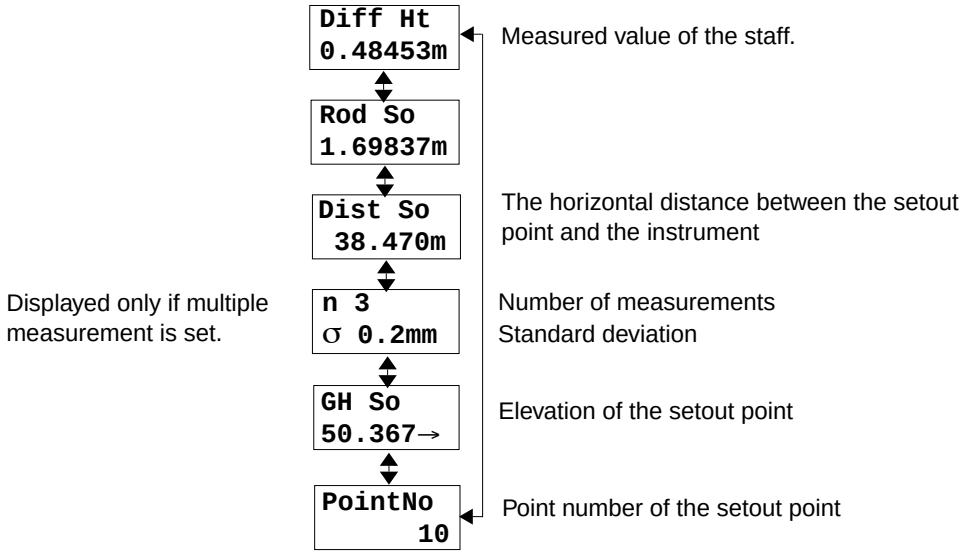


[Example 1] The number of measurement is three

Operating procedure	Operating	Display
		Fore Pn 40
1 After completing the backsight measurement and before measuring to the next foresight, press the [IN/SO] key.	[IN/SO]	Inter- mediate
2 Select the Setout menu by pressing the [▲] or [▼] key.	[▲] or [▼]	Set Out
3 Press [ENT]. Referring Coordinate data is within Ram or Group which is selected in “Out module”.	[ENT]	Read Coordi ?
4 Press [ENT].	[ENT]	Read Now ↓ So Pn PN1
5 Select a point number in selected group by pressing the [▲] or [▼] key and press [ENT]. You can see “Set Ht ” , “PointNo” and “Info” alternately by pressing the [▲] or [▼] key at this step.	[▲] or [▼] [ENT]	Set Ht 49.88087 ↓ So Pn PN1

6 Collimate the staff on the setout point, and press [MEAS]. After the measurement has been taken, the measured data will be displayed including the three measurements and the final average of the three measurements. *1),2)	Collimate [MEAS]	RodSo 3 1.6983m ↓ Diff Ht 0.48453m ↓ Rec=ENT Cont=ESC
7 Press [ENT] key to record the measurement. •Press [ESC] key if you want to remeasure the same stakeout point .	[ENT]	End=ENT Next=ESC
8 Press [ENT] key to return to the “Fore Pn” prompt. •Press [ESC] key if you want to set another stakeout point.	[ENT]	Fore Pn PN2

*1)Pressing [▲] or [▼] at this step displays the following measured data.



*2)Referred coordinate data will not be memorized in RAM or Card.

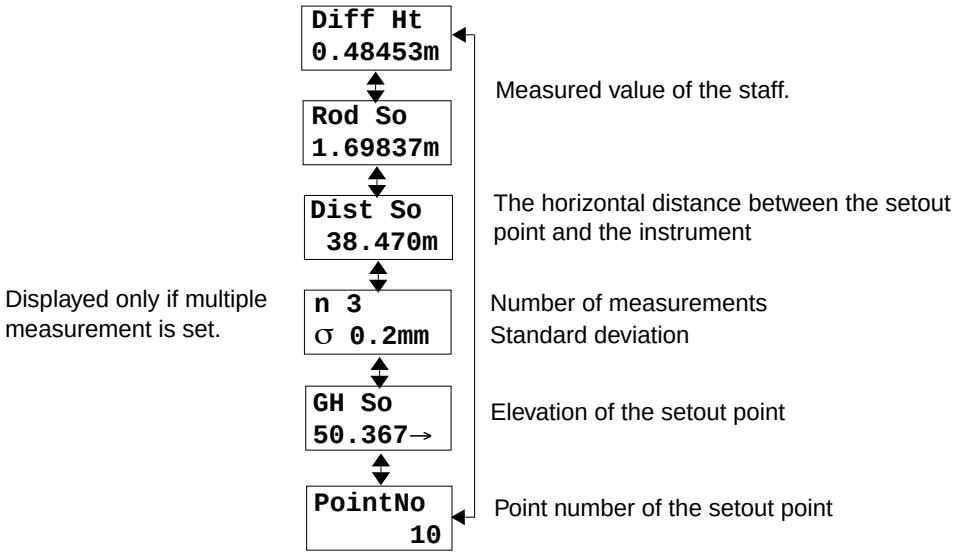
[Example 2]
Manual Inputting of set out height, Point number and Information

The number of measurement is three

Operating procedure	Operating	Display
		Fore Pn 40
1 After completing the backsight measurement and before measuring to the next foresight, press the [IN/SO] key.	[IN/SO]	Inter- mediate
2 Select the Setout menu by pressing the [▲] or [▼] key.	[▲] or [▼]	Set Out
3 Press [ENT].	[ENT]	Read Coordi ?
4 Press [ESC] to cancel referring coordinate data.	[ESC]	Set Ht?
5 Enter the elevation of the point to be stakeout, and press [ENT].	Height [ENT]	So Pn?
6 Enter the point number to be stakeout, and press [ENT].	Point number [ENT]	Info1?
7 Enter the Information to be stakeout, and press [ENT]. •After pressing [ENT] key, you can confirm the data by pressing the [▲] or [▼] key.	Info [ENT]	So Pn PN1
8 Collimate the staff on the setout point, and press [MEAS]. After the measurement has been taken, the different height calculated from the average of three measurements data will be displayed. *1)	Collimate [MEAS]	RodSo 3 1.6983m ↓ Diff Ht 0.48453m ↓ Rec=ENT Cont=ESC
9 Press [ENT] key to record the measurement. • Press [ESC] key if you want to remeasure the same stakeout point .	[ENT]	End=ENT Next=ESC

10 Press [ENT] key to return to the “Fore Pn” prompt. • Press [ESC] key if you want to set another stakeout point.	[ENT]	Fore Pn PN2

*1)Pressing [▲] or [▼] at this step displays the following measured data.



End of Change Point [End Mode]

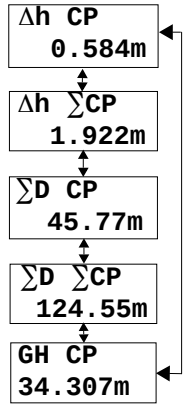
You can close line leveling loop job at a change point.
The closed job can be continued to measure. To continue a C.P closed job, refer to section "Continuing Leveling".

Operating procedure	Operating	Display
		Back Pn 20
1 Press the [MENU] key at the "Back Pn" prompt after having collected a foresight point and before measuring a backsight point.	[MENU]	Cont Leveling
2 Press the [▲] key to display the end mode menu.	[▲]	Close Leveling
3 Press the [ENT] key.	[ENT]	End of CP
4 Press the [ENT] key.	[ENT]	CP No? 1
5 Enter change point number.	C P No. [ENT]	Info1 ?
6 Enter to remarks one and two. *1),2) • Press [ENT] at the "Info 1" prompt to bypass remark entry. Input is limited to 16 alphanumeric characters. If record mode is "OFF", this step is skipped.	Remark 1 [ENT] Remark 2 [ENT]	Info2 ? Δh CP 0.584m
7 Press the [ENT] key.	[ENT]	Cont Leveling

Display when the [▲] or [▼] key is pressed.

*1)If there is no previous change point the height difference between benchmark will be displayed.

*2) The following data can be displayed by pressing the [▲] or [▼] key.



Total differences of each change points height (height difference between benchmark and end change point)

Horizontal distance from the last change point (Horizontal distance from the benchmark in case the first change point)

Total horizontal distance of each change points (Distance from the benchmark to the final change point)

Elevation of the end change point

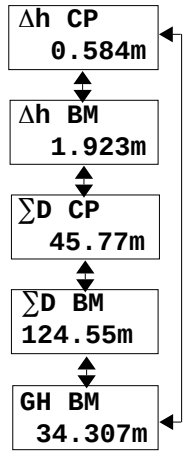
End of Line Leveling (End of Benchmark) [End Mode]

Operating procedure	Operating	Display
		Back Pn 20
1 Press the [MENU] key at the “Back Pn” prompt after having collected a foresight point and before measuring a backsight point.	[MENU]	Cont Leveling
2 Press the [▲] key to display the end mode menu.	[▲]	Close Leveling
3 Press the [ENT] key.	[ENT]	End of CP
4 Press the [▼] key to display the end of benchmark screen.	[▼]	End of BM
5 Press the [ENT] key.	[ENT]	BM No? B01
6 Enter the ending benchmark number and press [ENT].	BM No. [ENT]	Info1 ?
7 Enter to remarks one and two. *1),2) • Press [ENT] at the “Info 1” prompt to bypass remark entry. Input is limited to 16 alphanumeric characters. If record mode is “OFF”, this step is skipped.	Remark 1 [ENT] Remark 2 [ENT]	Info2 ? Δh CP 0.584m
8 Press the [ENT] key. The display shows menu of start line leveling.	[ENT]	Start Leveling

*1)If there is no previous change point the height difference between benchmarks (Δh BM) will be displayed.

*2)The following data can be displayed in this state. Each time pressing[▲] or [▼] key, display changes.

Display when the [▲] or [▼] key is pressed.



If there is no previous change point, then this screen is not displayed.

The height difference between the benchmarks

Horizontal distance from the last change point. If there is no previous change point, then this screen is not displayed.

Horizontal distance between benchmarks.

Elevation of the benchmark.

Continuing Leveling [Cont Leveling]

This mode is used to continue line-leveling job.

• “Out Module” in the Set Mode should be set to “RAM” or “Card”.

•The job loop must have been closed by [End of Change Point] mode.

•The job data must be selected in “Out Module”.

Operating procedure	Operating	Display
		Menu Leveling
1 Press the [ENT] key from the [Menu Leveling] screen.	[ENT]	Start Leveling
2 Press the [▲] key to display the end mode menu.	[▼]	Cont Leveling
3 Press the [ENT] key.	[ENT]	Job JO11
4 Select a job by pressing the [▲] or the [▼] key.	[▲]or[▼]	Job JO7733
5 Press the [ENT] key. Job data will be set. *1)	[ENT]	Setting Now ↓
6 Start measuring. For further operations, refer to section “Line Leveling -Foresight, Backsight Collection”.		Back Pn 20

*1)You can exit the job only when the first backsight prompt is shown.

5 THE OTHER FUNCTIONS

Manual Input of Data [MANU] key

The manual input of rod height and the horizontal distance can be done using the [MEAS] key if measurement using the [MEAS] key is impossible for some reason.

[Example] From within line leveling

Operating procedure	Operating	Display
		Fore Pn 20
1 Press the [MANU] key instead of the [MEAS] key at the backsight or foresight point or the intermediate point prompt.	[MANU]	Rod Fr?
2 Enter the rod height and press the [ENT] key.	Input Rod Ht. [ENT]	D Fr?
3 Enter the horizontal distance and press the [ENT] key. The program then proceeds to the next step depending on whether the previous point was a backsight or foresight.	Input Distance [ENT]	Back Pn 20

[Example] From within normal measurement

Operating procedure	Operating	Display
		Meas Mn 30
1 Press the [MANU] key instead of the [MEAS] key at the measure number prompt.	[MANU]	Rod ?
2 Enter the rod height and press the [ENT] key.	Input Rod Ht. [ENT]	Dist ?
3 Enter the horizontal distance and press the [ENT] key.	Input Distance [ENT]	Rec ? ENTorESC
4 Press [ENT] key to record the data.	[ENT]	Meas Mn 30

Distance Display [DIST] key

The distance to the foresight can be checked before collecting the actual point using the [DIST] key. This function can be used to ensure that distances to the backsight and foresight are equal.

[Example] From within line levelling

Operating procedure	Operating	Display
		Fore Pn 11
1 At the “Fore Pn” prompt press [DIST] to check the horizontal distance to the staff. After measuring and displaying the distance to the staff the display returns to the “Fore Pn” prompt.	[DIST]	Dist 23.57m ↓ Fore Pn 11

Inverse staff mode

This mode enables you to measure for the ceiling points with the inverted staff.
Beforehand, it is necessary to set the Inverse Mode to “Use” in the SET MODE. Refer to Chapter 6 “SET MODE”

Operating procedure	Operating	Display
		Fore Pn 11
1 Press the [-] key to set the inverse mode ON. The inverse mode prompt “ i ” is displayed.	[-]	Fore Pn i 11
2 Collimate the inverted staff and press [MEAS] key.	Collimate Bk [MEAS]	Back Pn i 11
3 Press the [-] key again, the mode returns to the normal measurement mode.	[-]	Back Pn 11

In case wrong setting a staff up and down or in poor measuring condition, sometimes message displays as below.

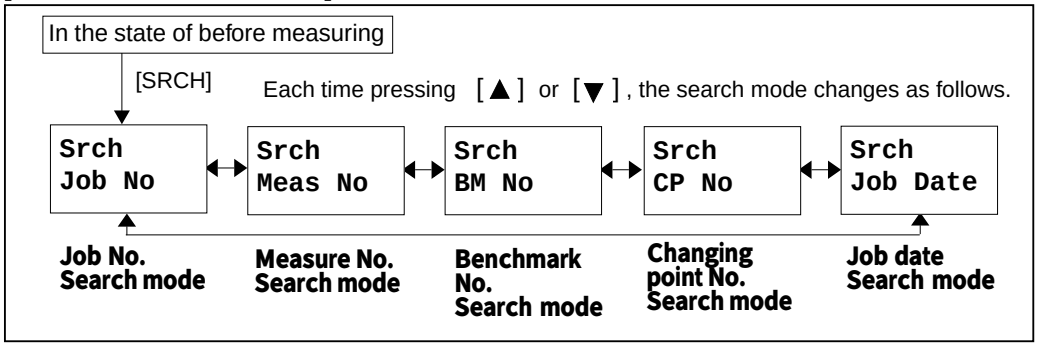
```
Fore Pn
Rod OK?
```

Confirm the setting of the staff or measuring condition.
If the staff is set properly, press the [ENT] key, but if you like stop the measurement, press the [CLR] key.
The error message may be displayed in such procedure did not performed correctly.

Search of Recorded Data [SRCH] key

The [SRCH] key is used to search and display the recorded data.
Search will be done in Ram or a Group (Card) which is selected in “Out module”.

[In case “Out Module” : Ram]



[Example] Search for Benchmark No.

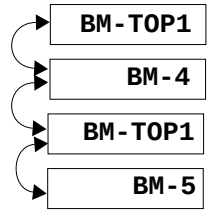
Operating procedure	Operating	Display
		Fore Pn 11
1 To search and display recorded data, press the [SRCH] key when the display is at a menu option or when the display is prompting you for a measurement.	[SRCH]	Srch Job No
2 Press [▲] or [▼] several times until the “ BM No” prompt is displayed.	[▲] or [▼]	Srch BM No
3 Press the [ENT] key .	[ENT]	BM No?
In case searching the last measured Benchmark No.		BM No?
4 Press the [ENT] key as it is. The last measured Benchmark No. is searched and displays.	[ENT]	Srch B Last ↓ *BM No BM-5

In case searching Benchmark No. one before the Benchmark No. displayed.

5 Press the [SRCH] key after procedure ***4*** , and press [▲].

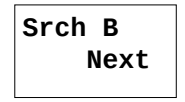
- To display the Benchmark No. one before or after the displayed Benchmark No., press the [SRCH] key and press [▲] or [▼].

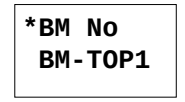
[SRCH]
[▲] or [▼]



[SRCH]

[▲]





In case searching the Benchmark No. specified.

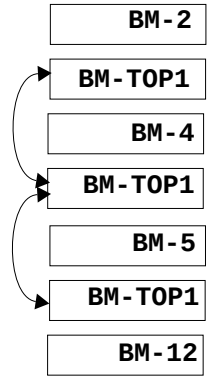
4′ Enter the Benchmark No., and press the [ENT] key.

In case searching the same Bench MarkNo.displayed.

5′ Press the [SRCH] key after procedure ***4′*** , and press [▲].

- To display the same Benchmark No. one before or after the displayed, press the [SRCH] key and press [▲] or [▼].

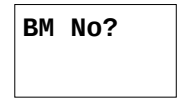
[SRCH]
[▲] or [▼]

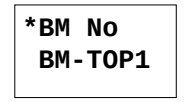


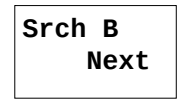
BM No.
[ENT]

[SRCH]

[▲]

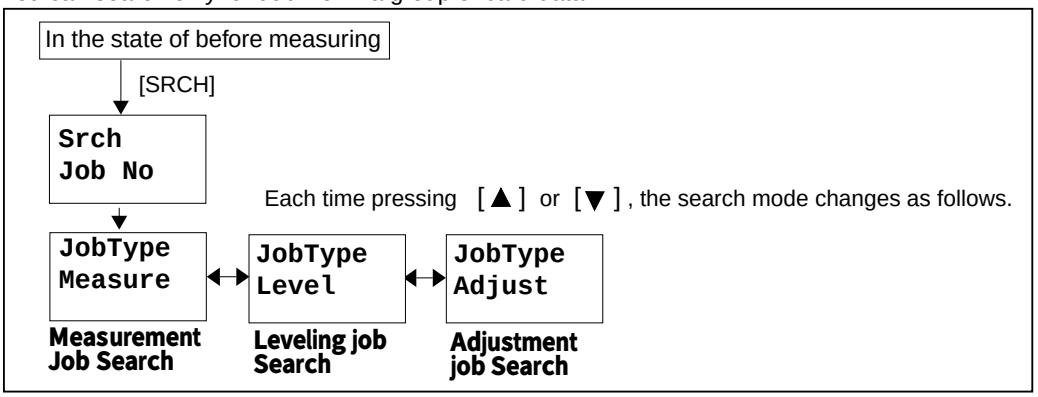






- If the[▲] or [▼]key is pressed after searching the Benchmark No., before or after data is shown.
- If you reach the top of the file “Top of file” will be displayed. If you reach the bottom of the file “Bottom of file” will be displayed.
- If no matching data is found, “No data” is displayed.
- Press [ESC] once or twice to return to the previous mode.

[In case "Out Module" : Card]
You can search only for Job No. in a group of card data.



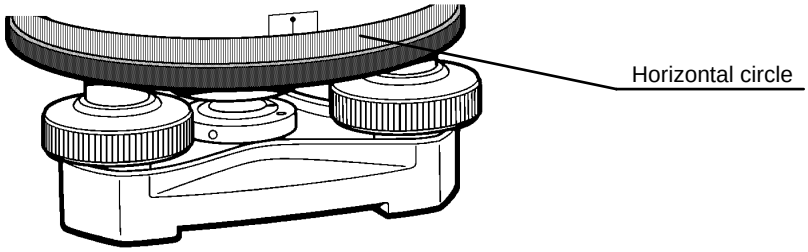
[Example] Search for Benchmark No.

Operating procedure	Operating	Display
		Fore Pn 11
1 To search Job number, press the [SRCH] key when the display is at a menu option or when the display is prompting you for a measurement.	[SRCH]	Srch Job No
2 Press [▲] or [▼] several times to select Job Type.	[▲] or [▼]	JobType Measure
3 Press the [ENT] key .	[ENT]	Job
4 Enter Job number you want to search for. The last measured Benchmark No. is searched and displays.	Job No. [ENT]	*Job No J01
5 To display the Job No. one before or after the displayed Job No., press the [▲] or [▼].key. [▲] or [▼] → J01 (Top Job), J02, J03, J04 (Last Job)	[▲] or [▼]	*Job No J02

- If the[▲] or [▼] key is pressed after searching job No., before or after data is shown.
- If you reach the top of the file "Top of file" will be displayed. If you reach the bottom of the file "Bottom of file" will be displayed.
- If no matching Job is found, "Job Not Found" is displayed.
- Press [ESC] once or twice to return to the previous mode.

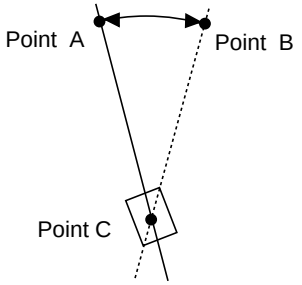
Measuring a Horizontal Angle

This instrument has a horizontal circle which can be used to measure horizontal angles.
The horizontal circle is graduated in 1° (1g) divisions and is numbered every 10° (10g), with the scale calibrated from 0 to 350° (0 to 390g). The angular value increases as the instrument is revolved clockwise.

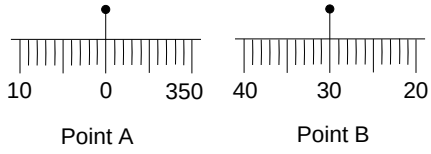


1 First, set up and level the instrument over the starting point, point C.
Then sight through the telescope on the backsight, point A. Align the rod on point A precisely to the vertical cross-hair using the horizontal tangent screw.
Rotate the horizontal circle ring until zero is set on the scale.

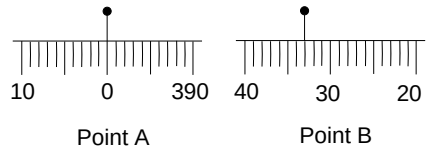
2 Next, sight through the telescope on the rod held on point B and precisely align with the horizontal tangent screw. The angular reading will be the horizontal angle between points A and B from point C, the angle ACB.



Horizontal angle: 30°or 33g



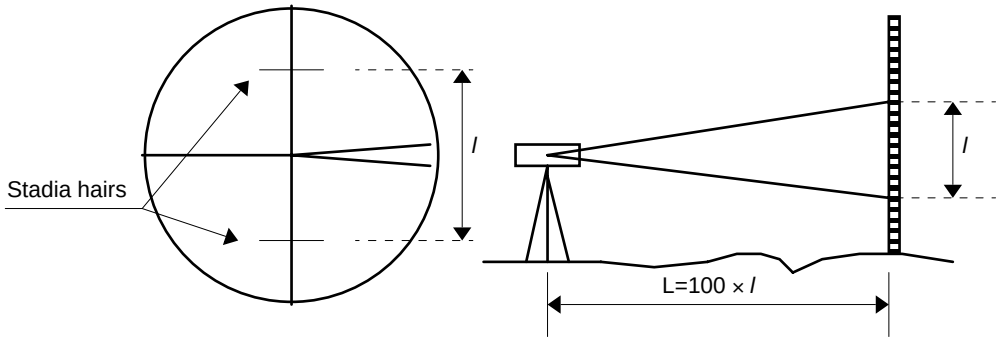
Degree type



Grade type

Stadia Surveying

This instrument can be used for stadia surveying, Measurement by stadia is a convenient method for measuring distances with the stadia hairs of the instrument, in combination with a graduated rod, such as a leveling rod or stadia rod, which is preferable for long distances. The distance from the center of the instrument to the rod is found by sighting through the instrument on the rod and multiplying the stadia interval by 100. The stadia interval is the distance between the top stadia hair reading and the bottom stadia fair reading.



1 Set the rod on the point to be surveyed.

2 Sight through the telescope of the leveled instrument and determine the distance or interval, " *l* ", between the top stadia hair reading and bottom stadia hair reading of the rod.

3 The horizontal distance " L " from the center of the instrument to the rod is equal to 100 times the stadia interval, " *l* ".
L =100 × *l*

6 FORMATTING DATA CARD / INTERNAL MEMORY (RAM) [MENU FORMAT]

This option will erase ALL FILES in either the internal memory (RAM) or Data Card memory and the files cannot be retrieved.
The password is input to avoid the accidental clearing of data due to operator error. The password is set by the manufacturer and cannot be changed by the user. This manual is the only place where there is a written record of the password.

```
Password : 753
```

Formatting Data Card

Operating procedure	Operating	Display
1 Press [MENU] and then press [▲] or [▼] while in the menu mode to display the Format screen. Press [ENT].	[▲] or [▼] [ENT]	Menu Format Set! Password
2 Enter the password ,753, and press the [ENT] key.	Password (753) [ENT]	Format Ram
3 Select “Card” by pressing the [▲] or [▼] key. Press [ENT].	[▲] or [▼] [ENT]	Format Card Format Card ?
4 Confirm the display and press the [ENT] key. The volume label will be shown. *1)	[ENT]	V Label TOPCON
5 Press the [ENT] key.	[ENT]	Changed Battery?
6 Press the [ENT] key. *2) The card memory expire will be set to three years later and the expire date will be shown.	[ENT]	Date ? 01/01/07
7 Confirm the date *3) ,4) and press the [ENT] key. Formatting will start.	[ENT]	Format >> ↓ Menu Format

*1)To reset the Volume Label, press the [ESC] key and enter new data.
*2),3)To reset the expire, press the [ESC] key and enter new date.
*4)To cancel the formatting, press the [ESC] key twice.

Formatting Internal Memory (RAM)

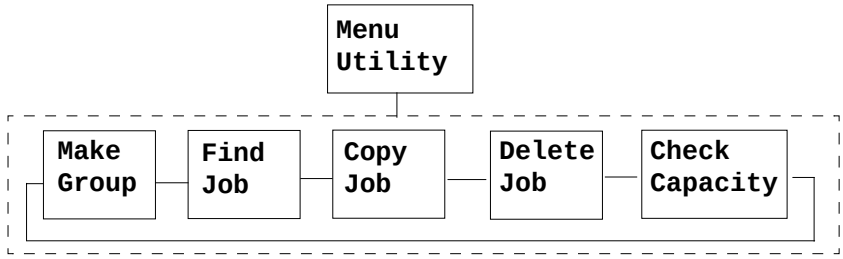
Operating procedure	Operating	Display
1 Press [MENU] and then press [▲] or [▼] while in the menu mode to display the Format screen. Press [ENT].	[▲] or [▼] [ENT]	**Menu** **Format** **Set!** **Password**
2 Enter the password ,753, and press the [ENT] key.	Password (753) [ENT]	**Format** **Card**
3 Select “RAM” by pressing the [▲] or [▼] key. Press [ENT].	[▲] or [▼] [ENT]	**Format** **RAM** **Format** **RAM ?**
4 Confirm the display and press the [ENT] key. Formatting will start. *1)	[ENT]	**Format** **>>** ↓ **Menu** **Format**
*1)Press [ESC] to abort the memory clear process.		

7 MEMORY MANAGER [Menu Utility]

This chapter describes how you can use Menu Utility to perform managing Ram and Data Card . The following tasks can be available.

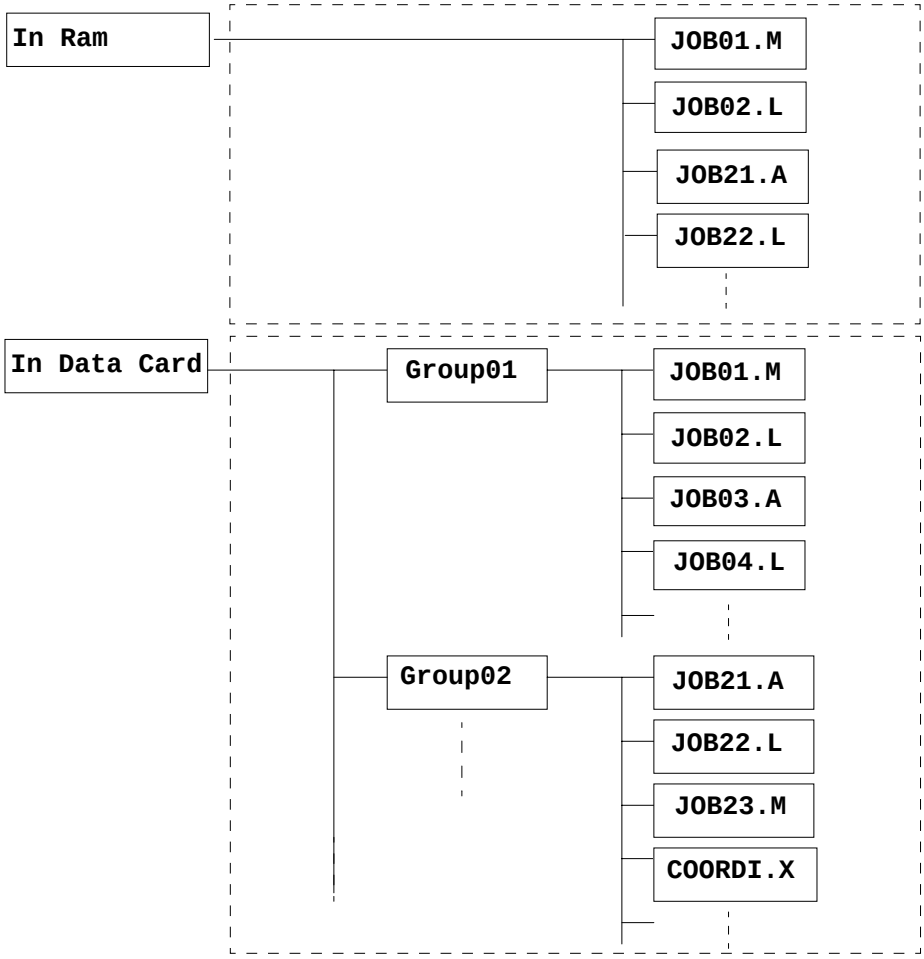
- Making group within Data card
- Finding job
- Copying job (Ram to Card, Card to Ram or Card to card)
- Deleting job within RAM or Data Card
- Checking capacity of RAM or Data Card

Menu Contains



Files in Ram and Data Card

Job and coordinate data can be stored within Ram or Data card as follows.



- Group can not be existed within Ram.
- In a Data card, it is not possible to make a job file of same name within one group.
- You can not use the word 'RAM' for the group name.
- Coordinate data file name is fixed as COORDI.
- Extended code can be added automatically according to file type as follows.
  L : Line leveling data file
  M: Measuring data file
  A : Adjustment data file
  X : Coordinate data file

Making group into Data Card [Make Group]

You can make one or more groups as directories.

Operating procedure	Operating	Display
1 Press [MENU] and then press [▲] or [▼] to display the "Menu Utility " screen.	[▲] or [▼]	**Menu Utility**
2 Press [▲] or [▼] to display the "Make Group " screen. Press [ENT].	[▲] or [▼] [ENT]	**Make Group** **Group**
3 Enter a group name to make and press [ENT]. *1) The display will return to Menu display	Enter name [ENT]	**Menu Utility**
*1)To enter characters, see section "Entering Characters while in Alpha Mode ".		

Finding a job [Find Job]

This item enables you to easily find a job file in a group or Ram selected in "Out Module" except coordinate files.

Operating procedure	Operating	Display
1 Press [MENU] and then press [▲] or [▼] to display the "Menu Utility " screen.	[▲] or [▼]	**Menu Utility**
2 Press [▲] or [▼] to display the "Find Job " screen. Press [ENT].	[▲] or [▼] [ENT]	**Find Job** **JobType Level**
3 Press [▲] or [▼] to select a type of job data. Press [ENT].	[▲] or [▼] [ENT]	**JobType Measure** **Job ABN01**

4 Find job by pressing the [▲] or [▼] key.	[▲] or [▼]	**Job TOK31**
•Pressing the [ESC] key, the display returns to menu .		

Copying job [Copy Job]

The job data within Data Card can be copied into RAM or vise versa.
Card to Card copy can be available but Ram to Ram copy can not be accomplished.
[Example] : Card to Card copy

Operating procedure	Operating	Display
1 Press [MENU] and then press [▲] or [▼] to display the "Menu Utility " screen.	[▲] or [▼]	**Menu Utility**
2 Press [▲] or [▼] to display the "Copy Job" screen.	[▲] or [▼]	**Copy Job**
Press [ENT].	[ENT]	**S Group TOPCON01**
3 Press [▲] or [▼] to select a group.	[▲] or [▼]	**Group HILTOP07**
Press [ENT].	[ENT]	**JobType Level**
4 Press [▲] or [▼] to select a type of job data.	[▲] or [▼]	**JobType Measure**
Press [ENT].	[ENT]	**Job ABN01**
5 Select job by pressing the [▲] or [▼] key.	[▲] or [▼]	**Job TOK31**
Press [ENT].	[ENT]	**D Group TOPCON01**
6 Select a group in which the job stored by pressing the [▲] or [▼] key.	[▲] or [▼]	**D Group HILTOP03**
Press [ENT]. Copying starts. *1),2)	[ENT]	**Copy Now**
		↓

		Copy OK!

*1) If all Job Types or all jobs are selected to load, the number of files completed loading will appear on the right side down of the display.*1)If all Job Types or all jobs are selected to load, the number of files completed loading will appear on the right side down of the display.
*2) In case copy of Card to Ram, a job can not be overwritten to Ram.

Deleting job [Delete Job]

The job data within a group or Ram selected in “Out Module” can be deleted.

[Example] Deleting a job data within Data card.

Operating procedure	Operating	Display
1 Press [MENU] and then press [▲] or [▼] to display the “Menu Utility ” screen.	[▲] or [▼]	Menu Utility
2 Press [▲] or [▼] to display the “Delete Job ” screen.	[▲] or [▼]	Delete Job
Press [ENT].	[ENT]	JobType Level
3 Press [▲] or [▼] to select a type of job data.	[▲] or [▼]	JobType Measure
Press [ENT].	[ENT]	Job ABN01
4 Select job by pressing the [▲] or [▼] key.	[▲] or [▼]	Job TOK31
Press [ENT]. *1)	[ENT]	Delete? TOK31
5 Confirm the display and press [ENT]. The job will be deleted and the display will return to menu.	[ENT]	Menu Utility

*1)Press [ESC] to abort the deleting process.
The data is not cleared.

Checking capacity of RAM or Data card [Check Capacity]

You can check the capacity of RAM or Data card as following.

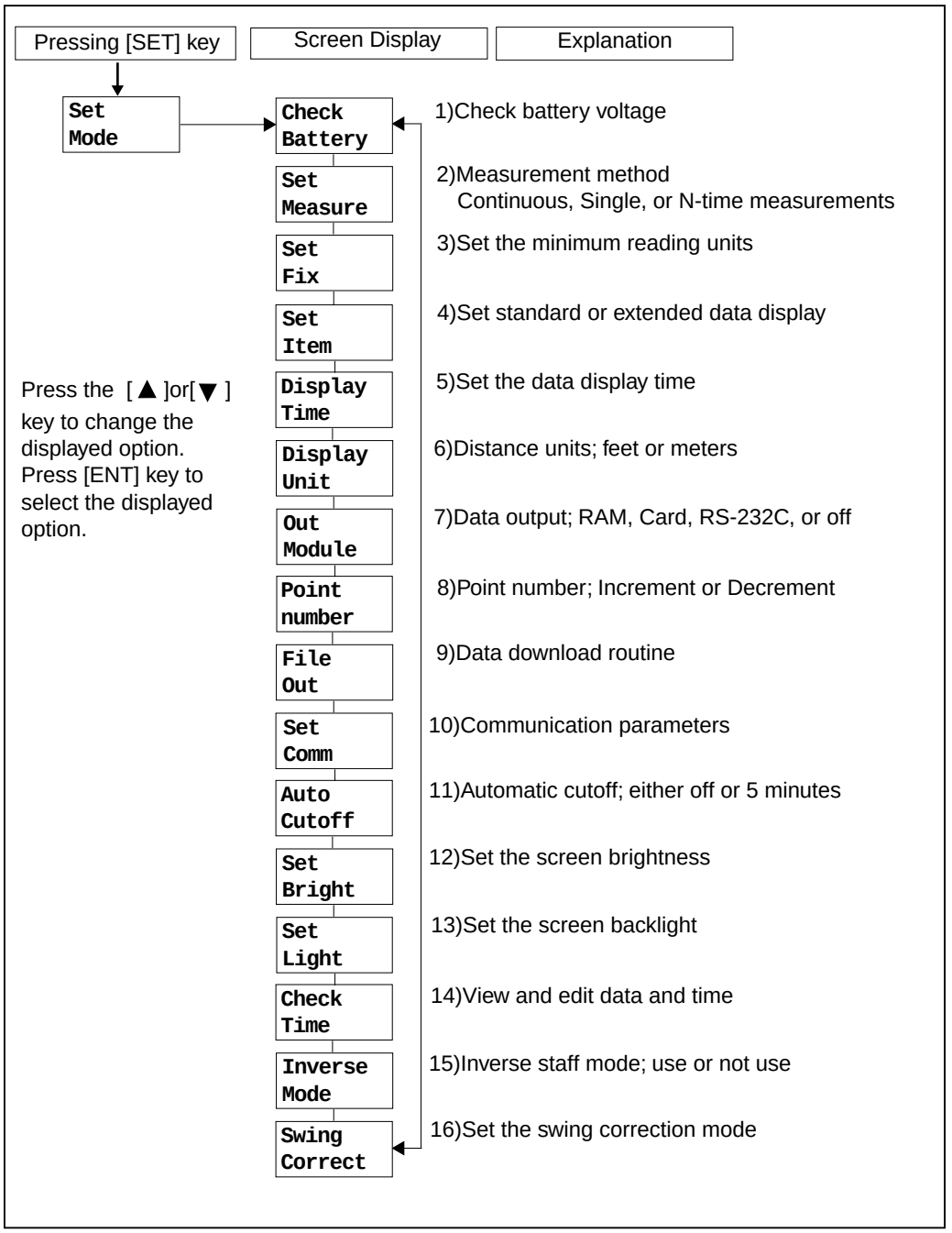
Operating procedure	Operating	Display
1 Press [MENU] and then press [▲] or [▼] to display the “Menu Utility ” screen.	[▲] or [▼]	**Menu Utility**
2 Press [▲] or [▼] to display the “Check Capacity” screen.	[▲] or [▼]	**Check Capacity**
Press [ENT]. The capacity of Ram will display for N-seconds. *1),2)	[ENT]	**Ram 60% use**
The capacity of Data card will display for N-seconds.		**Card 40% use**
The display returns to menu.		**Check Capacity**

*1)To set the displaying time, refer to Chapter , SET MODE.
*2)When the [ESC] key is pressed during display, the next display will be indicated.

8 SET MODE

The set mode menu allows the user to select a variety of different options that affect the way the level operates. The set menu allows the user to select measuring units, communication parameters, etc. The settings remain unchanged even when the power is off.

Set Mode Menu



1)Check Battery:

Displays the battery voltage.

See section “Battery Power Remaining Display”.

2)Set Measure:

Used to set the method of measurement.

Select one of the following measurement methods; N-times measurements, single measurement, or continuous measurement.

Option	Explanation
Measure N Time	Measurements taken N times N is between 2 and 99
Measure Single	Single measurement mode
Measure Cont	Continuous measurement mode

3)Set Fix:

Set the minimum units read by the level.

Option	Explanation	
	DL-101C	DL-102C
Fix Standard	0.1mm	1mm
Fix Precise	0.01mm	0.1mm

4)Set Item:

Set extension data display in line leveling

You may select whether to have extended data displayed or not displayed while in line leveling.

Extended data :d : Total backsight distance -Total foresight distance,

Σ : Total backsight distance + Total foresight distance

Option	Explanation
Item Standard	Do not display extended data
Item Extended	Display extended data

5)Display Time:

Setting display duration

This option is used to set how long certain screens will be displayed before the next screen is displayed.

Display	Explanation
Select N Sec.	Set the duration in seconds, 1-9 secs., that the data screens will be displayed.

6)Display Unit:

Distance units

Option	Explanation
Unit m	Measuring unit : m (meter)
Unit ft	Measuring unit : US. ft (feet) 1m= 3.280833333333333ft

7)Out Module:

Option that determines if and where the data will be stored.

Refer to section Setting Record Mode (Out Module)

Option	Explanation
Ram	Measured data is stored to internal memory
Card	PCMCIA SRam Card
RS-232C	Communication with an external data collector is enabled
Off	Measured data is not stored

8)Point Number:

Selection of point number increase or decrease.

9)File out:

Sending a data file

Out put a Job file in a group or Ram selected in “Out Module” to external device. For more information, refer to “Changing Set Mode”.

10)Set Comm:

This option is used to set the different communication parameters.

For more information refer to the DL-101C/102C interface manual.

1st layer menu	2nd layer menu	3rd layer menu	Contents
Comm Std	-------	-------	Standard setting (1200baud,7word length, 1stop bit , even parity)
Comm Manu	Set Baud	Select nnnn	Baud rate 300/600/1200/2400/4800/ 9600
	Set Parity	Parity Even	Set Parity Even / Odd / None
		Parity Odd	
		Parity None	
	Set Term	CR/LF Off	If term is set to ON all data strings sent to the computer will be terminated with the carriage return/line feeds characters. If term is OFF then CR/LF characters will not be appended to the data string.
		CR/LF On	

11)Auto Cutoff:

Toggle that determines whether auto cutoff is on or off

If auto cutoff is ON the instrument will automatically power down after five minutes without having a key pressed.

Option	Explanation
Cutoff 5min	Auto cutoff mode ON
Cutoff off	Auto cutoff mode OFF

12)Set Bright:

This option is used to change the brightness of the display. The brightness of the screen can be set to one of nine different settings.

Display	Explanation
Choose Bright N	Set the brightness to one of nine steps

13)Set Light:

This option is used to turn the back light ON or OFF.

14)Check Time:

This option is used to display and edit the date and time for N-seconds each. While the date and time is displayed, the [ESC] key can be pressed to edit the displayed value.

15)Inverse Mode:

This option is used to measure with the inverted staff.

Refer to section “Inverse Staff Mode” how to measure.

Option	Explanation
Inverse Not Use	Not use the Inverse Mode
Inverse Use	Use the Inverse Mode

*The measuring time will be shortened in “Inverse Not Use” mode.

16)Swing Correct:

Toggle that determines whether Swing Correct is on or off.

If Swing Correct is ON the instrument will automatically correct measured data by swing.

Changing Set Modes

[Example 1] Set Measure: 3-times measurement

Operating procedure	Operating	Display
		Menu Measure
1 Press the [SET] key while either in menu mode or before measuring. The “Set Mode” screen will be displayed for a few seconds and then “Check Battery” will be displayed.	[SET]	Set Mode ↓ Check Battery
2 Press [▲] or [▼] several times until displays “Set Measure” screen.	[▲] or [▼]	Set Measure
3 Press [ENT] key. The previous set mode is displayed.	[ENT]	Measure Single
4 Select the measurement mode by pressing [▲] or [▼].	[▲] or [▼]	Measure N Time
5 Press [ENT] key and set the measurement times by inputting numerical character and press the [ENT] key. The display returns to “Set Measure” screen.	[ENT] Enter “ N ” [ENT]	N 03 Set Measure

[Example 2] File Out

Job file in a group or Ram selected in “Out Module” can be output to external device.

Operating procedure	Operating	Display
		Menu Measure
1 Press [SET] key in the state of menu display or before measuring. Battery check tile will be displayed.	[SET]	Set Mode ↓ Check Battery

2 Press [▲] or [▼] several times until displays “File Out” screen. Press [ENT].	[▲] or [▼] [ENT]	File Out
3 Press [▲] or [▼] several times to select a job type. Press [ENT].	[▲] or [▼] [ENT]	JobType Level
4 Press [▲] or [▼] several times to select a job . Press the [ENT] key.	[▲] or [▼] [ENT]	Job J01 Out RECorESC
5 Press the [REC] key. When output is completed, returns to “File Out” screen.	[REC]	↓ File Out

[Example 3] Changing date and time

Operating procedure	Operating	Display
		Menu Measure
1 Press the [SET] key while either in menu mode or before measuring. The “Set Mode” screen will be displayed for a few seconds and then “Check Battery” will be displayed. The display shows Battery check title.	[SET]	Set Mode ↓ Check Battery
2 Press [▲] or [▼]several times until “Check Time” screen is displayed.	[▲] or [▼]	Check Time
3 Press [ENT] at the “Check Time” prompt. The screen will display the present date.	[ENT]	Date 07/21/94
4 Press [ESC/C] while the date is displayed.	[ESC/C]	Date ?
5 Enter the desired date and press [ENT]. For example, April. 29, 2000 would be entered as 042995. After the date has been set the time will be displayed.	042900 [ENT]	Time 13:17:05

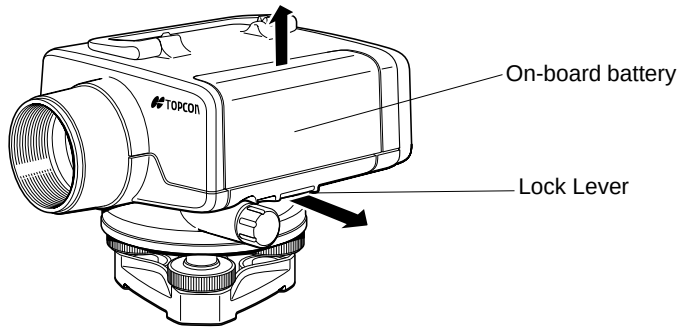
6 Press [ESC/C] when the time is displayed.	[ESC/C]	**Time ?**
7 Enter the time and press [ENT]. For example, 3:25:10 PM is entered as 152510. After the time has been set, the display returns to the "Check Time" screen.	152510 [ENT]	**Check Time**

9 USING AND CHARGING BATTERY

On-board Rechargeable battery BT-31Q

Removing the Battery

1 Lift up the battery while pulling the lock lever.



Charging the Battery

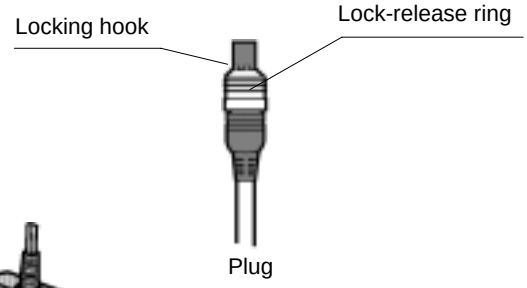
1 Connect the charger plug, BC-23B /C, to the battery, BT-31Q.

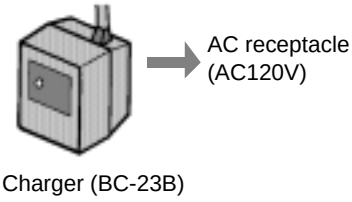
2 Insert the charger receptacle in an outlet. The BC-23B is for use with AC120V outlets and the BC-23C is for AC230V outlets. The red light on the charger should be on when the instrument is charging.

3 Charging time is approximately 15hours. The charger plug is secured by a locking system. Always pull the lock-release ring when removing the charger.

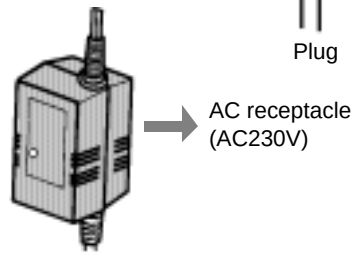
4 Unplug the charger from the outlet.

Battery (BT-31Q)





Charger (BC-23B)



Charger (BC-23C)

Notes

1 Recharging should take place in a room with an ambient temperature range of 10°C to 40°C, 50°F to 104°F.
2 Exceeding the recommended charging time may shorten the life of the battery .
3 The battery will discharge when stored. The battery should be checked before using with an instrument after extended storage.
4 When the instrument is being stored for an extended time the battery should be stored at a temperature of 30°C or below, and the battery should be recharged every three or fore months.

On-board dry battery holder DB-31

How to replace dry batteries

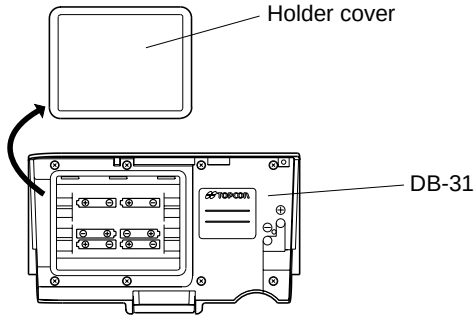
1 Lift up the holder DB-31 while pulling the lock lever as shown below.

2 Remove the holder cover from the holder DB-31.

3 Remove the old dry batteries and replace them with new six “AA”-size dry batteries making sure each is placed in the proper direction as indicated.

4 Install the holder cover on the holder DB-31 securely.

5 Install the holder DB-31 to the instrument.



Note :Replace all 6 batteries with new ones.
Do not mix old batteries and new ones.

Note : DL-100 series which has following serial number can not be operated with DB-31 dry battery holder.

Serial number **GM**xxxx, **HX**xxxx, **NI**xxxx, **NJ**xxxx,
TQxxxx, **TR**xxxx, **TS**xxxx, **TT**xxxx.

10 ADJUSTMENT

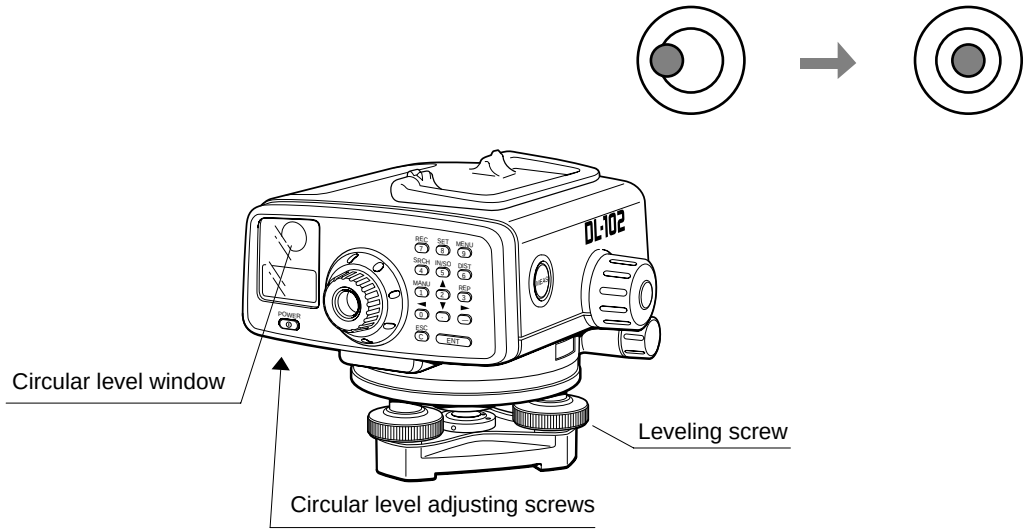
Adjustment of Circular Level

Check

1 Set the instrument on the tripod and carefully center the bubble of the circular level with the three leveling screws.

2 Revolve the telescope 180° around its vertical axis. If the bubble moves from the center, adjustment must be made as follows.

Adjustment



1 First, pick the level vial adjust screw that the bubble has moved toward. Then tighten the circular level adjustment screw. Return the bubble only one-half the amount of the total error.

2 Recenter the circular level bubble with the three leveling screws.

3 The bubble should now remain centered as the telescope is revolved around its axis.
If the bubble does not remain centered then the above adjustment should be repeated until the bubble remains centered when the instrument is revolved around its axis.

Collimation of the Instrument

Method Type A

1 Set the instrument on a tripod at a point midway between two rods approximately 50 meters, 165′, apart.

2 Level the instrument.

Fig.1

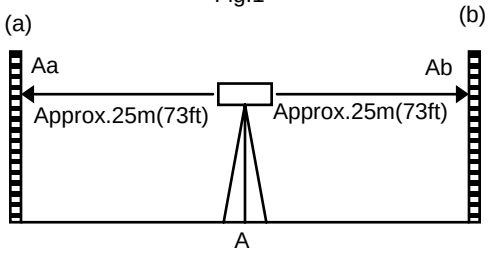


Fig.2

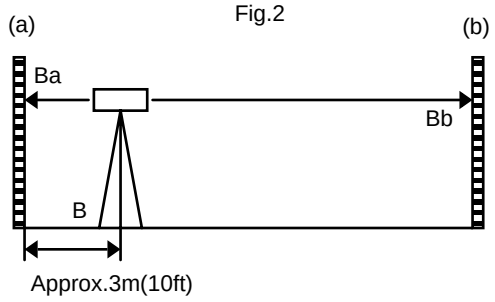


Fig.3

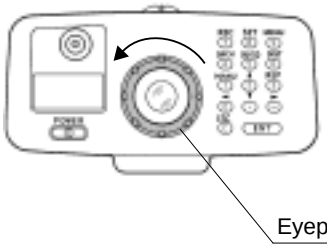
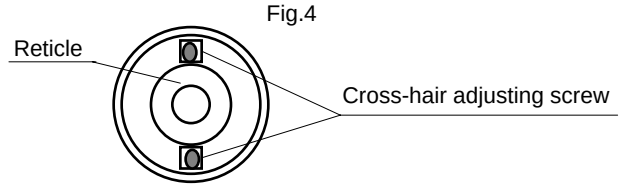


Fig.4



3 The following steps describe the adjustment process.

Operating procedure	Operating	Display
		Menu Adjust
1 From the “Menu Adjust” screen press [ENT].	[ENT]	**Method Type A**
2 Press [ENT]. The previous used job number will be displayed as the default.	[ENT]	**Job No? J04**
3 Enter Job No., and press [ENT].	Job. No. [ENT]	**Info1 ?**
4 Enter remarks 1-3 and press the [ENT] key.	Remark 1 [ENT] Remark 2 [ENT] Remark 3 [ENT]	**Info2 ?** **Info3 ?**

		Meas A a←←A b
5 Collimate the staff located on point " a" and press [MEAS]. (Fig.1) Aa will be measured and displayed.	Collimate (a) [MEAS]	Rod Aa 1.5586m ↓ Meas A a A→→b
6 Collimate the staff located on point " b " and press [MEAS]. (Fig.1) Ab will be measured and displayed.	Collimate (b) [MEAS]	Rod Ab 1.6586m Move ! (a)staff ↓
7 Move the instrument to position B, approximately 3m (10ft) from the staff at point " a" and level the instrument. (Fig.2)	Move the instrument	Meas B a←B b
8 Collimate to the staff at point " a" and press [MEAS]. (Fig.2) Ba will be measured and displayed.	Collimate (a) [MEAS]	Rod Ba 1.5473m ↓ Meas B a B→→→→b
9 Collimate to the staff at point " b" and press [MEAS]. (Fig.2) Bb will be measured and displayed. The correction value is then displayed.	Collimate (b) [MEAS]	Rod Bb 1.6453m ↓ d -4.8″ 0.0021m ↓ Data Store ?
10 To continue with the adjustment, press [ENT].	[ENT]	Adjust Reticle?

11 Press [ENT] key. The reticle value on the staff located at point "b" is shown.	[ENT]	**Adjust 1.58678m**
12 Reverse the staff located at point " b " . Remove the eyepiece cover to expose the cross-hair adjusting screw.	Reverse staff (b)	
13 Collimate the staff and read it manually. Shift the horizontal cross-hair line up and down, as required until the line is coincided with the reticle reading value. (Fig.3 Fig.4)	Collimate and Adjust	
14 Press [ENT] key. The display returns to the Adjusting Menu.	[ENT]	**Menu Adjust**

•To quit the adjustment procedure press [ESC] at any time during steps 1 through 11.
•When the error message is displayed, press [ESC] and continue the adjustment procedure.

Method Type B

1 Set the instrument on a tripod at position A divided into three equal parts between two staffs approximately 50 meters, 165′, apart.(Fig.1)

2 Level the instrument.

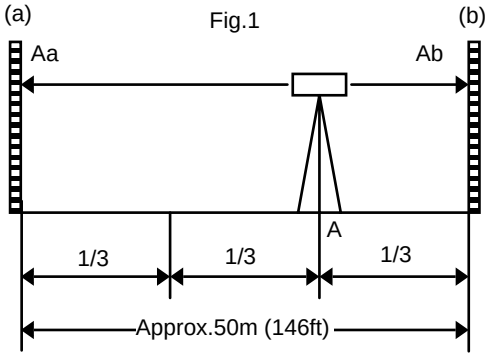


Fig.1

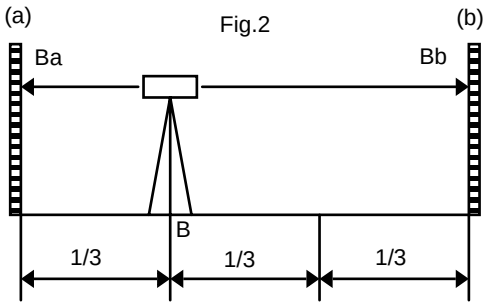
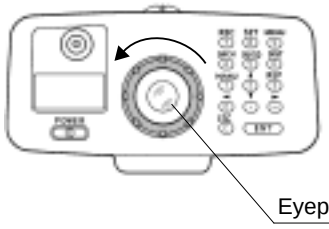


Fig.2

Fig.3



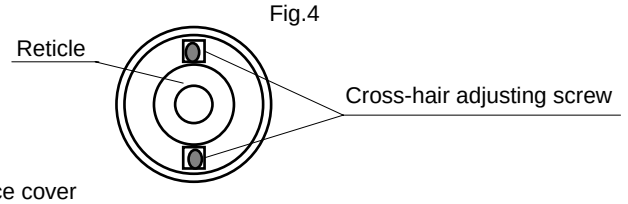


Fig.4

3 The following steps describe the adjustment process.

Operating procedure	Operating	Display
		Menu Adjust
1 From the “Menu Adjust” screen press [ENT].	[ENT]	**Method Type A**
2 Press [ENT]. The previous used job number will be displayed as the default.	[▼]	**Method Type B**
3 Press [ENT].	[ENT]	**Job No? J04**
4 Enter Job No., and press [ENT].	Job. No. [ENT]	**Info1 ?**
5 Enter remarks 1-3 and press the [ENT] key.	Remark 1 [ENT] Remark 2 [ENT] Remark 3 [ENT]	**Info2 ?** **Info3 ?**

		Meas A a←←←A b
6 Collimate the staff located on point “a” and press [MEAS]. (Fig.1) Aa will be measured and displayed.	Collimate (a) [MEAS]	Rod Aa 1.5586m ↓ Meas A a A→b
7 Collimate the staff located on point “b” and press [MEAS]. (Fig.1) Ab will be measured and displayed.	Collimate (b) [MEAS]	Rod Ab 1.6586m ↓ Move ! (a)staff
8 Move the instrument to position B, approximately 16.5m (54ft) from the staff at point “a” and level the instrument. (Fig.2)	Move the instrument	↓ Meas B a←B b
9 Collimate to the staff at point “a” and press [MEAS]. (Fig.2) Ba will be measured and displayed.	Collimate (a) [MEAS]	Rod Ba 1.5473m ↓ Meas B aB→→→b
10 Collimate to the staff at point “b” and press [MEAS]. (Fig.2) Bb will be measured and displayed. The correction value is then displayed.	Collimate (b) [MEAS]	Rod Bb 1.6453m ↓ d -4.8″ -0.0021m ↓ Data Store ?
11 To continue with the adjustment press [ENT].	[ENT]	Adjust Reticle?

12 Press [ENT] key. The reticle value on the staff located at point "b" is shown.	[ENT]	**Adjust** **1.58678m**
13 Reverse the staff located at point "b" . Remove the eyepiece cover to expose the cross-hair adjusting screw.	Reverse staff (b)	
14 Collimate the staff and read it manually. Shift the horizontal cross-hair line up and down, as required until the line is coincided with the reticle reading value. (Fig.3 Fig.4)	Collimate and Adjust	
15 Press [ENT] key. The display returns to the Adjusting Menu.	[ENT]	**Menu** **Adjust**

•To quit the adjustment procedure press [ESC] at any time during steps 1 through 13.
•When the error message is displayed, press [ESC] and continue the adjustment procedure.

11 SPECIAL ACCESSORIES

Battery charger BC-19BR/BC-19CR

Input voltage	:	AC120V±15%(BC-19BR) AC220V±15%(BC-19CR)
Frequency	:	50/60 Hz
Recharging time	:	1.5hours at +20°C (+68 °F)
Operating temperature	:	10 °C to 40 °C (50 °F to 104 °F)
Charging signal	:	Red lamp illumination
Finishing signal	:	Green lamp illumination
Refreshing signal	:	Yellow lamp illumination
Weight	:	0.3kg (0.7 lb)

12 STORAGE PRECAUTIONS

1.Clean the instrument after use.
- •When the instrument is exposed to sea water, clean the salty water with a wet cloth and dry the instrument with a dry cloth. Never store wet or damp instrument in its case. Leave the instrument in a dry area to air dry the instrument and case.
- •Sweep dust away from the instrument with a cleaning brush and wipe the dirt off with a soft cloth. Never use compressed air or gas.
- •Use a cleaning brush to clean the lens and to sweep away dust. A mixture of alcohol and ether can be used to clean the lens' surface. Swab lightly with a clean cotton cloth. The cloth should be free of oils or pastes.

2.When cleaning plastic parts avoid the use of volatile material such as thinner or benzene. Use neutralized detergent or water to clean plastic parts.

3.Check each part of the tripod after extended use. Parts such as screws and clamps may work themselves loose.

4.Clean the Pattern Staff after use.
- •Sweep dust away from the pattern surface or connected part and wipe the dirt off with a wet cloth repeatedly and dry with a dry cloth. Avoid the use of volatile material such as thinner or benzene.

5.For the safety storage of Pattern Staff.
- •It is recommended to cover the pattern staff or connected part with cloth as a protection.

13 MESSAGE & ERROR DISPLAY

Display	Explanation	Countermeasure
Already Exists	Same job or group name is already existed.	Enter a new job name or group.
Cannot Cont	The job going to be continued caused GH error or illegal format data.	Press [ESC] to return to menu.
Cannot Copy	Illegal copy (from card to card) is carryed out. When card to Ram copy is carryed out, there is illegal data or format error whthin a card.	Confirm the data.
Cannot Make	Crad capacity is full.	Use other card.
Cannot ReadData	The coordinate data can not be read.	Confirm the files in the card.
Card over 90%	90 percent of the data memory area is used by data.	Press [ESC]. Delete unnecessary job within the card.
Card Full	Card memory is full.	Use other card.
Card is Broken!	Management block of card memory is broken.	Confirm the card.
Card Changed	When carrying out line levelling work, Data card is changed with other one.	Confirm the card. If you want to continue the line leveling press [ESC].
CardNot Format	Data card is not formatted	Format the card.
CardNot Ready	Data card is not inserted	Insert data card.
Compe Err	The inclination of the instrument exceeds the capacity of the compensator.	Press [ESC]. Level the instrument properly.
Coll Error	An invalid value has been collected during the adjustment process.	Press [ESC]. Start the adjustment procedure from the beginning.
Coordi Not Found	There is no coordinate appointed.	Confirm the coordinate data, and set again.
Dark Err	The level cannot read the rod due to lack of light.	Press [ESC]. The data will have to be entered manually until lighting has improved.
E61,88	Any abnormality occurs within the CPU.	Turn the power switch off, then on again.

E70′s	Measuring error •Level is not properly sighted on the staff. •The distance between the instrument and the staff is either too far or near. •The staff is obstructed by more than 30 percent. •The cross-hairs are not within the range of the staff.	Press [ESC]. and remeasure. •Collimate the staff properly. •The distance between the instrument and the staff should be within the range of 2m to 100m, 7 ′ to 328 ′. (Fiberglass staff) . •Remove the obstructions. •The staff should be within the range of the cross-hairs.
E90~96	Communication error	Press [ESC]. Check the parameters of the level and/or external devices.
E98	The battery level of the internal backup battery is poor.	Press [ESC]. Contact your dealer to replace the built-in battery.
E99	This message is displayed when any abnormality occurs with internal memory.	Turn the power switch off then on again. Contact your dealer if the problem persists.
Gh Error	The calculated elevation exceeds the level′s	Press [ESC] to return to the measurement screen.
Group Nothing	There is no group appointed in Data Card.	Confirm the group or the card, and set again.
Illegal Card	Card more than 2Mbytes is used.	Capacity of a card must be less than 2Mbytes.
Illegal Format	A format of data card is different.	Format the card.
Input Error	Invalid data was input.	Reinput the corrected data.
Job Not Found	In a card, there is no job appointed.	Confirm the job, and set again.
Job Over	256 jobs exist whthin RAM or a group.	Press [ESC]. Delete the job in RAM or group after saving the job data.
Light Err	The level cannot read the rod due to an excess of light such as direct sunlight or glare.	Press [ESC]. Remove the source of the sunlight or glare.
Memory full	The data memory area of the instrument is full.	Press [ESC]. Delete unnecessary job within Ram.
Memory over 90%	90 percent of the data memory area is used by data.	Press [ESC]. Delete unnecessary job within Ram.
Must do End mode	The menu option just selected is not available in the present mode of the instrument.	Finish all pending operations and return to menu mode before attempting to execute the function again.
No Job To Cont	There is no job to continue.	Press [ESC] to return to menu.
Opr. Err	Method type A and B of adjusting mode The collimated direction is opposite.	Press [ESC]. Retry the adjusting in right direction.

Read Error	By abnormality of a card, a reading is not completed. An error occurred in cluster read.	Change the card for other card.
Same Group	Copy a file into same group.	Copy a file into other group.
Setting Error	Method type A of adjusting mode The horizontal distance between Aa and Ab exceeds 1 meters. The horizontal distance Ba is too near or far from staff (a). Method type B of adjusting mode Either position A or B is not set up correctly on 1/3 of the distance between staff (a) and (b).	Press [ESC]. Set the instrument half way between points a and b within 1 meters. Set the instrument approximately 3 m from the staff (a). Press [ESC]. Set the instrument at correct position divided into 1/3 between staff (a) and (b).
Write Error	Data can not be written into data card. An error occurred in cluster write. There is not space cluster in file generation.	Check the data card.
Write Protect!	Data card is write protection	Cancel write protection

•If errors still persist after attempting to clear them, contact your local TOPCON dealer.

14 SPECIFICATIONS

Telescope

Magnification :

DL-101C	DL-102C
32×	30×

Objective Aperture : 45mm
Field of view : 1° 20'
Resolving power : 3"

Compensator

Working Range :
Setting Accuracy :

	DL-101C	DL-102C
Working Range	±12'	±15'
Setting Accuracy	0.3"	0.5"

Height Measurement

Accuracy
(Standard deviation for 1km):

	DL-101C	DL-102C
Electronic reading	0.4mm Invar Staff	1.0mm Fiberglass Staff
Optical reading	1mm	1.5mm

Least count:

DL-101C	DL-102C
0.01mm/0.1mm	0.1mm/1mm

Distance Measurement

Least count : DL-101C : 1cm/1mm DL-102C : 1cm
Accuracy
(Using the [MEAS] key) : 1cm to 5cm

Measuring range

: 2m to 100m (7ft to 328ft) : Fiberglass staff
: 2m to 60m (7ft to 197ft): Invar Staff

Measuring Time

: 4sec.

Circular level sensitivity

: DL-101C : 8'/2mm DL-102C : 10'/2mm

Others

Display : 2-line, 8-digit per line, Dot matrix LCD
Data Storage : Internal memory 400KB (approx.8,000 data)
Data Transmission : RS-232C port provided

Key board	: Alphanumeric input
Timer	: Built-in timer
Horizontal Circle	: 360° or 400gon
Power Supply	: On-board rechargeable battery, BT-31Q NiCd 7.2V
	: On-board dry battery holder, DB-31 (Alkaline manganese dry batteries 6 pcs)
Operating Time	:BT-31Q:10hours
	:DB-31:10hours (Alkaline manganese dry batteries)
Ambient Temperature Range	:-20 °C to +50 °C [-4 °F to +122 °F]
Dimensions	: 237 ×196×141 mm[9.33 ×7.72×5.55inch]
Weight	: 2.8kg[6.16 lbs] (including on-board battery)

Data Card

: PC card based on PCMCIA
(SRAM: 64kbytes to 2Mbytes)

Staves

Fiberglass staff	:	Length	:	3m[9.84ft] (1.5m[4.92ft] × 2pcs.)
		Graduation	:	1cm graduation with 5mm pattern (front surface)
Invar staff	:	length	:	3.0m[9.84ft]
Aluminum staff	:	Length	:	5.0m[16.40ft]

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