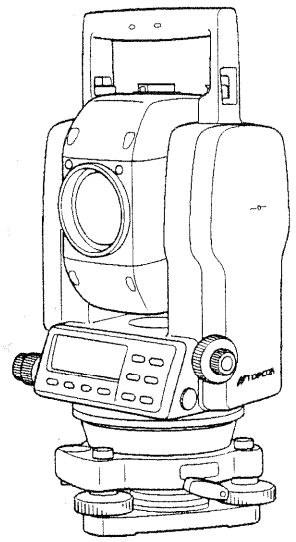
TOPCON



INSTRUCTION MANUAL

PULSE TOTAL STATION

GPT-1000 SERIES

GPT-1003

GPT-1004

GENERAL HANDLING PRECAUTIONS

Do not submerge the instrument into water.

The instrument can not be submerged underwater.
The instrument is designed based on the International Standard IPX 4, therefore it is protected from the normal rainfall.

Setting the instrument on a tripod

When mounting the instrument on a tripod, use a wooden tripod when possible. The vibrations that may occur when using a metallic tripod can effect the measuring precision.

Installing the tribrach

If the tribrach is installed incorrectly , the measuring precision could be effected. Occasionally check the adjusting screws on the tribrach. Make sure the base fixing lever is locked and the base fixing screws are tightened.

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

Always carry the instrument by its handgrip.

Exposing the instrument to extreme heat.

Do not leave the instrument in extreme heat for longer than necessary. It could adversely affect its performance.

Sudden changes of temperature

Any sudden change of temperature to the instrument or prism may result in a reduction of measuring distance range, i.e when taking the instrument out from a heated vehicle. Let instrument acclimate itself to ambient temperature.

Battery level check

Confirm battery level remaining before operating.

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
● 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!
● Laser beams can be dangerous, and can cause eye injury's if used incorrectly . Never attempt to repair the instrument yourself.
● Cause eye injury or blindness. Do not look at the sun through a telescope.
● High temperature may cause fire. Do not connect the battery to an instrument while it is charging.
● 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.
● May ignite explosively. Never use an instrument near flammable gas, liquid matter, and do not use in a coal mine.
● 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.
● Risk of fire. Do not use any other power cable other than the one specified.
● The short circuit of a battery can cause a fire. Do not short circuit battery when storing it.

⚠ CAUTION

- Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- 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 .
- Do not allow skin or clothing to come into contact with acid from the batteries,if this does occur then wash off with copious amounts of water and seek medical advice.
- A plumb bob can cause an injury to a person if used incorrectly.
- It could be dangerous if the instrument falls over,please ensure you attach a handle battery to the instrument securely.
- 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.
- Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.

USER

- 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,before operating,inspecting or adjusting.
- Wear the required protectors (safety shoes, helmet,etc.) when operating.

EXCEPTIONS FROM RESPONSIBILITY

- The user of this product is expected to follow all operating instructions and make periodic checks of the product's performance.
- 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.
- 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.
- 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.
- 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.
- The manufacturer,or its representatives,assumes no responsibility for damage caused by wrong movement,or action due to connecting with other products.

SAFETY STANDARD FOR LASER BEAM

GPT-1000 series uses the invisible laser beam to measure distance. The GPT-1000 series are manufactured and sold in accordance with "Performance Standards for Light-Emitting Products" (FDA/BRH 21 CFR 1040) or "Radiation Safety of Laser Products, Equipment Classification, Requirements and User`s Guide" (IEC Publication 825) provided on the safety standard for laser beam.

As per the said standard, GPT-1000 is classified as "Class 1 (I) Laser Products".

This is simple a product to operating that is not required to training from a "Laser safety officer".

In case of any failure, do not disassemble the instrument. Contact TOPCON or your TOPCON dealer.

Caution:	Use of controls or adjustments or performance of procedure than those specified in this manual may result in hazardous radiation exposure.

CONTENTS

STANDARD SET COMPOSITION

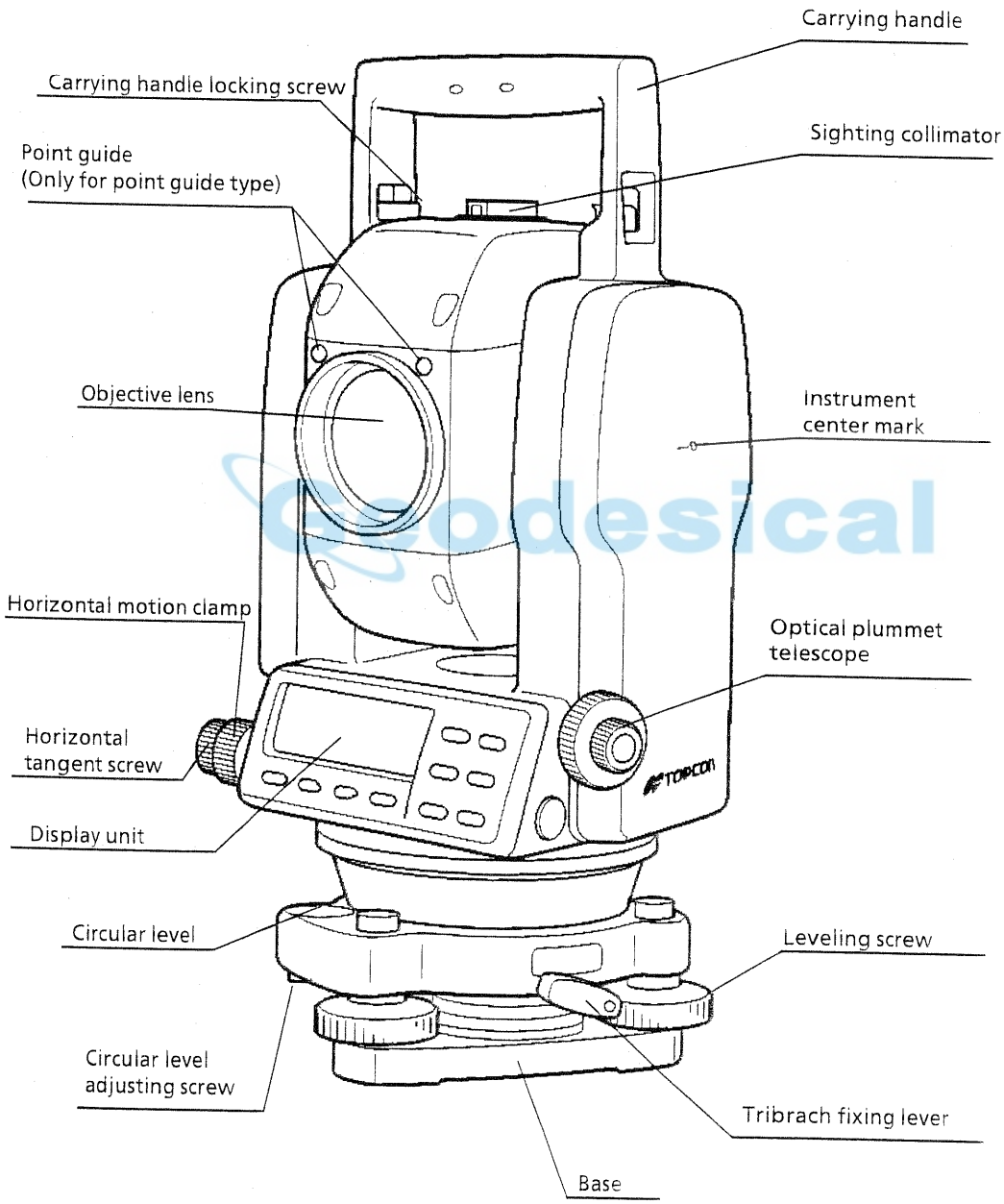
1. GPT-1000 series (with lens cap) ..... 1 each
2. On-board battery BT-32Q ..... 1 each
3. Battery charger BC-19BR or BC-19CR ..... 1 each
4. Tool kit with case [2 rod pins, screwdriver , cleaning brush, silicon cloth] ..... 1 set
5. Plastic carrying case ..... 1 each
6. Plastic rain cover ..... 1 each
7. Instruction manual ..... 1 each

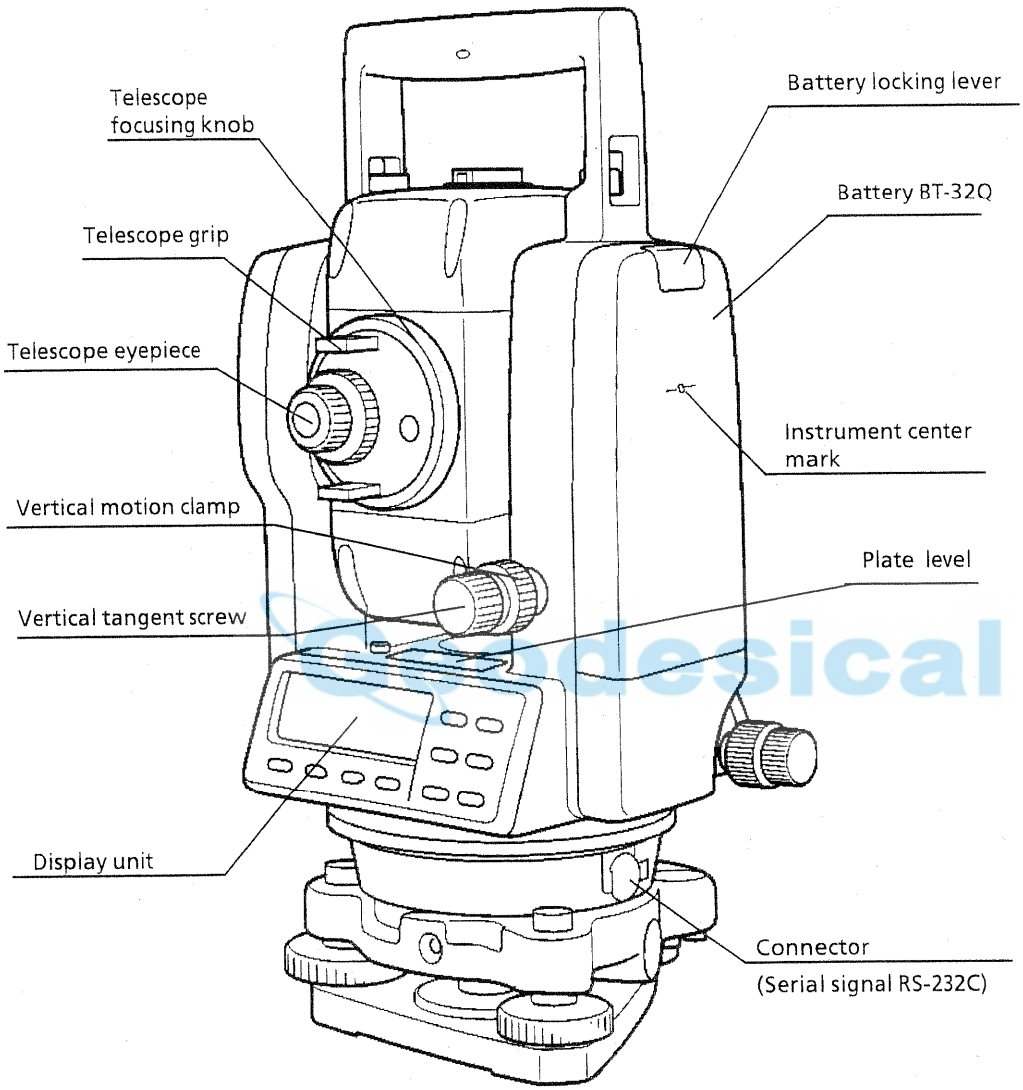
(Make sure that all of the above items are with the instrument when purchased.)

Remarks : 1. Battery charger BC-19CR is for AC 230V use and BC-19BR is for AC 120V use.
2. Plumb bob set and plumb bob hook are supplied for certain markets.

1. NOMENCLATURE AND FUNCTIONS

1.1 Nomenclature




Telescope
focusing knob
Telescope grip
Telescope eyepiece
Vertical motion clamp
Vertical tangent screw
Display unit
Battery locking lever
Battery BT-32Q
Instrument center
mark
Plate level
Connector
(Serial signal RS-232C)

1.2 Display

- **Display**
  The display uses a dot matrix LCD which has 4 lines and 20 characters per line. In general, the upper three lines display measured data,and the bottom line displays the soft key function which changes with the measuring mode.
- **Contrast and Illumination**
  The contrast and illumination of display window are adjusted. Refer to Chapter 6."SPECIAL MODE (Menu Mode)".
- **Example**

```
V :  90°10'20"
HR: 120°30'40"

OSET HOLD HSET P1↓
```

Angle measurement mode

V-angle : 90°10'20"
H-angle : 120°30'40"

```
HR: 120°30'40"
HD*   65.432 m
VD:   12.345 m
MEAS MODE  NP/P P1↓
```

Distance measurement mode

Horizontal-angle : 120°30'40"
Horizontal distance : 65.432m
Relative elevation : 12.345m

Feet unit

```
HR: 120°30'40"
HD*  123.45 ft
VD:   12.34 ft
MEAS MODE  NP/P P1↓
```

Horizontal-angle : 120°30'40"
Horizontal distance : 123.45ft
Relative elevation : 12.34ft

Feet and inch unit

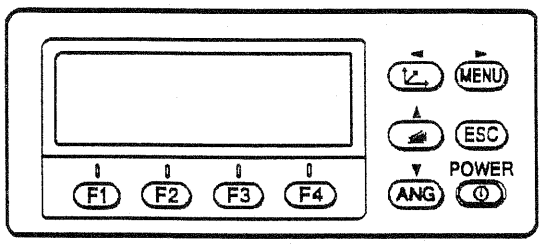
```
HR: 120°30'40"
HD*  123.04.6fi
VD:   12.03.4fi
MEAS MODE  NP/P P1↓
```

Horizontal-angle : 120°30'40"
Horizontal distance : 123ft 4in 6/8in
Relative elevation : 12ft 3in 4/8in

- **Display marks**

Display	Contents	Display	Contents
V	V-angle	*	EDM working
HR	H-angle right	m	Meter unit
HL	H-angle left	ft	Feet unit
HD	Horizontal distance	fi	Feet and inch unit
VD	Relative elevation	N_P	Non- prism mode
SD	Slope distance		
N	N coordinate		
E	E coordinate		
Z	Z coordinate		

1.3 Operating Key

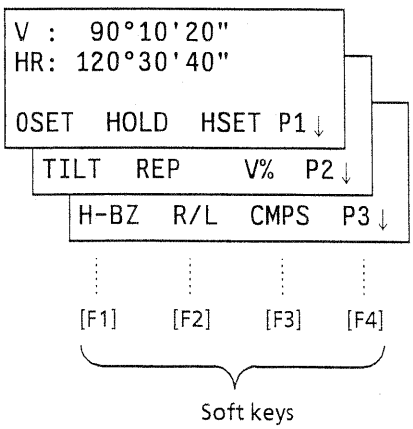


Keys	Name of key	Function
∠	Coordinate meas.key	Coordinate measurement mode
◢	Distance meas.key	Distance measurement mode.
ANG	Angle meas.key	Angle measurement mode
MENU	Menu key	Switches menu mode and normal mode. To set application measurements and adjust in the menu mode.
ESC	Escape key	• Returning to the measurement mode or previous layer mode from the mode set. • To be DATA COLLECTION mode or LAYOUT mode directly from the normal measurement mode.
POWER	Power source key	ON/OFF of power source
F1~F4	Soft key (Function key)	Responds to the message displayed.

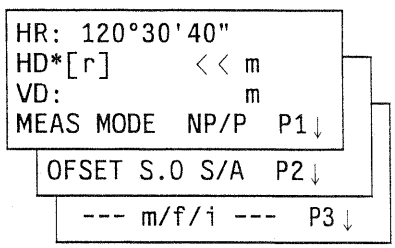
1.4 Function Key (Soft Key)

The Soft Key message is displayed at the bottom line of display. The functions are according to the displayed message.

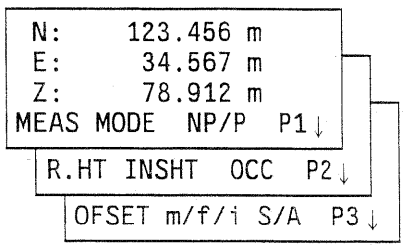
Angle measurement mode



Distance measurement mode



Coordinates measurement mode



Angle measurement mode

Page	Soft key	Display mark	Function
1	F1	0SET	Angle of Horizontal is set to 0°00'00"
	F2	HOLD	Hold the horizontal angle
	F3	HSET	Sets a required horizontal angle by entering numerals.
	F4	P1↓	The function of soft keys is shown on next page (P2).
2	F1	TILT	Setting Tilt Correction If ON, the display shows tilt correction value.
	F2	REP	Repetition angle measurement mode
	F3	V%	Vertical angle percent grade(%) mode
	F4	P2↓	The function of soft keys is shown on next page (P3).
3	F1	H-BZ	Sets the buzzer sound for every horizontal angle 90°
	F2	R/L	Switches R/L rotation of horizontal angle.
	F3	CMPS	Switches the COMPASS ON/OFF of vertical angle.
	F4	P3↓	The function of soft keys is shown on next page (P1).

Distance measurement mode

1	F1	MEAS	Start measuring
	F2	MODE	Sets a measuring mode, Fine/Coarse/Tracking
	F3	NP/P	Switches non-prism mode or prism mode.
	F4	P1↓	The function of soft keys is shown on next page (P2).
2	F1	OFSET	Select Off-set measurement mode
	F2	S.O	Select stake out measurement mode
	F3	S/A	Select set audio mode
	F4	P2↓	The function of soft keys is shown on next page (P1).
3	F2	m/f/i	Switches meter, feet or feet and inch unit.

Coordinate measurement mode

1	F1	MEAS	Start measuring
	F2	MODE	Sets a measuring mode,Fine/Coarse/Tracking
	F3	NP/P	Switches non-prism mode or prism mode.
	F4	P1↓	The function of soft keys is shown on next page (P2).
2	F1	R.HT	Sets a prism height by input values.
	F2	INSHT	Sets an instrument height by input values.
	F3	OCC	Sets an instrument coordinate point by input values.
	F4	P2↓	The function of soft keys is shown on next page (P3).
3	F1	OFSET	Select Off-set measurement mode
	F2	m/f/i	Switches meter, feet or feet and inch unit.
	F3	S/A	Select set audio mode
	F4	P3↓	The function of soft keys is shown on next page (P1).

1.5 Serial signal RS-232C connector

The serial signal connector is used for connecting the GPT-1000 series with a computer or TOPCON Data Collector, which enables the computer to receive measured data from the GPT-1000 series or to send preset data of horizontal angle, etc. to it.

- The following data will be output at each mode.

Mode	Output
Angle mode (V,HR or HL) (V in percent)	V,HR (or HL)
Horizontal distance mode (HR, HD, VD)	V,HR, HD, VD
Slope distance mode (V, HR,SD)	V,HR, SD,HD
Coordinate mode	N, E, Z, HR (or V,H,SD,N,E,Z)

- The display and the output at the coarse mode are the same as the contents above.
- Output at the tracking mode is displayed as distance data only.

The details necessary for the connection with the GPT-1000 Series are obtained from its Interface Manual which is optionally available. Please refer to the manual.

2 PREPARATION FOR MEASUREMENT

2.1 Setting Instrument Up For Measurement

Mount the instrument to the tripod. Level and center the instrument precisely to insure the best performance. Use tripods with a tripod screw of 5/8 in. diameter and 11 threads per inch, such as the Type E TOPCON wide- frame wooden tripod.

Reference: Leveling and Centering the Instrument

1. Setting up the Tripod

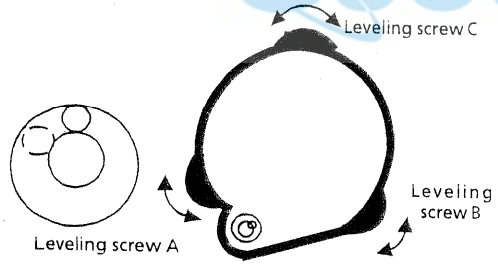
First, extend the extension legs to suitable lengths and tighten the screws on their midsections.

2. Attaching the Instrument on the Tripod Head

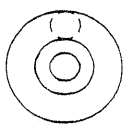
Place the instrument carefully on the tripod head and slide the instrument by loosening the tripod screw. If the plumb bob is positioned right over the center of the point, slightly tighten the tripod screw.

3. Roughly Leveling the Instrument by Using the Circular Level

① Turn the leveling screws A and B to move the bubble in the circular level. The bubble is now located on a line perpendicular to a line running through the centers of the two leveling screws being adjusted.

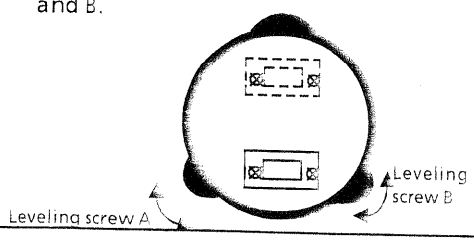


② Turn the leveling screw C to bring the bubble to the center of the circular level.

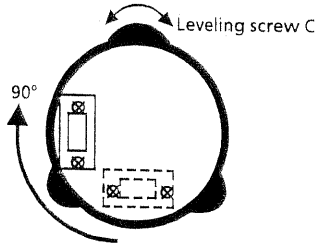


4. Centering by Using the Plate Level

① Rotate the instrument horizontally by using the Horizontal motion/clamp screw and place the plate level parallel with the line connecting leveling screws A and B, and then bring the bubble to the center of the plate level by turning leveling screws A and B.



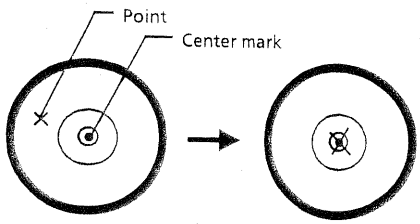
② Rotate the instrument 90° (100g) around its vertical axis and turn the remaining leveling screw or C to center the bubble



③ Repeat the procedures ① and ② for each 90° (100g) rotation of the instrument and check whether the bubble is correctly centered for all four points.

5. Centering by Using the Optical Plummet Telescope

Adjust the eyepiece of the optical plummet telescope to your eyesight.
Slide the instrument by loosening the tripod screw, place the point on the center mark, and then tighten the tripod screw. Sliding the instrument carefully not to rotate that allows you to get the least dislocation of the bubble.



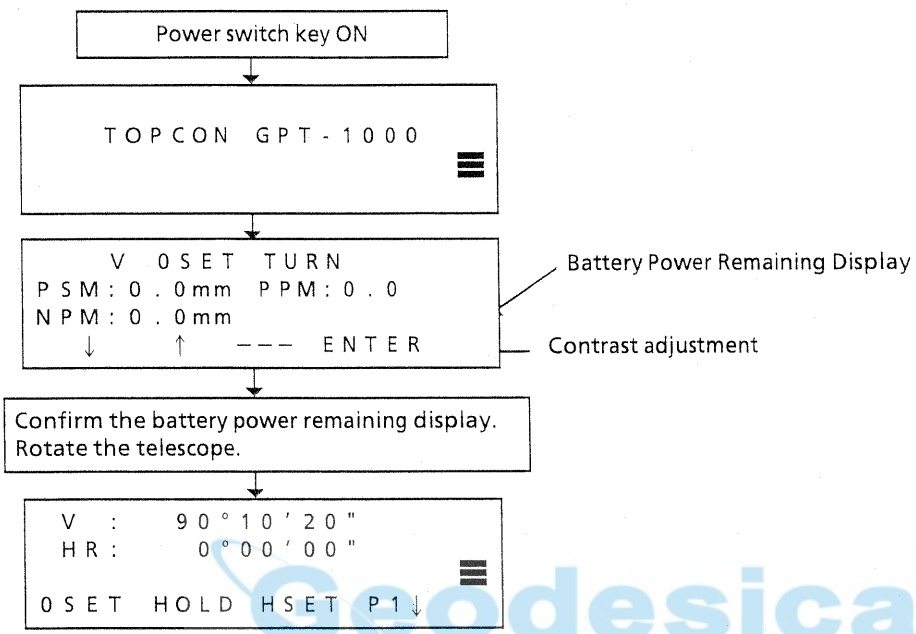
6. Completely Leveling the Instrument

Leveling the instrument precisely in a similar way to 4. Rotate the instrument and check to see that the bubble is in the center of the plate level regardless of telescope direction, then tighten the tripod screw hard.

2.2 POWER Switch Key ON

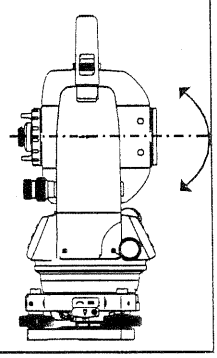
① Turn the power switch ON.
Display initializes for two seconds and shows ZERO SET , current prism constant value (PSM), non-prism constant value (NPM) and atmospheric correction value (PPM) . This allows you to confirm the prism constant value to be used.

② Rotate the telescope to set the instrument at vertical angle reading of 0°



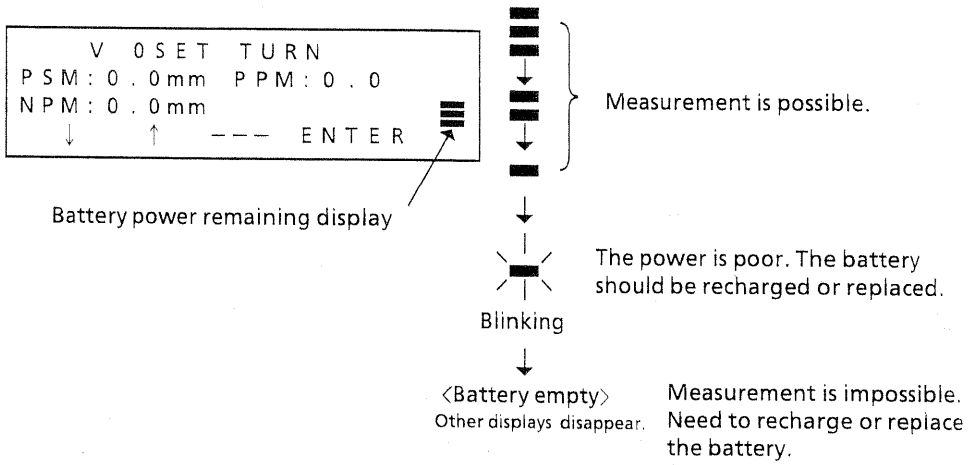
- Confirm the battery power remaining display. Replace with charged battery or charge when battery level is low or indicates "Battery empty". Refer to Chapter 2.3 "Battery Power Remaining Display".
- When you set the horizontal angle 0° (Horizontal angle 0° detection in the selecting mode), Set the horizontal 0° setting by rotating the instrument after the vertical angle 0° setting.
- **Contrast adjustment**
  This enables you to adjust the brightness by pressing the [F1](↓) or [F2](↑) key.
  To memorize the setting value after powering off, press [F4](ENTER) key.

Note : For setting the vertical angle at 0°, an electronic datum 0 is provided on the vertical angle circle. If the telescope is turned and the sensor passes the datum 0, angle measurement begins.
The datum 0 is placed near the level position of the telescope, the vertical angle setting of 0 can easily be set by rotating the telescope.



2.3 Battery Power Remaining Display

Battery power remaining display indicates the power condition.



Note : 1) The battery operating time will vary depending on the environmental conditions such as ambient temperature, charging time, the number of times of charging and discharging etc. It is recommended for safety to charge the battery beforehand or to prepare spare full charged batteries.

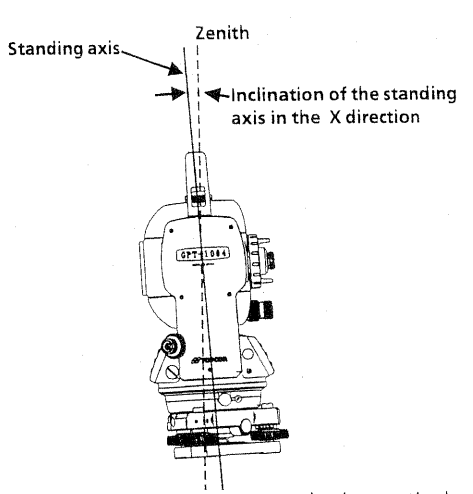
2) For general usage of the battery, see chapter 14" Power source and charging".

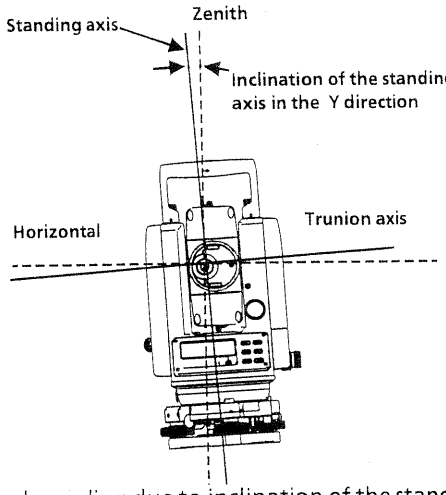
3) The battery power remaining display shows the power level regarding to the measurement mode now operating.
The safety condition indicated by the battery power remaining display in the angle measurement mode does not necessarily assure the battery's ability to be used in the distance measurement mode.
It may happen that the mode change from the angle mode to the distance mode will stop the operation because of insufficient battery power for the distance mode which consumes more power than angle mode.
Note that the EDM unit is working when "V-0SET" and the battery power remaining display shown at the power ON, which shows as an easy battery check before use.

2.4 Vertical and Horizontal Angle Tilt Correction

(GPT-1004 has vertical angle correction only)

When the tilt sensors are activated, automatic correction of vertical and horizontal angle for mislevelment is displayed.
To ensure a precise angle measurement, tilt sensors must be turned on. The display can also be used to fine level the instrument. If the (TILT OVER) display appears the instrument is out of automatic compensation range and must be leveled manually.





- GPT-1004 compensate only the vertical angle reading due to inclination of the standing axis in the X direction.
- GPT-1003 compensates both the vertical angle and the horizontal angle readings due to inclination of the standing axis in the X and Y directions .
- For more information about dual axis compensation, refer to APPENDIX 1 "Dual Axis Compensation".

GPT-1003

When the instrument is out of compensation. (TILT OVER)

V : ° ' " HR: ° ' " 〈X TILT OVER〉	V : ° ' " HR: ° ' " 〈Y TILT OVER〉	V : ° ' " HR: ° ' " 〈XY TILT OVER〉
Standing Axis in the X direction out of range	Standing Axis in the Y direction out of range	Standing Axis in the X and Y directions out of range

GPT-1004

V : ° ' "
HR: 120°30'40"
〈X TILT OVER〉

- To set auto tilt correction from the moment that power is on, refer to chapter 6.4.3" Vertical and Horizontal Angle Tilt correction (Tilt ON/OFF)".
- The display of Vertical or Horizontal angle is unstable when instrument is on an unstable stage or a windy day. You can turn off the auto tilt correction function of V/H angle in this case.

• Setting Tilt Correction by Soft Key

To enable you to select tilt ON/OFF function. setting is not memorized after power is OFF.

[Example] Setting X,Y Tilt OFF

Operating procedure	Operation	Display
① Press [F4] key to get the function page 2.		V : 90°10'20" HR: 120°30'40" OSET HOLD HSET P1↓
	[F4]	TILT REP V% P2↓
② Press [F1](TILT) key. In case ON is already selected, the display shows tilt correction value.	[F1]	TILT SENSOR: [XY-ON] X:-0°00'25" Y: 0°00'20" X-ON XY-ON OFF ---
③ Press [F3](OFF) key.	[F3]	TILT SENSOR: [OFF] X-ON XY-ON OFF ---
④ Press [ESC] key.	[ESC]	V : 90°10'20" HR: 120°30'40" OSET HOLD HSET P1↓

- The setting mode performed here will not be memorized after powering OFF. To set TILT correction in the initialized setting (it is memorized after powering OFF) refer to Chapter 6.4.3" Vertical and Horizontal Angle Tilt correction (Tilt ON/OFF)".

2.5 How to Enter Alphanumeric characters

This enables you to enter alphanumeric characters such as the instrument height, prism height, occupied point, backsight point etc..

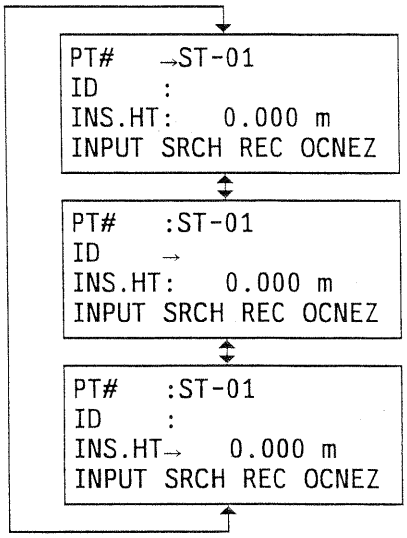
• How to select a item

[Example setting] Occupied point in the data collection mode.

The arrow indicates a item to enter.

The arrow line moves up or down when the [▼] key or [▲] key is pressed.

[▼] or [▲]



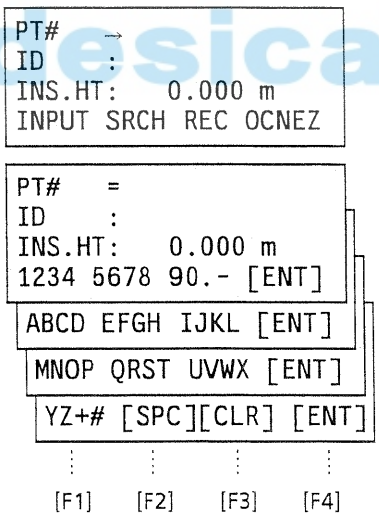
• How to enter characters

① Move the arrow to enter a item using the [▲] or [▼] key.

② Press the [F1](INPUT) key.
The arrow changes to the equal (=).

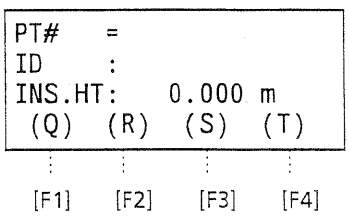
The characters are displayed on the bottom line.

③ Press the [▲] or [▼] key to select a page.



④ Press the soft key to select a group of characters.

Example: [F2](QRST) key is pressed.



⑤ Press soft key to select a character.

Example: [F4](T) key is pressed.

```
PT#    =T
ID     :
INS.HT:    0.000 m
MNOP QRST UVWX [ENT]
```

Select next character in the same manner.

```
PT#    =TOPCON-1
ID     :
INS.HT:    0.000 m
MNOP QRST UVWX [ENT]
```

⑥ Press [F4](ENT) key.
The arrow moves to next item.

```
PT#    :TOPCON-1
ID     →
INS.HT:    0.000 m
INPUT SRCH REC OCNEZ
```

- To correct a character, move the cursor to correct character by pressing [◀] or [▶] key and enter again.

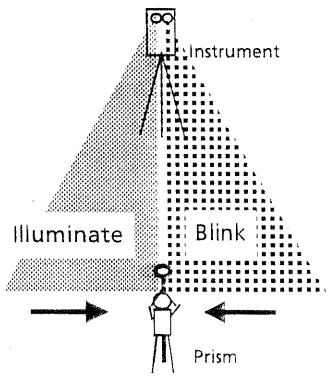
2.6 Point Guide (Only for Point guide type)

Fast and simple to use, the Point Guide feature is useful when doing stake out work. The LED's for the Point Guide System on the instrument telescope assist the rod person to get on-line. When using the Point Guide System, the battery life will be approximately 7 hours at +20°C (+68°F).

Turning the Point Guide ON and Operation:

Press the [MENU] key twice to turn ON the Point Guide LED's.
Looking at the objective lens of the telescope, the right LED will blink and the left LED will stay lit.

The Point Guide should be used within a distance of 100 meters (328 feet). The quality of its results will depend on the weather conditions and the user's eyesight.



The goal of the rod person is to look at both LED's on the instrument and move the prism on-line until both LED's are equally bright.

- If the solid LED is brighter, move right.
- If the blinking LED is brighter, move left.

Once you have determined that both of the LED's are equally bright, you are on-line with the instrument.

3 ANGLE MEASUREMENT

3.1 Measuring Horizontal Angle Right and Vertical Angle

Make sure the mode is in Angle measurement.

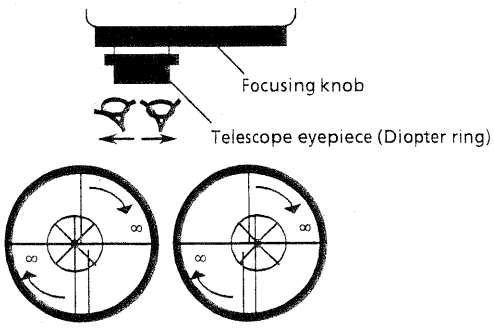
Operating procedure	Operation	Display
① Collimate the 1st target (A).	Collimate A	V : 90°10'20" HR: 120°30'40" OSET HOLD HSET P1↓
② Set horizontal angle of target A at 0° 00' 00". Press [F1](0 set) key and press [F3](YES) key.	[F1]	H ANGLE 0 SET > OK? --- --- [YES] [NO]
	[F3]	V : 90°10'20" HR: 0°00'00" OSET HOLD HSET P1↓
③ Collimate the 2nd target (B). The required V/H angle to target B will be displayed.	Collimate B	V : 98°36'20" HR: 160°40'20" OSET HOLD HSET P1↓

Reference

How to Collimate

① Point the telescope toward the light. Turn the diopter ring and adjust the diopter so that the cross hairs are clearly observed.
(Turn the diopter ring toward you first and then backward to focus.)
② Aim the target at the peak of the triangle mark of the sighting collimator. Allow a certain space between the sighting collimator and yourself for collimating.
③ Focus the target with the focusing knob.

※ If parallax is created between the cross hairs and the target when viewing vertically or horizontally while looking into the telescope, focusing is incorrect or diopter adjustment is poor. This adversely affects precision in measurement or survey. Eliminate the parallax by carefully focusing and using diopter adjustment.



3.2 Switching Horizontal Angle Right/Left

Make sure the mode is Angle measurement

Operating procedure	Operation	Display
① Press [F4](↓)key twice to get the function on page 3.	[F4] twice	V : 90°10'20" HR: 120°30'40" OSET HOLD HSET P1↓ TILT REP V% P2↓ H-BZ R/L CMPS P3↓
② Press [F2](R/L) key. The mode Horizontal angle Right (HR) switches to (HL) mode.	[F2]	V : 90°10'20" HL: 239°29'20" H-BZ R/L CMPS P3↓
③ Measure as HL mode.		
• Every time pressing [F2](R/L) key, HR/HL mode switches.		

3.3 Measuring from the Required Horizontal Angle

3.3.1 Setting by Holding the Angle

Make sure the mode is angle measurement

Operating procedure	Operation	Display
① Set the required horizontal angle, using Horizontal tangent screw	Display angle	V : 90°10'20" HR: 130°40'20" OSET HOLD HSET P1↓
② Press [F2](HOLD) key.	[F2]	H ANGLE HOLD HR= 130°40'20" > SET ? --- --- [YES] [NO]
③ Collimate the target.	Collimate	
④ Press [F3](YES) key to finish holding the horizontal angle.※1) The display turns back to normal angle measurement mode.	[F3]	V : 90°10'20" HR: 130°40'20" OSET HOLD HSET P1↓
※1) To return to the previous mode, press [F4](NO) key.		

3.3.2 Setting a Horizontal Angle from the Keys

Make sure the mode is in Angle measurement.

Operating procedure	Operation	Display
① Collimate the target.	Collimate	V : 90°10'20" HR: 170°30'20" OSET HOLD HSET P1↓
② Press [F3](HSET) key.	[F3]	H ANGLE SET HR: INPUT --- --- ENTER
③ Input the required horizontal angle by using keys. ※1) For example :70°40'20" When completed, normal measuring from the required Horizontal angle is possible.	[F1] 70.4020 [F4]	1234 5678 90.- [ENT] V : 90°10'20" HR: 70°40'20" OSET HOLD HSET P1↓

※1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters".

3.4 Vertical Angle Percent Grade(%) Mode

Make sure the mode is Angle measurement

Operating procedure	Operation	Display
① Press [F4](↓) key to get the function on page 2.		V : 90°10'20" HR: 170°30'20" OSET HOLD HSET P1↓
	[F4]	TILT REP V% P2↓
② Press [F3](V%) key. ※1)	[F3]	V : -0.30 % HR: 170°30'20" TILT REP V% P2↓

※1) Every time pressing the [F3](V%) key, the display mode switches.

- When the measurement is carried out over ±45° (±100%) from the horizontal, the display shows 〈OVER〉.

3.5 Repetition Angle Measurement

Make sure the mode is Angle measurement

Operating procedure	Operation	Display
① Press [F4](↓) key to get the function on page 2.		V : 90°10'20" HR: 170°30'20" OSET HOLD HSET P1↓
	[F4]	TILT REP V% P2↓
② Press [F2](REP)key.	[F2]	REPETITION ANGLE >OK ? --- --- [YES][NO]
③ Press [F3](YES) key.	[F3]	REP-ANGLE COUNT[0] Ht: 0°00'00" Hm: OSET V/H REL HOLD
④ Collimate the target A. and press [F1] (OSET) key.	Collimate A [F1]	REP-ANGLE COUNT[0] Ht: 0°00'00" Hm: OSET V/H REL HOLD
⑤ Collimate the target B using the horizontal clamp and tangent screw. Press [F4](HOLD) key.	Collimate B [F4]	REP-ANGLE COUNT[1] Ht: 45°10'00" Hm: 45°10'00" OSET V/H REL HOLD
⑥ Recollimate target A using the horizontal clamp and tangent screw, and press [F3](REL)key.	Recollimate A [F3]	REP-ANGLE COUNT[1] Ht: 45°10'00" Hm: 45°10'00" OSET V/H REL HOLD
⑦ Recollimate target B using the horizontal clamp and tangent screw, and press [F4](HOLD) key.	Recollimate B [F4]	REP-ANGLE COUNT[2] Ht: 90°20'00" Hm: 45°10'00" OSET V/H REL HOLD
⑧ Repeat ⑥to ⑦to measure the desired number of repetitions.		REP-ANGLE COUNT[4] Ht: 180°40'00" Hm: 45°10'00" OSET V/H REL HOLD [Example] 4 measurement
⑨ To return to the normal angle mode, press the [F2](V/H) key or [ESC] key.	[ESC] or [F2]	REPETITION ANGLE Exit >OK ? --- --- [YES][NO]

⑩ Press [F3](YES) key.	[F3]	V : 90°10'20" HR: 170°30'20" OSET HOLD HSET P1↓

- Horizontal angle can be accumulated up to (3600°00'00" – minimum reading)(horizontal angle right) or –(3600°00'00" – minimum reading)(horizontal angle left) . In case of 5 second reading, horizontal angle can be accumulated up to ±3599°59'55".

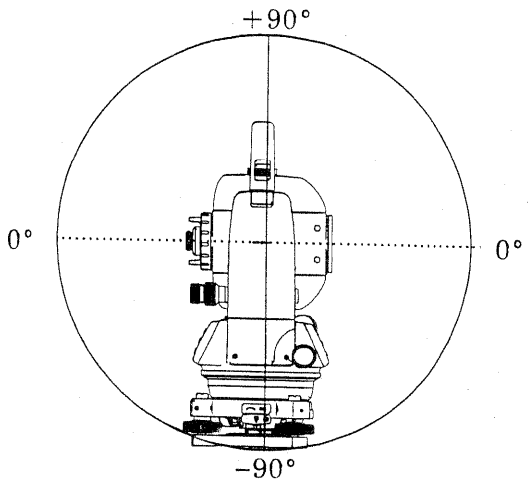
3.6 Buzzer Sounding for Horizontal Angle 90° Increments

When the horizontal angle falls in the range of less than ±1° of 0°、90°、180° or 270°, the buzzer sounds . Buzzer stops only when the horizontal angle is adjusted to 0°00'00", 90°00'00" , 180°00'00" or 270°00'00".
This setting is not memorized after powering off. Refer to Chapter 16 "SELECTING MODE" to set the initial setting (memorized after powering off).
Make sure the mode is Angle measurement

Operating procedure	Operation	Display
① Press [F4](↓) key twice to get the function on page 2.	[F4] twice	V : 90°10'20" HR: 170°30'20" OSET HOLD HSET P1↓ H-BZ R/L CMPS P3↓
② Press [F1](H-BZ) key. The data previously set is shown.	[F1]	H-ANGLE BUZZER [OFF] [ON] [OFF] --- ENTER
③ Press [F1](ON) key or [F2](OFF) key to select the buzzer ON/OFF .	[F1] or [F2]	H-ANGLE BUZZER [ON] [ON] [OFF] --- ENTER
④ Press [F4](ENTER) key.	[F4]	V : 90°10'20" HR: 170°30'20" OSET HOLD HSET P1↓

3.7 Compasses (vertical angle)

Vertical angle is displayed as shown below.



Operating procedure	Operation	Display
① Press [F4](↓) key twice to get the function on page 3.	[F4] twice	V : 98°10'20" HR: 170°30'20" OSET HOLD HSET P1↓ H-BZ R/L CMPS P3↓
② Press [F3](CMPS) key.※1)	[F3]	V : - 8°10'20" HR: 170°30'20" H-BZ R/L CMPS P3↓

※1) Every time pressing [F3](CMPS) key, the display mode switches.

4 DISTANCE MEASUREMENT

Those distances shorter than 2.5m will not be displayed in Non-prism mode.

Prism mode and Non-prism mode

In GPT-1000 series, the distance measurement will be done using invisible pulse laser beam emitted from pulse laser diode. You can select measurement mode between Prism mode which collimating a prism and Non-prism mode that is collimating a target object except prism.

- Non-prism mode enables all distance measurements such Distance measurement, Coordinate measurement, Offset measurement and Layout.
- To switch over Prism mode to Non-prism mode or contrary, press the [NP/P] soft key in each measurement display. [NP] of Non-prism mode indicator will be shown at the right corner of the display in Non-prism mode measurement.
  Changing mode shall be done before measurement.

Example: Distance measurement

```
HR: 120°30'40"
HD*   123.456 m    NP
VD:     5.678 m
MEAS MODE  NP/P  P1↓
```

Non-prism mode indicator

Coordinate measurement

```
N:    123.456 m
E:     34.567 m    NP
Z:     78.912 m
MEAS MODE  NP/P  P1↓
```

To change the mode, press the [NP/P] soft key in each measurement.

- It is possible to set Non-prism mode for distance measurement during the power on time. Refer to 16.SELECTING MODE to set the option.
- If happened collimating the near distance prism in Non-prism mode, measurement will not be done because of too much light.

Note : Do not switch over Prism mode to Non-prism mode as you are collimating the prism. In case you have done the power off once.

4.1 Setting of the Atmospheric Correction

When setting the atmospheric correction, obtain the correction value by measuring the temperature and pressure. Refer to Chapter 12.2 "Setting of Atmospheric Correction Value".

4.2 Setting of the Correction for Prism Constant

Topcon's prism constant value is 0. Set correction for prism at 0. If the prism is of another manufacture, the appropriate constant shall be set beforehand. Refer to Chapter 11 "Setting the Prism Constant Value". The setting value is kept in the memory even after power is off.

Note: Also the prism constant value is set here will be used in Non-prism mode. Confirm the Prism Constant Value is set at 0 before measurement in Non-prism mode.

4.3 Distance Measurement (Continuous Measurement)

Make sure the mode displays angle measurement.

Operating procedure	Operation	Display
① Collimate the center of prism.	Collimate	V : 90°10'20" HR: 120°30'40" OSET HOLD HSET P1↓
② Press [◢] key. Distance measurement starts. ※1),2)	[◢]	HR: 120°30'40" HD*[r] << m VD: m MEAS MODE NP/P P1↓
The measured distances are shown. ※3)~※5)		HR: 120°30'40" HD* 123.456 m VD: 5.678 m MEAS MODE NP/P P1↓
• Pressing [◢] key again, the display changes to horizontal (HR) and vertical (V) angle and slope distance (SD). ※6)	[◢]	V : 90°10'20" HR: 120°30'40" SD* 131.678 m MEAS MODE NP/P P1↓

※1) When EDM is working, the "＊" mark appears in the display.
※2) To change mode from Fine to Coarse or Tracking, refer to Chapter 4.5 "Fine Mode/ Coarse Mode/Tracking Mode".
To set the distance measurement on when the instrument is powered up, refer to Chapter 16 "Selecting Mode".
※3) The distance unit indicator "m" (for meter), "ft" (for feet) or "fi"(for feet inch) appears and disappears alternatively with buzzer sounds at every renewal of distance data.
※4) Measurement may repeat automatically in the instrument if the result is affected by shimmer etc..
※5) To return to the normal measuring angle mode from a distance measuring mode, press [ANG] key.
※6) It is possible to choose the display order (HR,HD,VD) or (V,HR,SD) for initial measuring distance mode. Refer to Chapter 16 "SELECTING MODE".

4.4 Distance Measurement (N-time Measurement / Single Measurement)

When the number of times measurement is preset, the GPT-1000 series measures the distance the set number of times. The average distance will be displayed.
When presetting the number of times as 1, it does not display the average distance, because of single measurement. Single measurement is set at the factory.

Make sure the mode displays angle measurement.

Operating procedure	Operation	Display
① Collimate the center of the prism.		V : 90°10'20" HR: 120°30'40" OSET HOLD HSET P1↓
② Press [◢] key. Continuous measuring starts .※1)	[◢]	HR: 120°30'40" HD*[r] << m VD: m MEAS MODE NP/P P1↓
③ Press [F1](MEAS) key while continuous measuring is exceeding. ※2) The average value is displayed and "*" mark disappears.	[F1]	HR: 120°30'40" HD*[n] << m VD: m MEAS MODE NP/P P1↓ ↓ HR: 120°30'40" HD: 123.456 m VD: 5.678 m MEAS MODE NP/P P1↓
• While EDM is working, press [F1](MEAS) key again, the mode will be changed to continuous measuring mode.		

※1) It is possible to set the measurement mode for N-times measurement mode or Continuous Measurement mode when the power is turned on. Refer to Chapter 16 "SELECTING MODE".

※2) For setting the number of times (N-times) in the measurement, refer to Chapter 16 "SELECTING MODE".

○ Choose meter /feet / feet + inch unit by soft key

It is possible to change the unit for distance measurement mode by soft key.
This setting is not memorized after power off. Refer to 16.SELECTING MODE to set at the initial setting (memorized after power off).

Operating procedure	Operation	Display
① Press [F4](P1↓) key twice to get the function on page 3.	[F4] Twice	HR: 120°30'40" HD* 2.000 m VD: 3.000 m MEAS MODE NP/P P1↓ --- m/f/i --- P3↓
② Every time pressing [F2](m/f/i) key, the display unit will be changed. • Every time pressing [F2](m/f/i) key, the unit mode switches.	[F2]	HR: 120°30'40" HD* 6.560 ft VD: 9.845 ft --- m/f/i --- P3↓

4.5 Fine Mode/Tracking Mode/Coarse Mode

This setting is not memorized after power is off. Refer to Chapter 16"SELECTING MODE" to set at the initial setting (memorized after power is off).

○Fine Mode : This is a normal distance measuring mode.
The unit to be displayed : 0.2mm or 1mm. (0.001ft or 0.005ft)
Measurement time 0.2mm mode : approx. 3.0 sec.
1mm mode : approx. 1.0 sec.

○Tracking Mode : This mode measures in shorter time than in fine mode.
It is very useful when tailing the moving object or carrying out stake-out work.
The unit to be displayed : 10mm
Measuring time : approx. 0.3 sec.

○Coarse Mode : This mode measures in shorter time than in fine mode.
The unit to be displayed : 10mm or 1mm
Measuring time : approx. 0.5 sec.

Operating procedure	Operation	Display
① Press [F2](MODE) key from the distance measuring mode.※1) The initial character (F/T/C) of set mode is displayed . (F:Fine, T:Tracking, C:Coarse)	[F2]	HR: 120°30'40" HD* 123.456m VD: 5.678m MEAS MODE NP/P P1↓ HR: 120°30'40" HD* 123.456m VD: 5.678m FINE TRACK COARSE F
② Press [F1](FINE) key, [F2](TRACK) key, or [F3](COARSE) key.	[F1]~[F3]	HR: 120°30'40" HD* 123.456m VD: 5.678m MEAS MODE NP/P P1↓

※1) To cancel the setting, press [ESC] key.

4.6 Stake Out (S.O)

The difference between the measured distance and the input stake out distance is displayed.

Measured distance – Stake out distance = Displayed value

- In stake out operation, you can select either horizontal distance (HD), relative elevation (VD) and slope distance (SD)

Operating procedure	Operation	Display
① Press [F4](↓) key in the distance measuring mode to get the function on page 2.	[F4]	HR: 120°30'40" HD* 123.456 m VD: 5.678 m MEAS MODE NP/P P1↓ OFSET S.O S/A P2↓
② Press [F2](S.O) key. The data previously set is shown.	[F2]	STAKE OUT HD : 0.000 m HD VD SD ---
③ Select the measuring mode by pressing [F1] to [F3] key. Example : Horizontal distance	[F1]	STAKE OUT HD : 0.000 m INPUT --- --- ENTER
④ Enter the distance for stake out. ※1)	[F1] Enter data [F4]	1234 5678 90.- [ENT] STAKE OUT HD : 100.000 m INPUT --- --- ENTER
⑤ Collimate the target (Prism). Measuring starts.	Collimate P	HR: 120°30'40" dHD*[r] << m VD: m MEAS MODE NP/P P1↓ ↓ HR: 120°30'40" dHD* 23.456 m VD: 5.678 m MEAS MODE NP/P P1↓
The difference between the measured distance and the stake out distance is displayed. ⑥ Move the target until the difference becomes 0m.		

※1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters ".

- To return to normal distance measurement mode, stake out distance to "0"m or turn the power off.

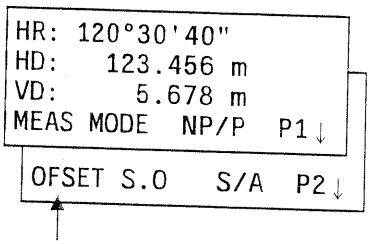
4.7 Offset Measurement

There are four offset measurement modes in the Offset Measurement.

1 Angle offset
2 Distance offset
3 Plane offset
4 Column offset

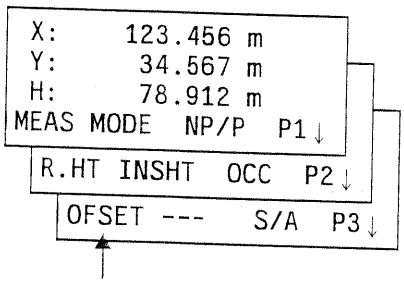
To show the offset measurement menu, press the [OFSET] soft key from distance or coordinate measurement mode.

Example: Distance measurement

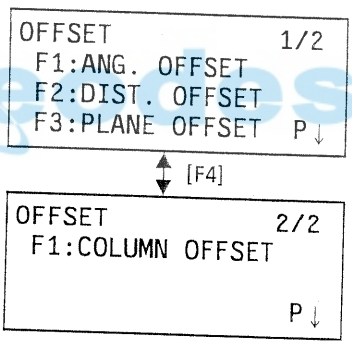


Press the [OFSET] soft key.

Coordinate measurement

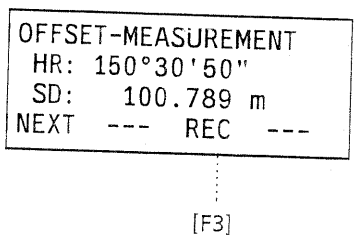


Offset Measurement Menu



Outputting the Measurement Data

The results of offset measurement can be output to external device.
Setting the function of the[ESC] key to (REC), the [F3] soft key which assigned (REC) will appear in measured result display.
Refer to Chapter 16-SELECTING MODE to set this option.

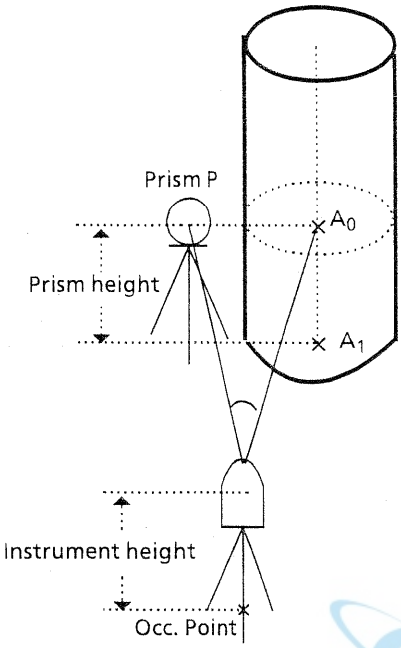


Distance measurement mode of the offset measurement

Offset measurement will be done by N-time fine measurement mode.
For setting measuring times refer to Chapter 16-SELECTING MODE

4.7.1 Angle Offset

This mode is useful when it is difficult to set up the prism directly, for example at the center of a tree. Place the prism at the same horizontal distance from the instrument as that of point A_0 to measure.
To measure the coordinates of the center position, operate the offset measurement after setting the instrument height/prism height.



When measuring coordinates of ground point A_1 :Set the instrument height / prism height.

When measuring coordinates of point A_0 : Set the instrument height only. (Set the prism height to 0).

When sighting to A0, you can select one of two ways. One is to fix vertical angle to the prism position even updown the telescope position, and the other is to gear vertical angle to the updown of telescope movement. In case following the vertical angle to the movement of telescope, SD and VD will be changed according to the movement of telescope.
To set this option, refer to Chapter -16 SELECTING MODE".

- Set the instrument height/prism height before proceeding to the offset measurement mode.
- When setting the coordinate value for the occupied station, refer to Section- 5.1 "Setting Coordinate Values of Occupied Point".

Operating procedure	Operation	Display
		HR: 120°30'40" HD: 123.456 m VD: 5.678 m MEAS MODE NP/P P1↓
① Press the [F4](P1↓) key from distance measuring mode to get the function on page 2.	[F4]	OFSET S.O S/A P2↓
② Press the [F1](OFSET) key.	[F1]	OFFSET 1/2 F1:ANG. OFFSET F2:DIST. OFFSET F3:PLANE OFFSET P↓
③ Press the [F1](ANG. OFFSET) key.	[F1]	OFFSET-MEASUREMENT HR: 120°30'40" HD: m MEAS --- NP/P ---

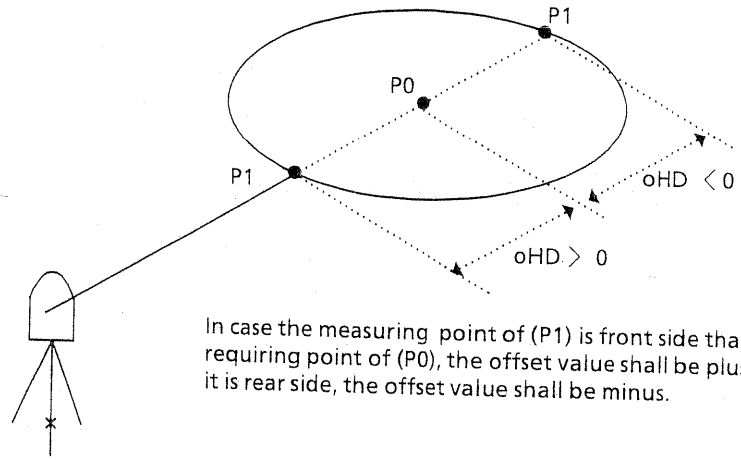
④ Collimate prism P, and press the [F1] (MEAS) key.	Collimate P [F1]	OFFSET-MEASUREMENT HR: 110°20'30" HD*[n] << m MEAS --- NP/P ---
The horizontal distance from the instrument to the prism will be measured.		OFFSET-MEASUREMENT HR: 110°20'30" HD: 56.789 m NEXT --- --- ---
⑤ Collimate point A_0.	Collimate A_0	OFFSET-MEASUREMENT HR: 150°30'50" HD: 56.789 m NEXT --- --- ---
⑥ Show the relative elevation of point A_0.	[◢]	OFFSET-MEASUREMENT HR: 110°20'30" VD: 34.567 m NEXT --- --- ---
⑦ Show the slope distance of point A_0.	[◢]	OFFSET-MEASUREMENT HR: 110°20'30" SD: 45.678 m NEXT --- --- ---
• Each time pressing the [◢] key, horizontal distance , relative elevation and slope distance are shown in sequence.		
⑧ Show N coordinate of point A_0 or A_1.	[⌞]	OFFSET-MEASUREMENT HR: 110°20'30" N : -12.345 m NEXT --- --- ---
• Each time pressing the [⌞] key, N,E and Z coordinate are shown in sequence.		

- To return to procedure④, press [F1](NEXT) key.
- To return to the previous mode, press [ESC] key.

4.7.2 Distance Offset Measurement

Measuring distance and coordinate of the center of a pond or a tree of which the radius is known.

Measuring the distance or coordinate till P0 point, input ◦HD value as an offset value and measure P1 point showing as following draw in distance offset measurement. The display shows distance or coordinate value until P0 point.



In case the measuring point of (P1) is front side than that of requiring point of (P0), the offset value shall be plus, and if it is rear side, the offset value shall be minus.

- When setting the coordinate value for the occupied station, refer to Section- 5.1 "Setting Coordinate Values of Occupied Point".

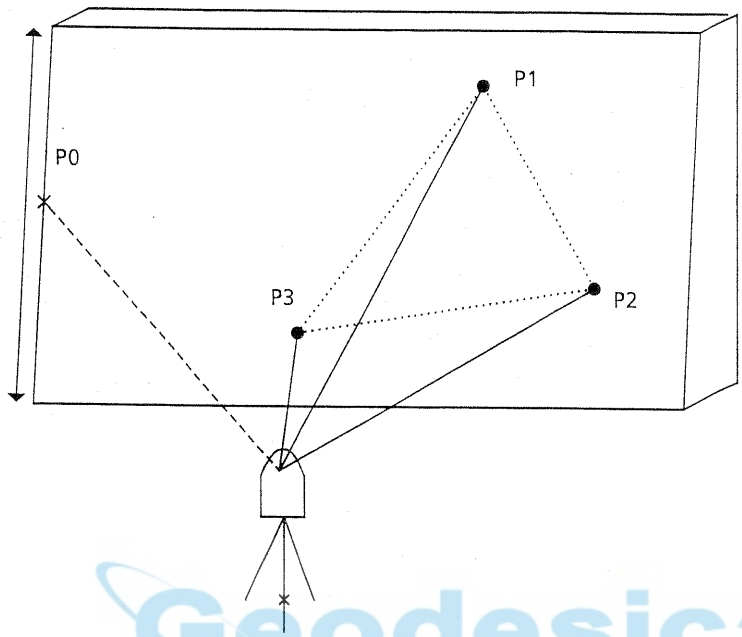
Operating procedure	Operation	Display
		HR: 120°30'40" HD: 123.456 m N VD: 5.678 m P MEAS MODE NP/P P1↓
① Press the [F4](P1↓) key from distance measuring mode to get the function on page 2.	[F4]	OFSET S.O S/A P2↓
② Press the [F1](OFSET) key.	[F1]	OFFSET 1/2 F1:ANG. OFFSET N F2:DIST. OFFSET P F3:PLANE OFFSET P↓
③ Press the [F2](DIST. OFFSET) key.	[F2]	DISTANCE OFFSET INPUT FORWARD HD N oHD: 0.000 m P INPUT --- --- ENTER
④ Press the [F1](INPUT) key and enter a offset value. Press the [F4](ENTER) key to set the value. ※1)	[F1] Offset Value [F4]	DISTANCE OFFSET HR: 80°30'40" N HD: m P MEAS --- NP/P ---

⑤ Collimate P1, then press the [F1](MEAS) key. N-times measuring will start. After measuring, the result added offset value will be shown. ※2)	Collimate [F1]	DISTANCE OFFSET HR: 80°30'40" N P HD*[n] << m >Measuring・・・ DISTANCE OFFSET HR: 80°30'40" N P HD: 10.000 m NEXT --- --- ---
⑥ Show the relative elevation of point A_0. ● Each time pressing the [⊿] key, horizontal distance , relative elevation and slope distance are shown in sequence. ● To show the N coordinate of point A_0, press the [∠] key. Each time pressing the [∠] key, N,E and Z coordinate are shown in sequence.	[⊿]	DISTANCE OFFSET HR: 80°30'40" N P VD: 10.000 m NEXT --- --- --- DISTANCE OFFSET HR: 80°30'40" N P SD: 14.142 m NEXT --- --- --- N: 12.345 m E: 23.456 m N P Z: 1.234 m NEXT --- --- ---
⑦ To return to the procedure ④, press the [F1] (NEXT) key. To escape the measuring, press the [ESC] key. The display returns to the previous mode.	[ESC]	

※1) The non-prism/prism mode switching should be done after the step 4.
※2) The displaying mode is the same as the previous mode .

4.7.3 Plane Offset Measurement

Measuring will be taken for the place where direct measuring can not be done, for example distance or coordinate measuring for a edge of a plane.
Three random points (P1, P2, P3) on a plane will be measured at first in the plane offset measurement to determine the measured plane. Collimate the measuring point (P0) then the instrument calculates and displays coordinate and distance value of cross point between collimation axis and of the plane.



- When setting the coordinate value for the occupied station, refer to Chapter 5.1 "Setting Coordinate Values of Occupied Point".

Example: Non-prism measuring

Operating procedure	Operation	Display
		HR: 120°30'40" HD: 123.456 m VD: 5.678 m MEAS MODE NP/P P1↓
① Press the [F4](P1↓) key from distance measuring mode to get the function on page 2.	[F4]	OFSET S.O S/A P2↓
② Press the [F1](OFSET) key.	[F1]	OFFSET 1/2 F1:ANG. OFFSET F2:DIST. OFFSET F3:PLANE OFFSET P↓
③ Press the [F3](PLANE OFFSET) key.	[F3]	PLANE N001# SD: m MEAS --- NP/P ---
④ Press the [F3](NP/P) key to change to the non-prism mode.	[F3]	PLANE N001# N P SD: m MEAS --- NP/P ---

⑤ Collimate P1 and press the [F1](MEAS) key. N-times measuring will start. After measuring, the display will show the second point measurement.	Collimate P1 [F1]	PLANE N001# N P SD*[n] << m >Measuring···
⑥ Measure the second and third points in the same way. ※1)	Collimate P2 [F1]	PLANE N002# N P SD: m MEAS --- NP/P ---
	Collimate P3 [F1]	PLANE N003# N P SD: m MEAS --- NP/P ---
The instrument calculates and displays coordinate and distance value of cross point between collimation axis and of the plane. ※2)		HR: 80°30'40" HD: 54.321 m N P VD: 10.000 m EXIT
⑦ Collimate the edge (P0) of the plane. The data will be shown.※3)	Collimate P0 [F1]	HR: 80°30'40" HD: 12.321 m N P VD: 11.234 m EXIT
⑧ To show the slope distance (SD), press the [◢] key, horizontal distance. ● To show the N coordinate of point A_0, press the [∠] key. Each time pressing the [∠] key, N,E and Z coordinate are shown in sequence.	[◢]	V : 90°10'20" HR: 120°30'40" N P SD: 1.789 m EXIT
⑨ To escape the measuring, press the [F1](EXIT) key. The display returns to the previous mode.	[F1]	

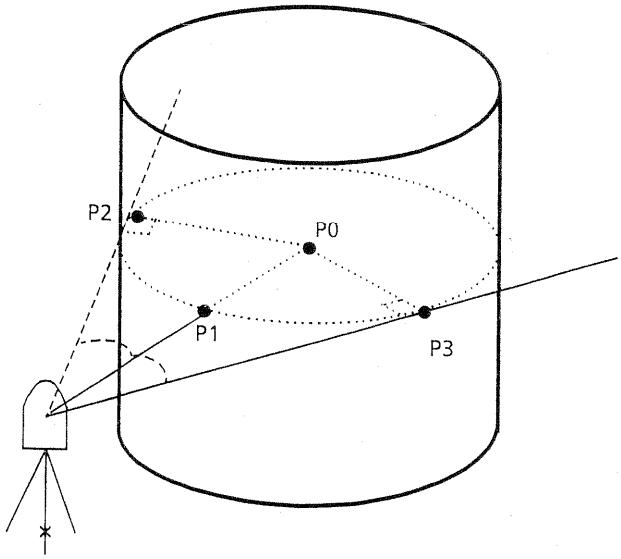
※1) In case the calculation of plane was not successful by the measured three points, error displays. Start measuring over again from the first point.

※2) Data display is the mode beforehand of offset measurement mode.

※3) Error will be displayed when collimated to the direction which does not cross with the determined plane.

4.7.4 COLUMN OFFSET

If it is possible to measure circumscription point (P1) of column directly, the distance to the center of the column (P0), coordinate and direction angle can be calculated by measured circumscription points (P2) and (P3).
The direction angle of the center of the column is 1/2 of total direction angle of circumscription points (P2) and (P3).



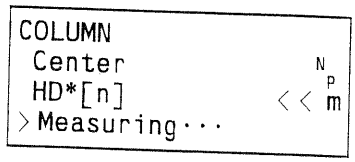
- When setting the coordinate value for the occupied station, refer to Chapter 5.1 "Setting Coordinate Values of Occupied Point".

Example: Non-prism measuring

Operating procedure	Operation	Display
		HR: 120°30'40" HD: 123.456 m VD: 5.678 m MEAS MODE NP/P P1↓
① Press the [F4](P1↓) key from distance measuring mode to get the function on page 2.	[F4]	OFSET S.O S/A P2↓
② Press the [F1](OFSET) key and press the [F4] (P1↓) key to get the soft key on page 2.	[F1] [F4]	OFFSET 1/2 OFFSET 1/2 F1:COLUMN OFFSET P↓
③ Press the [F1](COLUMN OFFSET) key.	[F1]	COLUMN OFFSET Center HD: m MEAS --- NP/P ---
④ Press the [F3](NP/P) key to change prism mode to the non-prism mode.	[F3]	COLUMN OFFSET Center N HD: m MEAS --- NP/P ---

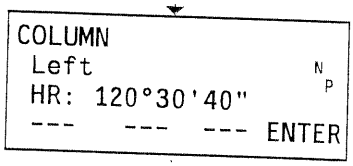
⑤ Collimate the center of the column (P1) and press the [F1](MEAS) key.
N-time measuring will start.
After the measurement, angle measuring display of the left side (P2) will be shown.

Collimate P1 [F1]



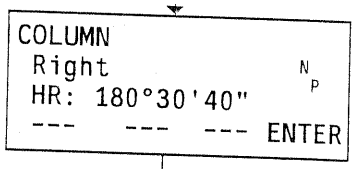
⑥ Collimate the left side of the column (P2) and press the [F4](ENTER) key.
After the measurement, angle measuring display of the right side (P3) will be shown.

Collimate P2 [F4]

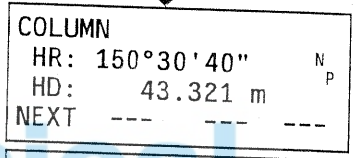


⑦ Collimate the right side of the column (P3) and press the [F4](ENTER) key.

Collimate P3 [F4]



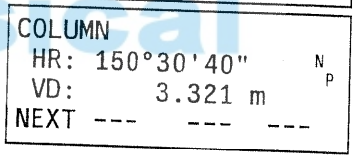
The distance between the instrument and center of the column (P0) will be calculated.



⑧ To show the relative elevation, press the [∠] key.

To show the coordinate value , press the [∠] key.

[∠]



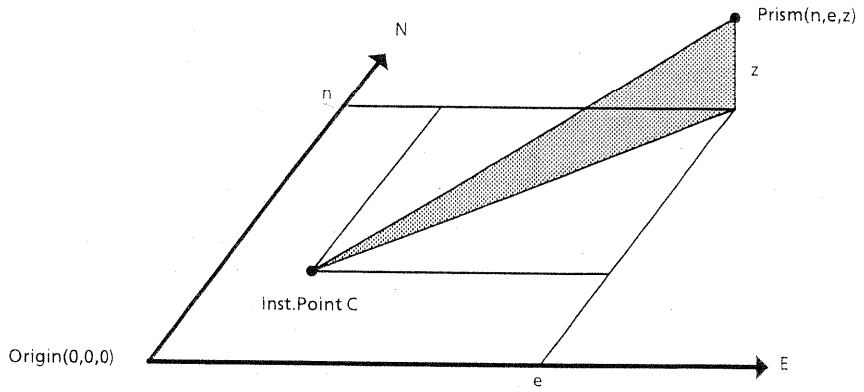
⑨ To escape the measuring, press the [ESC] key. The display returns to the previous mode.
To return to the procedure ④, press the [F1] (NEXT) key.

[ESC]

5 COORDINATE MEASUREMENT

5.1 Setting Coordinate Values of Occupied Point

Set the coordinates of the instrument (occupied point) according to coordinate origin, and the instrument automatically converts and displays the unknown point (prism point) coordinates following the origin.
It is possible to retain the coordinates of the occupied point after turning the power off. Refer to Chapter 16"SELECTING MODE"



Operating procedure	Operation	Display
		N: 123.456 m E: 34.567 m Z: 78.912 m MEAS MODE NP/P P1↓
① Press [F4](↓) key from the coordinate measurement mode to get the function on page 2.	[F4]	R.HT INSHT OCC P2↓
② Press [F3](OCC) key.	[F3]	N→ 0.000 m E: 0.000 m Z: 0.000 m INPUT --- --- ENTER
③ Enter N coordinate value.※1)	[F1] Enter data [F4]	1234 5678 90.- [ENT] N: -72.000 m E→ 0.000 m Z: 0.000 m INPUT --- --- ENTER
④ Enter E and Z coordinate values in the same manner. After entering the values, the display returns coordinate measuring display.		N: 51.456 m E: 34.567 m Z: 78.912 m MEAS MODE NP/P P1↓

※1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters".
- Input range −999999.9990 ≦N,E,Z≦ +9999999.9990m
  −999999.999 ≦N,E,Z≦ +9999999.999 ft.
  −999999.11.7 ≦N,E,Z≦ +9999999.11.7 ft.+inch

5.2 Setting Height of the Instrument

It is possible to retain the height of instrument after turning the power off. Refer to Chapter 16 "SELECTING MODE".

Operating procedure	Operation	Display
		N: 123.456 m E: 34.567 m Z: 78.912 m MEAS MODE NP/P P1↓
① Press [F4](↓) key from the coordinate measurement mode to get the function on page 2.	[F4]	R.HT INSHT OCC P2↓
② Press [F2](INSHT) key. The current value is displayed.	[F2]	INSTRUMENT HEIGHT INPUT INS.HT: 0.000 m INPUT --- --- ENTER
③ Enter the instrument height. ※1)	[F1] Enter Inst.HT [F4]	1234 5678 90.- [ENT]
		N: 123.456 m E: 34.567 m Z: 78.912 m MEAS MODE NP/P P1↓

※1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters".
- Input range −999.9999 ≦Instrument height ≦+999.9999 m
  −999.999 ≦Instrument height ≦+999.999 ft.
  −999.11.7 ≦Instrument height ≦+999.11.7 ft.+inch

5.3 Setting Height of Target (Prism Height)

This mode can be used to obtain Z coordinate values.
It is possible to retain the height of target after turning the power off. Refer to Chapter 16 "SELECTING MODE".

Operating procedure	Operation	Display
		N: 123.456 m E: 34.567 m Z: 78.912 m MEAS MODE NP/P P1↓
① Press [F4](↓) key from the coordinate measurement mode to get the function on page 2.	[F4]	R.HT INSHT OCC P2↓
② Press [F1](R.HT) key. The current value is displayed.	[F1]	REFLECTOR HEIGHT INPUT R.HT : 0.000 m INPUT --- --- ENTER
③ Enter the prism height. ※1)	[F1] Enter Prism HT [F4]	1234 5678 90.- [ENT]
		N: 123.456 m E: 34.567 m Z: 78.912 m MEAS MODE NP/P P1↓

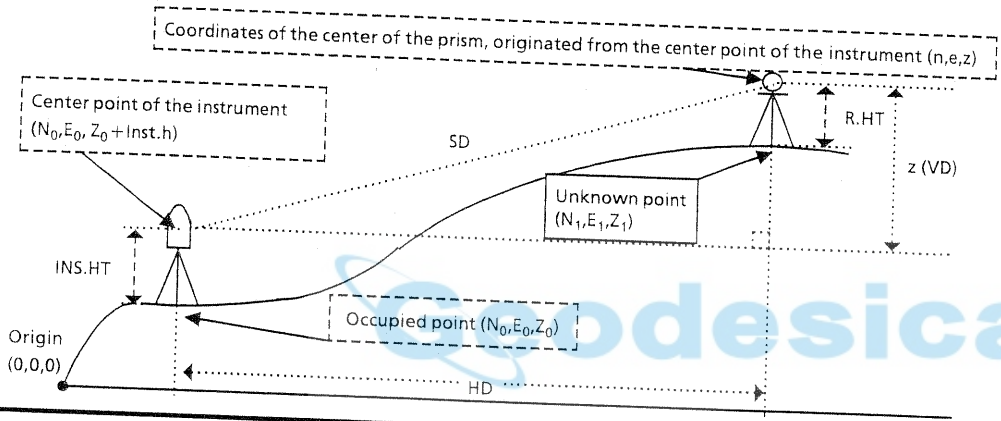
※1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters".
- Input range −999.9999 ≦Prism height ≦+999.9999 m
  −999.999 ≦Prism height ≦+999.999 ft.
  −999.11.7 ≦Prism height ≦+999.11.7 ft.+inch

5.4 Execution of Coordinate Measuring

Measure the coordinates by entering the instrument height and prism height, coordinates of unknown point will be measured directly.

- When setting coordinate values of occupied point, see Chapter 5.1"Setting Coordinates Values of Occupied Point"
- When setting the instrument height and prism height, Chapter 5.2 "Setting Height of the Instrument" and 5.3 "Setting Height of Target (Prism Height)".
- The coordinates of the unknown point are calculated as shown below and displayed:

  Coordinates of occupied point : (N_0,E_0,Z_0)
  Instrument height : INS.HT
  Prism height : R.HT
  Vertical distance(Relative elevation) : z (VD)
  Coordinates of the center of the prism,
  originated from the center point of the instrument : (n,e,z)
  Coordinates of unknown point : (N_1,E_1,Z_1)
  $N_1=N_0+n$
  $E_1=E_0+e$
  $Z_1=Z_0+INS.HT+z-R.HT$



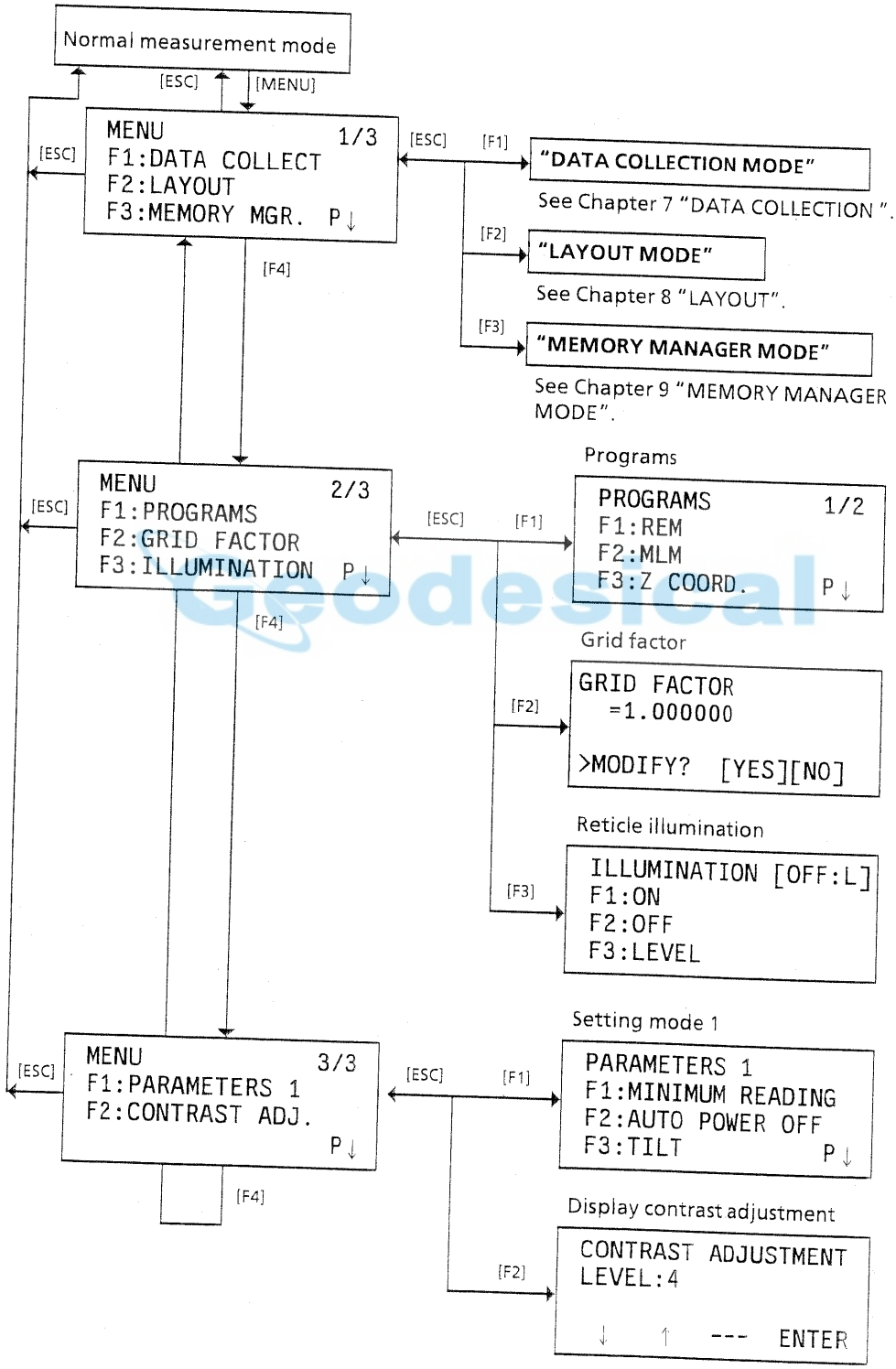
Operating procedure	Operation	Display
① Set the direction angle of known point. ※1)	Set direction angle	V : 90°10'20" HR: 120°30'40" OSET HOLD HSET P1↓
② Collimate target.	Collimate prism	
③ Press [∠] key. Measuring starts.	[∠]	N*[r] << m E: m Z: m MEAS MODE NP/P P1↓
The result will be shown.		N* 123.456 m E: 34.567 m Z: 78.912 m MEAS MODE NP/P P1↓

※1) Refer to Chapter 3.3 "Measuring from the Required Horizontal Angle".

- In case the coordinate of instrument point is not entered, (0,0,0) will be used as the default for the instrument point.
  The instrument height will be calculated as 0 when the instrument height is not entered.
- The prism height will be calculated as 0 when the prism height is not set.

6 SPECIAL MODE (Menu Mode)

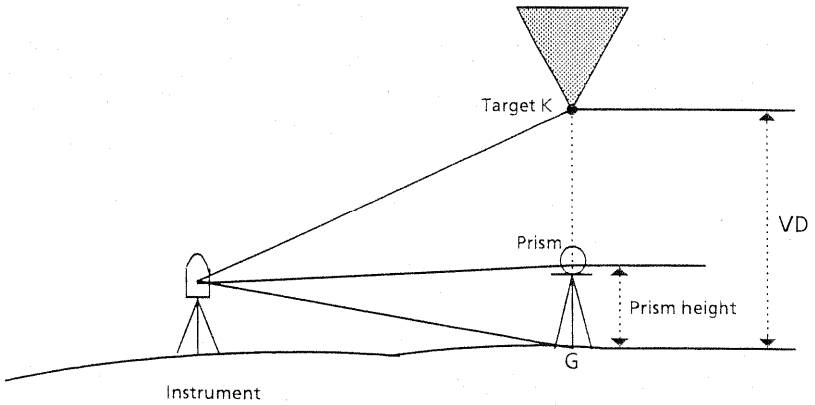
By pressing the [MENU] key, the instrument will be in MENU mode.
In this mode, special measuring , setting and adjustment are possible.



6.1 Application Measurement (PROGRAMS)

6.1.1 Remote Elevation measurement (REM)

To obtain elevation of the point at which setting the target prism is not possible, place the prism at any point on the vertical line from the target then carry out REM procedure as follows.



1) With prism height (h) input (Example :h = 1.5m)

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2.	[MENU] [F4]	MENU 2/3 F1:PROGRAMS F2:GRID FACTOR F3:ILLUMINATION P↓
② Press [F1] key.	[F1]	PROGRAMS 1/2 F1:REM F2:MLM F3:Z COORD. P↓
③ Press [F1](REM) key.	[F1]	REM F1:INPUT R.HT F2:NO R.HT
④ Press [F1] key.	[F1]	REM-1 <STEP-1> R.HT : 0.000 m INPUT --- --- ENTER
⑤ Enter prism height. ※1)	[F1] Enter R.HT [F4]	1234 5678 90.- [ENT] REM-1 <STEP-2> HD: m MEAS --- NP/P ---
⑥ Collimate prism.	Collimate P	
⑦ Press [F1](MEAS) key. Measuring starts.	[F1]	REM-1 <STEP-2> HD*[n] << m >Measuring···

Horizontal distance (HD) between the instrument and prism will be shown.		REM-1 <STEP-2> HD*[n] 123.456 m >Measuring···
The prism position will be decided. ※2)		REM-1 VD: 1.500 m --- R.HT HD ---
⑧ Collimate target K. Vertical distance (VD) will be shown. ※3)	Collimate K	REM-1 VD: 10.456 m --- R.HT HD ---

※1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters ".
※2) To return to procedure ⑤, press [F2](R.HT) key.
To return to procedure ⑥, press [F3](HD) key.
※3) To return to PROGRAMS Menu, press [ESC] key.

2) Without prism height input

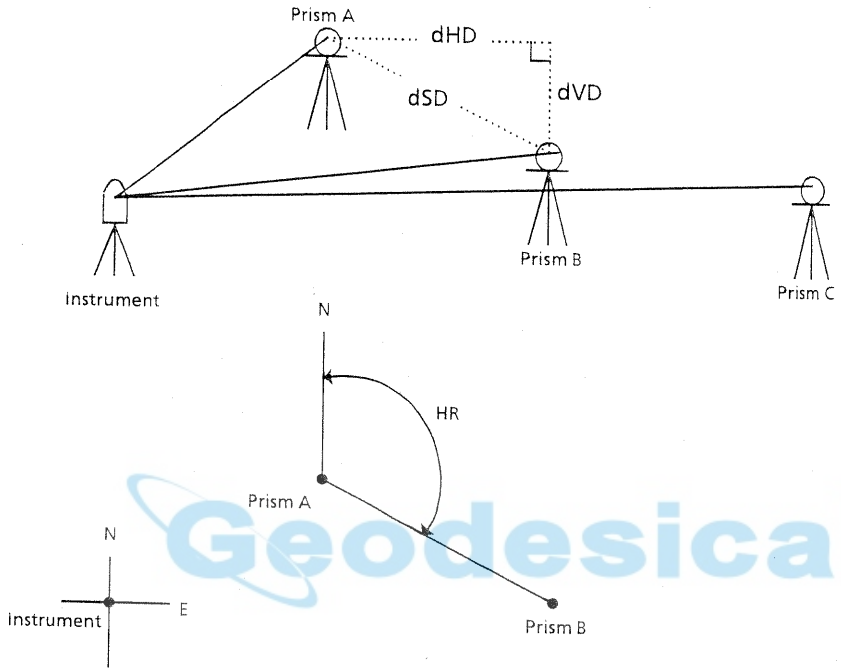
Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2.	[MENU] [F4]	MENU 2/3 F1:PROGRAMS F2:GRID FACTOR F3:ILLUMINATION P↓
② Press [F1] key.	[F1]	PROGRAMS 1/2 F1:REM F2:MLM F3:Z COORD. P↓
③ Press [F1][(REM) key.	[F1]	REM F1:INPUT R.HT F2:NO R.HT
④ Press [F2] key.	[F2]	REM-2 <STEP-1> HD: m MEAS --- NP/P ---
⑤ Collimate prism .	Collimate P	
⑥ Press [F1](MEAS) key. Measuring starts.	[F1]	REM-2 <STEP-1> HD*[n] << m >Measuring···

Horizontal distance (HD) between the instrument and prism will be shown.		REM-2 <STEP-1> HD*[n] 123.456 m >Measuring･･･
The prism position will be decided.		REM-2 <STEP-2> V : 60°45'50" --- --- --- SET
⑦ Collimate ground point G.	Collimate G	REM-2 <STEP-2> V : 123°45'50" --- --- --- SET
⑧ Press [F4](SET) key. The position of point G will be decided. ※1)	[F4]	REM-2 VD: 0.000 m --- V HD ---
⑨ Collimate target K. Vertical distance (VD) will be shown. ※2)	Collimate K	REM-2 VD: 10.456 m --- V HD ---

※1) To return to procedure ⑤, press [F3](HD) key.
To return to procedure ⑦, press [F2](V) key.
※2) To return to PROGRAMS Menu, press [ESC] key.

6.1.2 Missing Line Measurement (MLM)

Measurement for horizontal distance (dHD), slope distance (dSD), elevation (dVD) and horizontal bearing (HR) between two target prisms.
It is possible to enter the coordinate value directly or calculate from coordinate data file.
MLM mode has two modes.
1.MLM-1 (A-B, A-C) :Measurement is A-B, A-C, A-D,·····
2.MLM-2 (A-B, B-C) :Measurement is A-B, B-C, C-D,·····



- It is necessary to set the direction angle of the instrument.

[Example] MLM-1 (A-B, A-C)

- Procedure of MLM-2 (A-B, B-C) mode is completely same as MLM-1 mode.

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2.	[MENU] [F4]	MENU 2/3 F1:PROGRAMS F2:GRID FACTOR F3:ILLUMINATION P↓
② Press [F1] key.	[F1]	PROGRAMS 1/2 F1:REM F2:MLM F3:Z COORD. P↓
③ Press [F2](MLM) key.	[F2]	MLM F1:USE FILE F2:DON'T USE

④ Press [F1] or [F2] key to select using coordinate file.
[Example:F2 : DON'T USE]

[F2]

```
GRID FACTOR
 F1:USE G.F.
 F2:DON'T USE
```

⑤ Press [F1] or [F2] key to select using GRID FACTOR.
[Example:F2 : DON'T USE]

[F2]

```
MLM
 F1:MLM-1(A-B, A-C)
 F2:MLM-2(A-B, B-C)
```

⑥ Press [F1] key.

[F1]

```
 MLM-1(A-B, A-C)
 <STEP-1>
 HD:              m
MEAS  R.HT  NEZ  NP/P
```

⑦ Collimate prism A, and press [F1](MEAS) key.
Horizontal distance (HD) between the instrument and prism A will be shown.

Collimate A
[F1]

```
 MLM-1(A-B, A-C)
 <STEP-1>
 HD*[n]       << m
MEAS  R.HT  NEZ  NP/P
```

↓

```
 MLM-1(A-B, A-C)
 <STEP-1>
 HD*    123.456 m
MEAS  R.HT  NEZ  NP/P
```

```
 MLM-1(A-B, A-C)
 <STEP-2>
 HD:              m
MEAS  R.HT  NEZ  NP/P
```

⑧ Collimate prism B and press [F1](MEAS) key.
Horizontal distance (HD) between the instrument and prism B will be shown.

[F1]

```
 MLM-1(A-B, A-C)
 <STEP-2>
 HD*[n]       << m
MEAS  R.HT  NEZ  NP/P
```

↓

```
 MLM-1(A-B, A-C)
 <STEP-2>
 HD*    345.678 m
MEAS  R.HT  NEZ   SET
```

The horizontal distance (dHD) and relative elevation (dVD) between prism A and B.

↓

```
 MLM-1(A-B, A-C)
dHD :   123.456 m
dVD :    12.345 m
 ---   ---  HD  ---
```

⑨ To show slope distance (dSD) , press [◿] key.

[◿]

```
 MLM-1(A-B, A-C)
dSD :    234.567 m
 HR :   12°34'40"
 ---   ---  HD  ---
```

⑩ To measure the distance between points A and C, press [F3](HD). ※1)	[F3]	MLM-1(A-B, A-C) <STEP-2> HD: m MEAS R.HT NEZ NP/P
⑪ Collimate point C (Prism C) and press [F1](MEAS) key. Horizontal distance (HD) between the instrument and prism C will be shown. The horizontal distance (dHD) and relative elevation (dVD) between prism A and C.	Collimate prism C [F1]	MLM-1(A-B, A-C) dHD : 234.567 m dVD : 23.456 m --- --- HD ---
⑫ To measure the distance between points A and D, repeat procedure ⑩~⑪. ※1)		
※1) To return to previous mode, press [ESC] key.		

- **How to use coordinate data**

It is possible to input coordinate value directly or calculate from coordinate data file.

Operating procedure	Operation	Display
After procedure ⑥.		MLM-1(A-B, A-C) <STEP-1> HD: m MEAS R.HT NEZ NP/P
① Press [F3](NEZ) key. Direct key input display will be shown.	[F3]	N→ 0.000 m E: 0.000 m Z: 0.000 m INPUT --- PT# ENTER
② Press [F3](PT#) key to use coordinate data file. Point number input display will be shown. Pressing [F3](HD) key, the display will return to procedure ⑥. After selecting coordinate input mode by pressing [F3](NEZ or PT# or HD) key, press [F1](INPUT) key and enter the data.	[F3]	MLM-1(A-B,A-C) PT#:_____ INPUT LIST HD ENTER

6.1.3 Setting Z Coordinate of Occupied Point

Occupied point coordinate data and known point actual measuring data are utilized, z coordinate of occupied point is calculated and reset again.
Known point data and coordinate data can use the coordinate data file.

1) Setting occupied coordinate

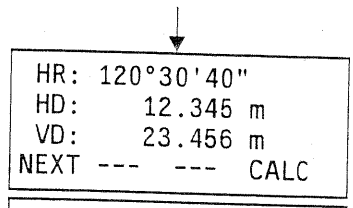
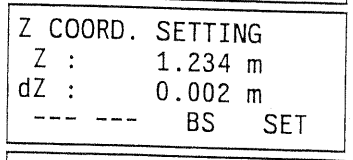
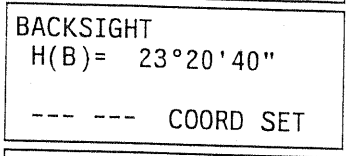
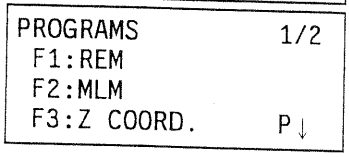
[Example setting] Using coordinate data file

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2.	[MENU] [F4]	MENU 2/3 F1:PROGRAMS F2:GRID FACTOR F3:ILLUMINATION P↓
② Press [F1] key.	[F1]	PROGRAMS 1/2 F1:REM F2:MLM F3:Z COORD. P↓
③ Press [F3](Z COORD.) key.	[F3]	Z COORD.SETTING F1:USE FILE F2:DON'T USE
④ Press [F1](USE FILE) key.	[F1]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
⑤ Press [F1](INPUT) key and enter the File Name.	[F1] Enter FN [F4]	Z COORD.SETTING F1:OCC.PT INPUT F2:REF.MEAS
⑥ Press [F1] key.	[F1]	OCC.PT PT#:_____ INPUT LIST NEZ ENTER
⑦ Press [F1](INPUT) key and enter the Point number.Instrument height setting display will be shown.	[F1] Enter PT# [F4]	INSTRUMENT HEIGHT INPUT INS.HT: 0.000 m INPUT --- --- ENTER
⑧ Press [F1](INPUT) key and enter the height. The display returns to Z coordinate menu.	[F1] Enter HT [F4]	Z COORD.SETTING F1:OCC.PT INPUT F2:REF.MEAS

2) Z Coordinate Calculation from Known Point Measuring Data

[Example setting] Using coordinate data file

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2.	[MENU] [F4]	MENU 2/3 F1:PROGRAMS F2:GRID FACTOR F3:ILLUMINATION P↓
② Press [F1] key.	[F1]	PROGRAMS 1/2 F1:REM F2:MLM F3:Z COORD. P↓
③ Press [F3](Z COORD.) key.	[F3]	Z COORD.SETTING F1:USE FILE F2:DON'T USE
④ Press [F1](USE FILE) key.	[F1]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
⑤ Press [F1](INPUT) key and enter the File Name.	[F1] Enter FN [F4]	Z COORD.SETTING F1:OCC.PT INPUT F2:REF.MEAS
⑥ Press [F2] key.	[F2]	NO01# PT#:_____ INPUT LIST NEZ ENTER
⑦ Press [F1](INPUT) key and enter the Point Number in coordinate data file.	[F1] Enter FN [F4]	REFLECTOR HEIGHT INPUT R.HT: 0.000 m INPUT --- --- ENTER
⑧ Press [F1](INPUT) key and enter the height.	[F1] Enter HT [F4]	REFLECTOR HEIGHT INPUT R.HT: 0.000 m >Sight? [YES][NO]
⑨ Collimate a prism on the point and press [F3](YES) key. Measuring starts. ※1)	Collimate [F3]	HR: 120°30'40" HD*[n] << m VD: m >Measuring···

		
⑩ Press [F4](CALC) key. ※2) Z : Z coordinate dZ : Standard deviation	[F4]	
⑪ Press [F3](BS) key. ※3) Horizontal angle to the last measured point will be shown.	[F3]	
⑫ Press [F4](SET) key. Z coordinate of the occupied point and horizontal angle will be set. The display returns to Programs 1/2 menu.	[F4]	

※1) Measurement is Fine N-times measurement mode.
※2) To measure other points, press [F1](NEXT) key.
※3) Pressing [F3] key, the display will be changed alternately.

6.1.4 Area Calculation

In this mode, there are two area calculation methods as follows.

1) Area Calculation from Coordinate data file
2) Area Calculation from Measured data

- It is impossible to calculate what a mix of coordinate file data and measured data.
- If the coordinate data file does not exist, the area calculation from measured data is done automatically.
- The numbers of points used to calculate are not limited.

1) Area Calculation from Coordinate Data File

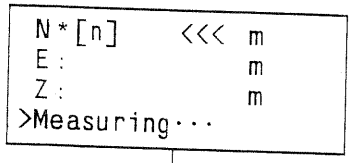
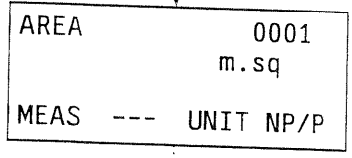
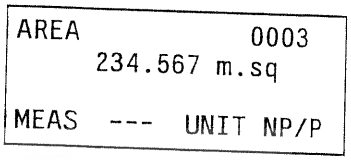
Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2/3.	[MENU] [F4]	MENU 2/3 F1:PROGRAMS F2:GRID FACTOR F3:ILLUMINATION P↓
② Press [F1] key.	[F1]	PROGRAMS 1/2 F1:REM F2:MLM F3:Z COORD. P↓
③ Press [F4](P↓) key to get the PROGRAMS menu on page 2/2.	[F4]	PROGRAMS 2/2 F1:AREA F2:POINT TO LINE P↓
④ Press [F1](AREA) key.	[F1]	AREA F1:FILE DATA F2:MEASUREMENT
⑤ Press [F1](FILE DATA) key.	[F1]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
⑥ Press [F1](INPUT) key and enter the File Name. Initial display will be shown.	[F1] Enter FN [F4]	AREA 0000 m.sq NEXT# :DATA-01 PT# LIST UNIT NEXT
⑦ Press [F4](NEXT) key. ※1),2) The top of the file data (DATA-01) will be set and the second point number will be shown.	[F4]	AREA 0001 m.sq NEXT# :DATA-02 PT# LIST UNIT NEXT
⑧ Repeat pressing [F4](NEXT) key to set required number of points.	[F4]	

When 3 or more points are set, the area surrounded by the points is calculated and the result will be shown.		AREA 0021 123.456 m.sq NEXT# :DATA-22 PT# LIST UNIT NEXT

※1) To set specify point, press [F1](PT#) key.
※2) To show the list of the coordinate data in the file, press [F2](LIST) key.

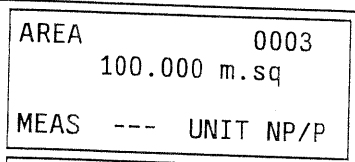
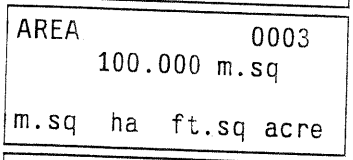
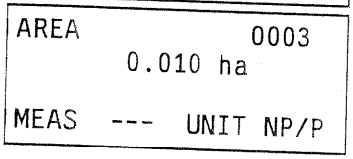
2) Area Calculation from Measured Data

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2/3.	[MENU] [F4]	MENU 2/3 F1:PROGRAMS F2:GRID FACTOR F3:ILLUMINATION P↓
② Press [F1] key.	[F1]	PROGRAMS 1/2 F1:REM F2:MLM F3:Z COORD. P↓
③ Press [F4](P↓) key to get the PROGRAMS menu on page 2/2.	[F4]	PROGRAMS 2/2 F1:AREA F2:POINT TO LINE P↓
④ Press [F1](AREA) key.	[F1]	AREA F1:FILE DATA F2:MEASUREMENT
⑤ Press [F2](MEASUREMENT) key.	[F2]	AREA F1:USE G.F. F2:DON'T USE
⑥ Press [F1] or [F2] key to select using GRID FACTOR. [Example:F2 : DON'T USE]	[F2]	AREA 0000 m.sq MEAS --- UNIT NP/P

⑦ Collimate a prism and press [F1](MEAS) key. Measuring starts. ※1)	Collimate P [F1]	
⑧ Collimate next point and press [F1] (MEAS) key. When 3 or more points are measured, the area surrounded by the points is calculated and the result will be shown.	Collimate [F1]	 
※1) Measurement is Fine N-times measurement mode.		

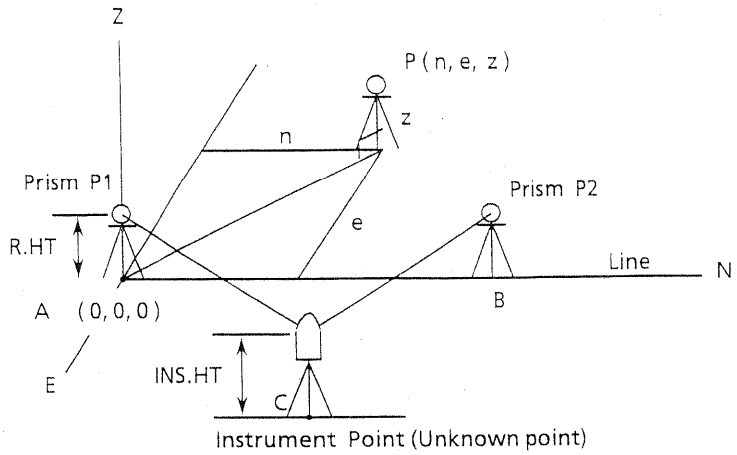
• To change the display unit

It is possible to change the displayed area unit .

Operating procedure	Operation	Display
① Press [F3](UNIT) key.	[F3]	 
② Select a unit by pressing [F1] to [F4] key. Example: [F2](ha) key.	[F2]	
• m.sq : square meter ha : hectare ft.sq : square feet acre : acre		

6.1.5 Point to Line Measurement

This mode is used to obtain the coordinate data with the origin point A(0,0,0) and the line AB as N axis.
Place the 2 prisms at the points A and B on the line, and place the instrument at unknown point C. After measuring the 2 prisms , the coordinate data and the direction angle of the instrument will be calculated and restored.



Instrument Point (Unknown point)

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2/3.	[MENU] [F4]	MENU 2/3 F1:PROGRAMS F2:GRID FACTOR F3:ILLUMINATION P↓
② Press [F1] key.	[F1]	PROGRAMS 1/2 F1:REM F2:MLM F3:Z COORD. P↓
③ Press [F4](P↓) key to get the PROGRAMS menu on page 2/2.	[F4]	PROGRAMS 2/2 F1:AREA F2:POINT TO LINE P↓
④ Press [F2] key.	[F2]	INSTRUMENT HEIGHT INPUT INS.HT: 0.000 m INPUT --- --- ENTER
⑤ Press [F1](INPUT) key and enter instrument height.	[F1] Enter HT [F4]	REFLECTOR HEIGHT INPUT R.HT: 0.000 m INPUT --- --- ENTER
⑥ Press [F1](INPUT) key and enter reflector A height.	[F1] Enter HT [F4]	POINT TO LINE MEAS.P1 HD: m MEAS --- NP/P ---

⑦ Collimate prism A (Origin) and press [F1](MEAS) key. Measuring starts. ※1) Input display of reflector B height will be shown.	Collimate [F1]	POINT TO LINE MEAS.P1 HD:[n] << m >Measuring･･･ ↓ REFLECTOR HEIGHT INPUT R.HT: 0.000 m INPUT --- --- ENTER
⑧ Press [F1](INPUT) key and enter reflector B height.	[F1] Enter HT [F4]	POINT TO LINE MEAS.P2 HD: m MEAS --- NP/P ---
⑨ Collimate prism B (End) and press [F1](MEAS) key. Measuring starts. ※1) The coordinate data and the direction angle of the instrument are calculated and restored. The result (The distance between A and B) will be displayed. dHD: Horizontal distance dVD:Vertical distance dSD:Slope distance ※2) ,3)	Collimate [F1]	POINT TO LINE MEAS.P2 HD:[n] << m >Measuring･･･ ↓ DIST. (P1-P2) 1/2 dHD: 10.000 m dVD: 0.000 m NEZ S.CO --- P↓
⑩ Press [F1](NEZ) key to measure other points.	[F4]	N: 0.000 m E: 0.000 m Z: 0.000 m MEAS R.HT NP/P ---
⑪ Collimate a prism and press [F1](MEAS) key. Coordinate measurement starts. ※4) The result will be shown. ※5)	Collimate [F1]	>Measuring･･･ ↓ N: 123.456 m E: 234.567 m Z: 1.234 m MEAS R.HT NP/P ---

※1) Measurement is Fine N-time measurement mode.
※2) To show dSD, press [F4](P↓) key.
※3) To show the new occupied data, press [F2](S.CO) key.
※4) Measurement is Fine Single measurement mode.
※5) To return to previous mode, press [ESC] key.

6.2 Setting the GRID FACTOR

GRID FACTOR can reset in this menu mode.
For more information, refer to Chapter 8.1.1"Setting the GRID FACTOR"

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2.	[MENU] [F4]	MENU 2/3 F1:PROGRAMS F2:GRID FACTOR F3:ILLUMINATION P↓
② Press [F2](GRID FACTOR) key.	[F2]	GRID FACTOR =0.998843 >MODIFY? [YES][NO]
③ Press [F3](YES) key.	[F3]	GRID FACTOR ELEV.→1000 m SCALE:0.999000 INPUT --- --- ENTER
④ Press [F1] (INPUT) key and enter Elevation. ※1) Press [F4](ENT) key.	[F1] Enter ELEV. [F4]	1234 5678 90.- [ENT]
⑤ Enter Scale Factor in the same way.	[F1] Enter Scale [F4]	GRID FACTOR ELEV.:2000 m SCALE→1.001000 INPUT --- --- ENTER
Grid Factor is displayed for 1 to 2 second and display returns to menu.		GRID FACTOR =1.000686

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".
- Input Range : Elevation : −9,999 to +9,999 meter (−32,805 to +3,2805 ft, ft+in)
  Scale Factor: 0.990000 to 1.010000

6.3 Setting Illumination of Display and Cross Hairs

Setting ON/OFF/LEVEL(High/Low) for illumination of display (LCD) and reticle.

- Setting LEVEL (High/Low) is only for reticle.

[Example setting] LEVEL:HIGH and turn on the illumination.

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2.	[MENU] [F4]	MENU 2/3 F1:PROGRAMS F2:GRID FACTOR F3:ILLUMINATION P↓
② Press [F3] key. The data previously set is shown.	[F3]	ILLUMINATION [OFF:L] F1:ON F2:OFF F3:LEVEL
③ Press [F3](LEVEL) key.	[F3]	ILLUMINATION [OFF:L] [LEVEL MODE] HIGH LOW --- ENTER
④ Press [F1](HIGH) key, and then press [F4](ENTER) key.	[F1] [F4]	ILLUMINATION [OFF:H] F1:ON F2:OFF F3:LEVEL
⑤ Press [F1](ON) key.	[F1]	ILLUMINATION [ON:H] F1:ON F2:OFF F3:LEVEL

- To return to previous mode, press [ESC] key.

6.4 Setting Mode 1

In this mode, the following settings are possible.
1. Setting Minimum Reading 2. Auto Power off 3. Vertical and Horizontal Angle Tilt Correction (Tilt ON/OFF). 4. Systematic Error of Instrument Correction
● This setting is memorized after power off.

6.4.1 Setting Minimum Reading

Select minimum display unit for angle measurement, coarse distance measurement mode.

Model	Angle Unit			Coarse mode Distance unit
	Degree	GON	MIL	
GPT-1003	5" / 1"	1mgon/0.2mgon	0.1mil/0.01mil	10mm(0.02ft) / 1mm(0.005ft)
GPT-1004	5" / 1"	1mgon/0.2mgon	0.1mil/0.01mil	10mm(0.02ft) /1mm(0.005ft)

Distance unit			
Meter		Feet	
Fine	Coarse	Fine	Coarse
1mm / 0.2mm	10mm / 1mm	0.005ft / 0.001ft	0.02ft / 0.005ft

To set display unit for fine distance measuring mode, refer to Chapter 16. "SELECTION MODE".
[Example GPT-1003] Minimum angle : 5", Coarse : 1mm

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key twice to get the menu on page 3.	[MENU] [F4] [F4]	MENU 3/3 F1:PARAMETERS 1 F2:CONTRAST ADJ. P↓
② Press [F1] key.	[F1]	PARAMETERS 1 1/2 F1:MINIMUM READING F2:AUTO POWER OFF F3:TILT P↓
③ Press [F1] key.	[F1]	MINIMUM READING F1:ANGLE F2:COARSE
④ Press [F1] key.	[F1]	MINIMUM ANGLE [F1: 1"] F2: 5" ENTER

⑤ Press [F2](5") key and press [F4](ENTER) key.	[F2] [F4]	MINIMUM READING F1:ANGLE F2:COARSE
⑥ Press [F2] key.	[F2]	COARSE READING F1: 1mm [F2:10mm] ENTER
⑦ Press [F1] key and press [F4](ENTER) key.	[F1] [F4]	MINIMUM READING F1:ANGLE F2:COARSE

- To return to previous mode, press [ESC] key.

6.4.2 Auto Power Off

If no key operation is given or no process of measurement is performed for more than 30 minutes (No change exceeding 30" has occurred during horizontal angle or vertical angle measurement.), the power turns off automatically. If the instrument is set at distance measurement mode (No change in distance exceeding 10cm has occurred during distance measurement), the mode changes to angle measurement automatically in case that the instrument does not operate for approximately 10 minutes, and the power turns off after 20 minutes .

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key twice to get the menu on page 3.	[MENU] [F4] [F4]	MENU 3/3 F1:PARAMETERS 1 F2:CONTRAST ADJ. P↓
② Press [F1] key.	[F1]	PARAMETERS 1 1/2 F1:MINIMUM READING F2:AUTO POWER OFF F3:TILT P↓
③ Press [F2] key. The data previously set is shown.	[F2]	AUTO POWER OFF [OFF] F1:ON F2:OFF ENTER
④ Press [F1](ON) key or [F2](OFF) key, and press [F4](ENTER) key.	[F1] or [F2] [F4]	

6.4.3 Vertical and Horizontal Angle Tilt correction (Tilt ON/OFF)

In case the instrument is used in an unstable situation, constant indexing of vertical and horizontal angle may be impossible. In this case, the function of tilt correction can be stopped by selecting TILT OFF. It has been set to X,Y (V/H) TILT ON at the factory.

- This setting is memorized after powering off.

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key twice to get the menu on page 3.	[MENU] [F4] [F4]	MENU 3/3 F1:PARAMETERS 1 F2:CONTRAST ADJ. P↓
② Press [F1] key.	[F1]	PARAMETERS 1 1/2 F1:MINIMUM READING F2:AUTO POWER OFF F3:TILT P↓
③ Press [F3] key. The data previously set is shown. If already ON, the display shows tilt correction value.	[F3]	TILT SENSOR:[XY-ON] X: 0°02'10" Y: 0°03'00" X-ON XY-ON OFF ENTER
④ Press [F1](X-ON) key or [F2](XY-ON) or [F3](OFF) key, and press [F4](ENTER) key.	[F1]~[F3] [F4]	

6.4.4 Systematic Error of Instrument Correction (Only for GTS-1003)

Setting ON/OFF for error correction of collimation and horizontal axis for angle measurement.

Note: Perform this item after complete Chapter 17.5. For more information, refer to Chapter 17.5.

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key twice to get the menu on page 3.	[MENU] [F4] [F4]	MENU 3/3 F1:PARAMETERS 1 F2:CONTRAST ADJ. P↓
② Press [F1] key.	[F1]	PARAMETERS 1 1/2 F1:MINIMUM READING F2:AUTO POWER OFF F3:TILT P↓
③ Press [F4] key.	[F4]	PARAMETERS 1 2/2 F1:ERROR CORRECTION P↓
④ Press [F1] key. The data previously set is shown.	[F1]	ERROR CORR. [OFF] F1:ON F2:OFF ENTER
⑤ Press [F1](ON) key or [F2](OFF) key, and press [F4](ENTER) key.	[F1] or [F2] [F4]	

6.5 Setting Contrast of Display

Setting level for contrast of display (LCD)

Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P ↓) key twice to get the menu on page 3.	[MENU] [F4] [F4]	MENU 3/3 F1:PARAMETERS 1 F2:CONTRAST ADJ. P ↓
③ Press [F2] key.	[F2]	CONTRAST ADJUSTMENT LEVEL: 4 ↓ ↑ --- ENTER
④ Press [F1](↓) key or [F2](↑) key, and press [F4](ENTER) key.	[F1]or [F2] [F4]	

7 DATA COLLECTION

The GPT-1000 is able to store the measured data in the internal memory.
The internal memory is shared by the measured data files and the coordinate data files.
Maximum 30 files can be generated.

- **Measured data**
  The collected data is memorized in a file.
- **The number of measurement points**
  (In case not using the internal memory in layout mode)

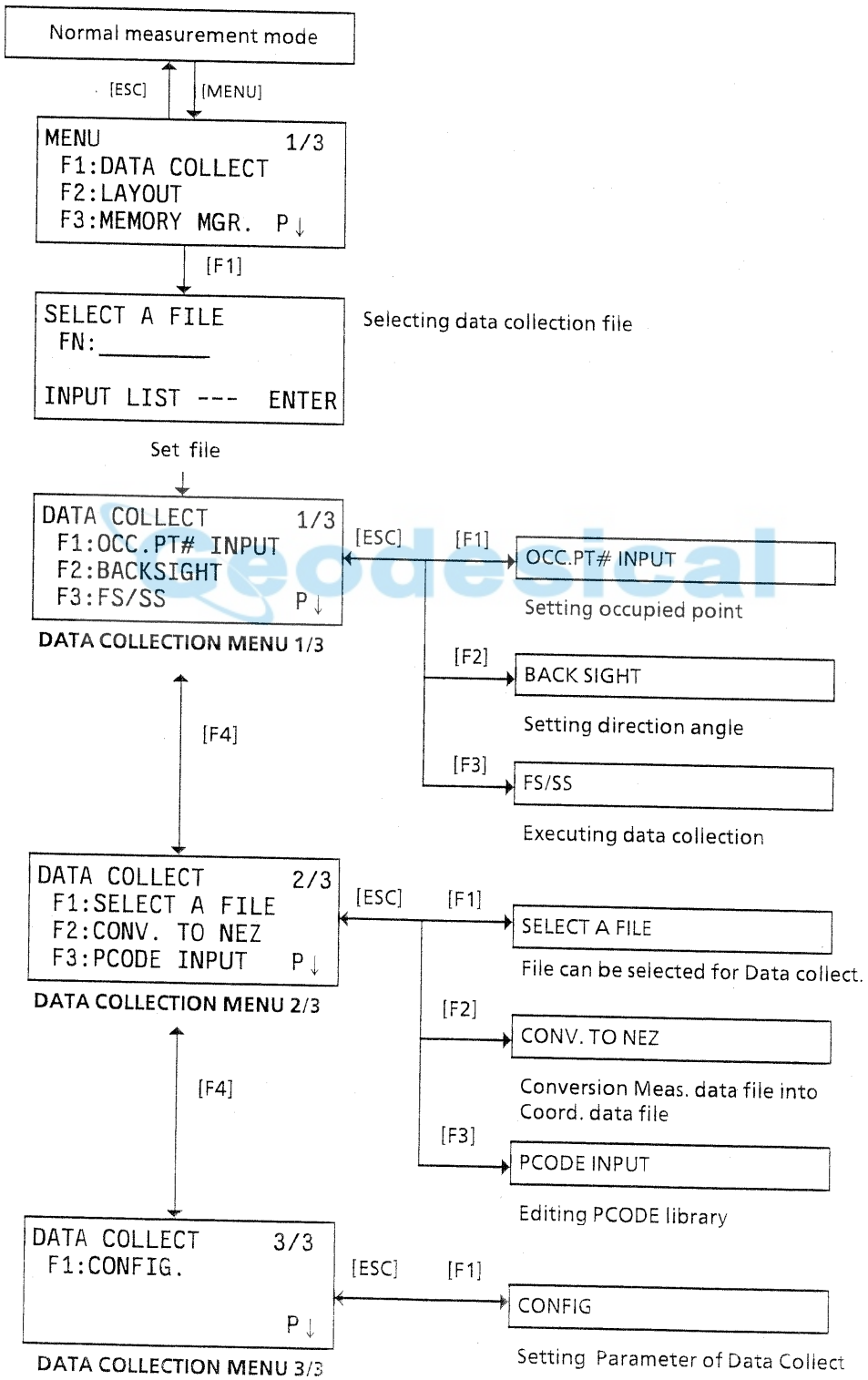
  MAX. 3,000 points

  Because the internal memory covers both data collection mode, and layout mode, the number of measurement points will be decreased when the layout mode is used.
  For the internal memory, refer to chapter 9" MEMORY MANAGER MODE".

1) **When turning off the power, ensure that you are in the main menu screen or main angle measurement mode.**
   This ensures completion of the memory access process and avoids possible damage to the stored data.
2) It is recommended for safety to charge the battery (BT-32Q) beforehand and prepare fully charged spare batteries.

● Data collect menu operation

By pressing the [MENU] key, the instrument will be in MENU 1/3 mode.
Press the [F1](DATA COLLECT) key, the menu of data collect 1/3 will be shown.



7.1 Preparation

7.1.1 Selecting a File for Data Collection

A file used by data collection mode must be selected at first.
Select a file before beginning data collection mode because selection screen of a file is displayed. And a selection from data collection menu is possible in the mode.

Operating procedure	Operation	Display
		MENU 1/3 F1:DATA COLLECT F2:LAYOUT F3:MEMORY MGR. P↓
① Press [F1](DATA COLLECT) key from menu 1/3.	[F1]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
② Press [F2](LIST) key to display the list of file. ※1)	[F2]	AMIDATA /M0123 →*HILDATA /M0345 TOPDATA /M0789 --- SRCH --- ENTER
③ Scroll file list by pressing [▲] or [▼] key and select a file to use. ※2),3)	[▲] or [▼]	TOPDATA /M0789 → RAPDATA /M0564 SATDATA /M0456 --- SRCH --- ENTER
④ Press [F4](ENTER) key. The file will be set and data collect 1/3 menu will be shown.	[F4]	DATA COLLECT 1/3 F1:OCC.PT# INPUT F2:BACKSIGHT F3:FS/SS P↓

※1) If you want to make a new file or input file name directly, press [F1](INPUT) key and enter a file name.
※2) When a file has been selected already, '*' mark is indicated on left of current file name.
※3) Data in a file shown with arrow can be searched by pressing [F2](SRCH) key.

- It is possible to select a file from DATA COLLECT 2/3 menu in the same way.

DATA COLLECT 2/3
F1:SELECT A FILE
F2:CONV. TO NEZ
F3:PCODE INPUT P↓

7.1.2 Selecting a Coordinate File for Data Collection

When coordinate data in a coordinate data file are used for occupied point or backsight point, select a coordinate file from the data collect menu 2/3 beforehand.

Operating procedure	Operation	Display
		DATA COLLECT 2/3 F1:SELECT A FILE F2:CONV. TO NEZ F3:PCODE INPUT P↓
① Press [F1](SELECT A FILE) key from DATA COLLECT menu 2/3.	[F1]	SELECT A FILE F1:MEAS.DATA F2:COORD.DATA
② Press [F2](COORD.DATA) key.	[F2]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
③ Select a coordinate file in the same manner as Chapter 7.1.1"Selecting a File for Data Collection".		

7.1.3 Occupied Point and Backsight Point

The occupied point and direction angle in the data collect mode are linked with the occupied point and direction angle in normal coordinate measurement.
It is possible to set or change the occupied point and direction angle from the data collect mode.

Occupied point can be set by two setting methods as follow.

1) Setting from the coordinate data stored in the internal memory.
2) Direct key input.

The following three setting methods for backsight point can be selected.

1) Setting from the coordinate data stored in the internal memory.
2) Direct key input of coordinate data.
3) Direct key input of setting angle.

Note: See 9.4"Coordinate data direct key input" and 9.7.2"Loading data" for how to store coordinate in the internal memory.

- Example for setting the occupied point:
  In case of setting occupied point from the coordinate data stored in the internal memory.

Operating procedure	Operation	Display
① Press [F1](OCC.PT# INPUT) key from the data collect menu 1/3. The previous data is shown.	[F1]	PT# →PT-01 ID : INS.HT: 0.000 m INPUT SRCH REC OCNEZ
② Press [F4] (OCNEZ) key.	[F4]	OCC.PT PT#:PT-01 INPUT LIST NEZ ENTER

③ Press [F1](INPUT) key.	[F1]	OCC.PT PT#=PT-01 1234 5678 90.- [ENT]
④ Enter PT#, press [F4](ENT) key. ※1)	Enter PT# [F4]	PT# →PT-11 ID : INS.HT: 0.000 m INPUT SRCH REC OCNEZ
⑤ Enter ID, INS.HT in the same way. ※2),3)	Enter ID, INS.HT	PT# :PT-11 ID : INS.HT→ 1.335 m INPUT SRCH REC OCNEZ
⑥ Press [F3](REC) key.	[F3]	> REC ? [YES][NO]
⑦ Press [F3](YES) key. The display returns to the data collect menu 1/3.	[F3]	DATA COLLECT 1/3 F1:OCC.PT# INPUT F2:BACKSIGHT F3:FS/SS P↓

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

※2) ID can be input by inputting a register number linked with PCODE Library.
To show the list of PCODE library, press the [F2](SRCH) key.

※3) Press [F3](REC) key when you do not input the INS.HT.

- The data recorded in data collect is PT#, ID and INS.HT.
- If point is not found in internal memory "PT# DOES NOT EXIST" is displayed.

- Example for setting the direction angle:

  The following is to memorize the data of the backsight after setting the backsight point from point number.

Operating procedure	Operation	Display
① Press [F2](BACKSIGHT) key from the data collect menu 1/3. The previous data is shown.	[F2]	BS# → PCODE : R.HT : 0.000 m INPUT SRCH MEAS BS
② Press [F4] (BS) key. ※1)	[F4]	BACKSIGHT PT#: INPUT LIST NE/AZ ENT
③ Press [F1](INPUT) key.	[F1]	BACKSIGHT PT#= 1234 5678 90.- [ENT]
④ Enter PT#, press [F4](ENT) key. ※2) Enter PCODE,R.HT in the same way. ※3),4)	Enter PT# [F4]	BS# →PT-22 PCODE : R.HT : 0.000 m INPUT SRCH MEAS BS
⑤ Press [F3](MEAS) key.	[F3]	BS# →PT-22 PCODE : R.HT : 0.000 m *VH SD NEZ P1↓
⑥ Collimate back sight point. Select one of the measuring mode and press the soft key. EXAMPLE : [F2](Slope Distance) key. Measuring starts. Horizontal circle is set to calculated direction angle. Measuring result is memorized and the display returns to the data collect menu 1/3.	Collimate [F2]	V : 90°00'00" HR: 0°00'00" SD*[n] <<< m > Measuring... ↓ DATA COLLECT 1/3 F1:OCC.PT# INPUT F2:BACKSIGHT F3:FS/SS P↓

※1) Pressing each time [F3] key, the input method changes as Coordinate value, Angle, Coordinate point name alternatively.
※2) Refer to Chapter 2.5"How to enter alphanumeric characters.
※3) PCODE can be input by inputting a register number linked with PCODE Library.
To show the list of PCODE library, press the [F2](SRCH) key.
※4) Data collect sequence set to [EDIT→MEAS]. Refer to Chapter 7.7 "Setting parameter of data collect".

- If point is not found in internal memory " PT# DOES NOT EXIST"is displayed.

7.2 Operational Procedure of "DATA COLLECT"

Operating procedure	Operation	Display
		DATA COLLECT 1/3 F1:OCC.PT# INPUT F2:BACKSIGHT F3:FS/SS P↓
① Press [F3](FS/SS) key from the data collect menu 1/3. The previous data is shown.	[F3]	PT# → PCODE : R.HT : 0.000 m INPUT SRCH MEAS ALL
② Press [F1](INPUT) key, and enter PT#. ※1) Press [F4]key.	[F1] Enter PT# [F4]	PT# =PT-01 PCODE : R.HT : 0.000 m 1234 5678 90.- [ENT]
		PT# :PT-01 PCODE → R.HT : 0.000 m INPUT SRCH MEAS ALL
③ Enter PCODE, R.HT in the same way. ※2),3)	Enter PCODE [F4] R.HT [F4]	PT# →PT-01 PCODE :TOPCON R.HT : 1.200 m INPUT SRCH MEAS ALL
④ Press [F3](MEAS) key.	[F3]	VH *SD NEZ P1↓
⑤ Collimate the target point.	Collimate	
⑥ Press one of [F1] to [F3] key. ※4) Example: [F2](SD) key. Measuring starts.	[F2]	V : 90°10'20" HR: 120°30'40" SD*[n] < m > Measuring... < complete >
The measuring data is memorized and the display changes to the next point. ※5) PT# is automatically incremented.		PT# →PT-02 PCODE : R.HT : 1.200 m INPUT SRCH MEAS ALL
⑦ Enter the next point data and collimate the next point.	Collimate	
⑧ Press [F4](ALL) key. Measuring starts in the same measuring mode of the previous point. Data is recorded.	[F4]	V : 98°10'20" HR: 123°30'40" SD*[n] < m > Measuring... < complete >

Continue the measuring in the same way. To finish the mode , press [ESC] key.		PT# →PT-03 PCODE : R.HT : 1.200 m INPUT SRCH MEAS ALL

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".
※2) PCODE can be input by inputting a register number linked with PCODE Library.
To show the list of PCODE library, press the [F2](SRCH) key.
※3) Data collect sequence set to [EDIT→MEAS]. Refer to Chapter 7.7 "Setting Parameter of Data Collect [CONFIG]".
※4) The mark "*" indicates the previous measuring mode.
※5) You can confirm the measured data as follows. Refer to Chapter 7.7 " Setting Parameter of Data Collect [CONFIG]".

```
V :  90°10'20"
HR: 120°30'40"
SD:    98.765 m
> OK ?    [YES][NO]
```

- **Searching the recorded data**
  While executing the DATA COLLECT mode, you can search the recorded data.

Operating procedure	Operation	Display
		PT# →PT-02 PCODE : R.HT : 1.200 m INPUT SRCH MEAS ALL
① While executing the DATA COLLECT mode, press [F2](SRCH) key. ※1) The using file name will appear on the top of the right side of the display.	[F2]	SEARCH [TOPCON] F1:FIRST DATA F2:LAST DATA F3:PT# DATA
② Select one of 3 search methods by pressing one of [F1] to [F3] key. ※2)	[F1] ~[F3]	

※1) It is possible to see the PCODE list when the arrow is located beside PCODE or ID.
※2) The operation is same as the "SEARCH" in the MEMORY MANAGER mode.
For more information, refer to Chapter 9.2 "Searching Data".

- **Entering PCODE/ID using PCODE Library**

  While executing the DATA COLLECT mode, you can enter PCODE/ID from PCODE Library.

Operating procedure	Operation	Display
		PT# :PT-02 PCODE → R.HT : 1.200 m INPUT SRCH MEAS ALL
① Move the arrow to the PCODE or ID in the DATA COLLECT mode, press [F1](INPUT) key.	[F1]	PT# :PT-02 PCODE =32 R.HT : 1.200 m 1234 5678 90.- [ENT]
② Enter a register number linked with PCODE library and press [F4](ENT) key. (Example) Register number , 32 = TOPCON	Enter No. [F4]	PT# :PT-02 PCODE :TOPCON R.HT → 1.200 m INPUT SRCH MEAS ALL

- **Entering PCODE/ID from the list of PCODE**

  You can also enter PCODE/ID from the list of PCODE.

Operating procedure	Operation	Display
		PT# :PT-02 PCODE → R.HT : 1.200 m INPUT SRCH MEAS ALL
① Move the arrow to the PCODE or ID in the DATA COLLECT mode, press [F2](SRCH) key.	[F2]	→ 001:PCODE01 002:PCODE02 EDIT --- CLR ENTER
② By pressing the following keys, the register number will increase or decrease. [▲] or [▼] : Increasing or Decreasing one by one [►] or [◄] : By ten Increasing or Decreasing. ※1)	[▲],[▼], [►],[◄]	031:PCODE31 → 032:TOPCON 033:HILTOP EDIT --- CLR ENTER
③ Press [F4](ENTER) key.	[F4]	PT# :PT-02 PCODE :TOPCON R.HT → 1.200 m INPUT SRCH MEAS ALL

※1) To edit the PCODE library, press the [F1](EDIT) key.
To delete the PCODE registered with shown an arrow, press the [F3](CLR) key.
PCODE can be edited in DATA COLLECT menu 2/3 or MEMORY MANAGER menu 2/3.

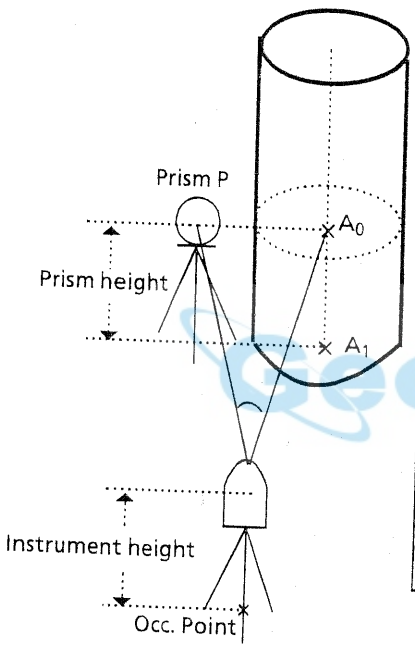
7.3 Data Collect · Offset Measurement mode

This mode is useful when it is difficult to set up the prism directly, for example at the center of a tree. Data Collect · Offset Measurement has four measuring methods.

- Angle offset measurement
- Distance offset measurement
- Plane offset measurement
- Column offset measurement

7.3.1 Angle Offset Measurement

Place the prism at the same horizontal distance from the instrument as that of point A_0 to measure.



When measuring coordinates of ground point A_1 :Set the instrument height / prism height.

When measuring coordinates of point A_0 : Set the instrument height only. (Set the prism height to 0).

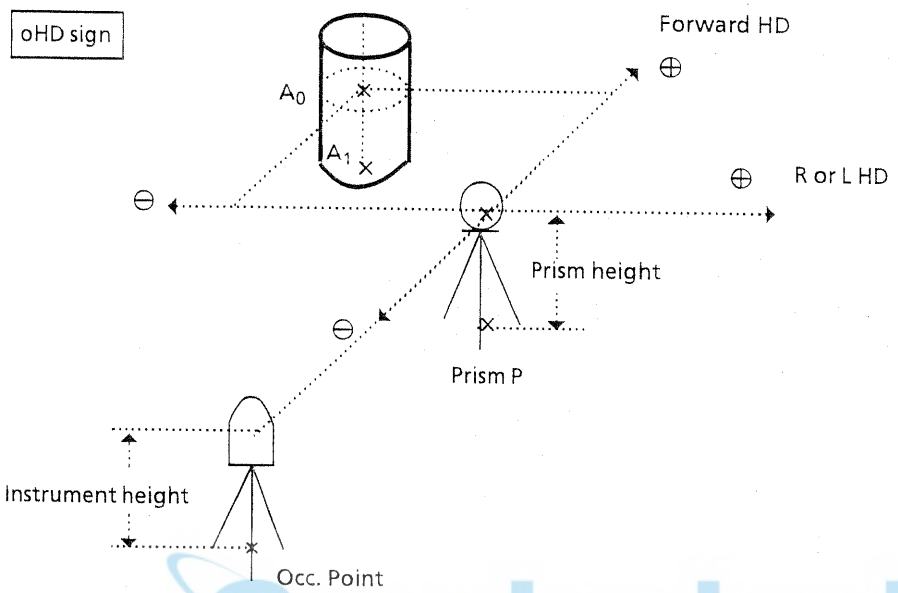
When sighting to A0, you can select one of two ways. One is to fix vertical angle to the prism position even updown the telescope position, and the other is to gear vertical angle to the updown of telescope movement. In case following the vertical angle to the movement of telescope, SD and VD will be changed according to the movement of telescope.
To set this option, refer to Chapter -16 "SELECTING MODE".

Operating procedure	Operation	Display
① Press [F3](MEAS) key and press the [F4](P1↓) key to get the next softkey page.	[F3] [F4]	PT# →PT-11 PCODE :TOPCON R.HT : 1.200 m INPUT SRCH MEAS ALL VH *SD NEZ P1↓ OFSET --- NP/P P2↓
② Press [F1](OFSET) key.	[F1]	OFFSET-MEASUREMENT1/2 F1:ANG. OFFSET F2:DIST. OFFSET F3:PLANE OFFSET P↓
③ Press [F1] key.	[F1]	OFFSET-MEASUREMENT HR: 120°30'40" SD: m MEAS --- NP/P ---
④ Collimate the prism.	Collimate P	

⑤ Press [F1](MEAS) key. Continuous measuring starts.	[F1]	OFFSET-MEASUREMENT HR: 120°30'40" SD*[n] < m >measuring・・・ ↓ OFFSET-MEASUREMENT HR: 120°30'40" SD* 12.345 m >OK? [YES][NO]
⑥ Collimate point A_0 using the horizontal motion clamp and horizontal tangent screw.	Collimate A_0	OFFSET-MEASUREMENT HR: 125°40'50" SD: 12.345 m >OK? [YES][NO]
⑦ Show the horizontal distance of point A_0.	[◢]	OFFSET-MEASUREMENT HR: 120°30'40" HD: 6.543 m >OK? [YES][NO]
⑧ Show the relative elevation of point A_0. • Each time pressing [◢] key, horizontal distance , relative elevation and slope distance are shown in sequence.	[◢]	OFFSET-MEASUREMENT HR: 120°30'40" VD: 34.567 m >OK? [YES][NO]
⑨ Show N coordinate of point A_0 or A_1. • Each time pressing [∟] key, N,E and Z coordinate are shown in sequence.	[∟]	OFFSET-MEASUREMENT HR: 120°30'40" N : -12.345 m >OK? [YES][NO]
⑩ Press [F3](YES) key. The data is recorded and the next measuring point is displayed.	[F3]	PT# →PT-12 PCODE : R.HT : 1.200 m INPUT SRCH MEAS ALL

7.3.2 Distance Offset Measurement

The measurement of a place apart from a prism is possible by inputting offset horizontal distance of front and back / right and left.



When measuring coordinates of ground point A_1 : Set the instrument height / prism height.

When measuring coordinates of point A_0 : Set the instrument height only. (Set the prism height to 0).

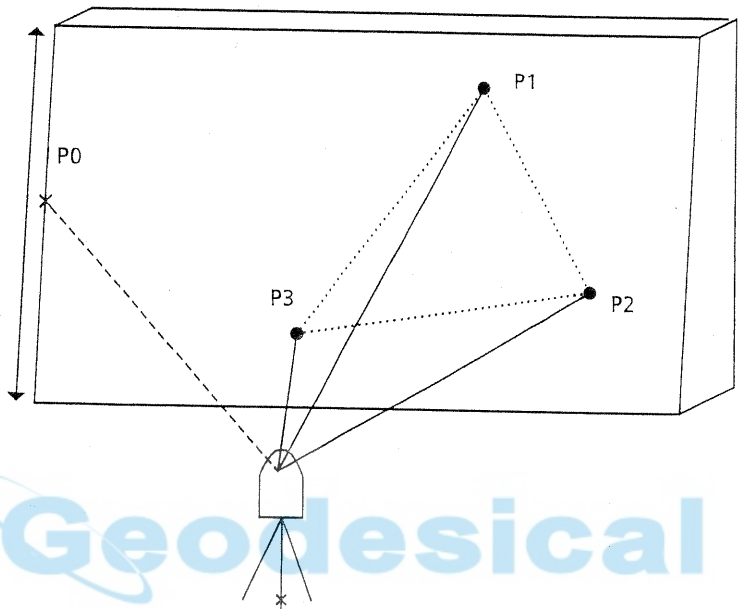
Operating procedure	Operation	Display
		PT# →PT-11 PCODE :TOPCON R.HT : 1.200 m INPUT SRCH MEAS ALL
① Press [F3](MEAS) key and press the [F4](P1↓) key to get the next softkey page.	[F3] [F4]	VH *SD NEZ P1↓ OFSET --- NP/P P2↓
② Press [F1](OFSET) key.	[F1]	OFFSET-MEASUREMENT1/2 F1:ANG. OFFSET F2:DIST. OFFSET F3:PLANE OFFSET P↓
③ Press [F2] key.	[F2]	DISTANCE OFFSET INPUT RorL HD oHD: m INPUT --- SKP ENTER
④ Press [F1](INPUT) key and enter Right and Left direction offset value.※1)	[F1] Enter HD [F4]	DISTANCE OFFSET INPUT FORWARD HD oHD: m INPUT --- SKP ENTER

④ Press [F1](INPUT) key and enter Forward direction offset value. ※1)	[F1] Enter HD [F4]	PT# →PT-11 PCODE :TOPCON R.HT : 1.200 m --- *SD NEZ NP/P
⑤ Collimate the prism.	Collimate P	
⑥ Press [F2] or [F3] key. Example:[F3](NEZ) key Measuring starts.	[F3]	N*[n] <<< m E : m Z : m >Measuring···
		>Calculating···
The data is recorded and the next measuring point is displayed.		PT# →PT-12 PCODE : R.HT : 1.200 m INPUT SRCH MEAS ALL

※1) To skip entering, press [F3](SKP) key.

7.3.3 Plane Offset Measurement

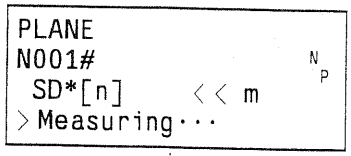
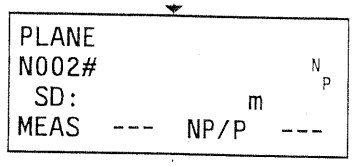
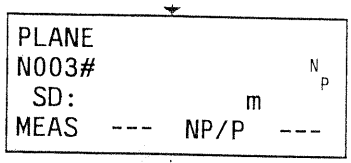
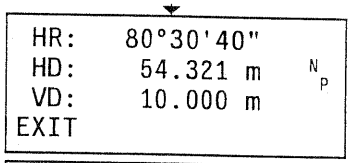
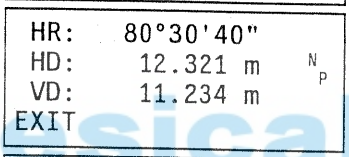
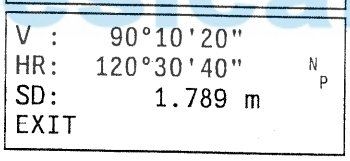
Measuring will be taken for the place where direct measuring can not be done, for example distance or coordinate measuring for a edge of a plane.
Three random points (P1, P2, P3) on a plane will be measured at first in the plane offset measurement to determine the measured plane. Collimate the measuring point (P0) then the instrument calculates and displays coordinate and distance value of cross point between collimation axis and of the plane.



- When setting the coordinate value for the occupied station, refer to Chapter 5.1 "Setting Coordinate Values of Occupied Point".

Example: Non-prism measuring

Operating procedure	Operation	Display
① Press [F3](MEAS) key and press the [F4](P1↓) key to get the next softkey page.	[F3] [F4]	PT# →PT-11 PCODE :TOPCON R.HT : 1.200 m INPUT SRCH MEAS ALL VH *SD NEZ P1↓ OFSET --- NP/P P2↓
② Press the [F1](OFSET) key.	[F1]	OFFSET 1/2 F1:ANG. OFFSET F2:DIST. OFFSET F3:PLANE OFFSET P↓
③ Press the [F3](PLANE OFFSET) key.	[F3]	PLANE N001# SD: m MEAS --- NP/P ---
④ Press the [F3](NP/P) key to change to the non-prism mode.	[F3]	PLANE N001# NP SD: m MEAS --- NP/P ---

⑤ Collimate P1 and press the [F1](MEAS) key. N-times measuring will start. After measuring, the display will show the second point measurement.	Collimate P1 [F1]	
⑥ Measure the second and third points in the same way. ※1)	Collimate P2 [F1]	
	Collimate P3 [F1]	
The instrument calculates and displays coordinate and distance value of cross point between collimation axis and of the plane. ※2)		
⑦ Collimate the edge (P0) of the plane. The data will be shown.※3)	Collimate P0 [F1]	
⑧ To show the slope distance (SD), press the [◿] key, horizontal distance. • To show the N coordinate of point A_0, press the [◺] key. Each time pressing the [◺] key, N,E and Z coordinate are shown in sequence.	[◿]	
⑨ To escape the measuring, press the [F1](EXIT) key. The display returns to the previous mode.	[F1]	

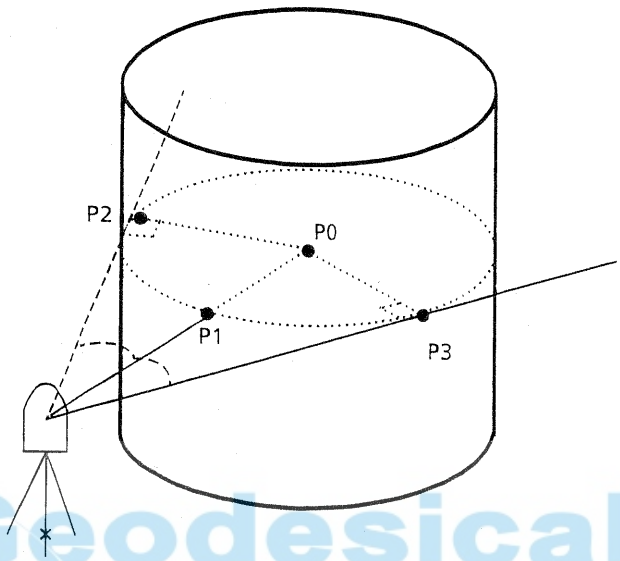
※1) In case the calculation of plane was not successful by the measured three points, error displays. Start measuring over again from the first point.

※2) Data display is the mode beforehand of offset measurement mode.

※3) Error will be displayed when collimated to the direction which does not cross with the determined plane.

7.3.4 Column Offset Measurement

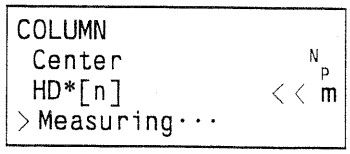
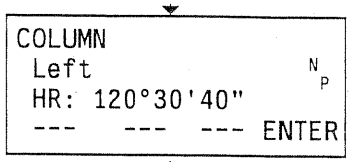
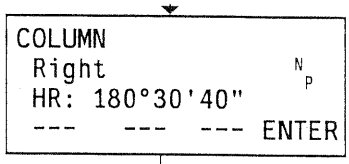
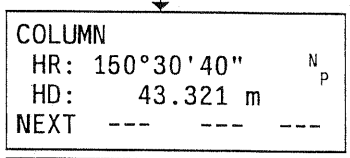
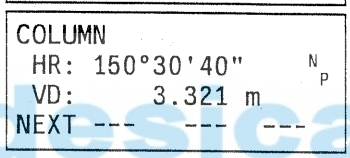
If it is possible to measure circumscription point (P1) of column directly, the distance to the center of the column (P0), coordinate and direction angle can be calculated by measured circumscription points (P2) and (P3).
The direction angle of the center of the column is 1/2 of total direction angle of circumscription points (P2) and (P3).



- When setting the coordinate value for the occupied station, refer to Chapter 5.1 "Setting Coordinate Values of Occupied Point".

Example: Non-prism measuring

Operating procedure	Operation	Display
		PT# →PT-11 PCODE :TOPCON R.HT : 1.200 m INPUT SRCH MEAS ALL VH *SD NEZ P1↓ OFSET --- NP/P P2↓
① Press [F3](MEAS) key and press the [F4](P1↓) key to get the next softkey page.	[F3] [F4]	
② Press the [F1](OFSET) key and press the [F4] (P1↓) key to get the soft key on page 2.	[F1] [F4]	OFFSET 1/2 OFFSET 2/2 F1:COLUMN OFFSET P↓
③ Press the [F1](COLUMN OFFSET) key.	[F1]	COLUMN OFFSET Center HD: m MEAS --- NP/P ---
④ Press the [F3](NP/P) key to change prism mode to the non-prism mode.	[F3]	COLUMN OFFSET Center N HD: m P MEAS --- NP/P ---

⑤ Collimate the center of the column (P1) and press the [F1](MEAS) key. N-time measuring will start. After the measurement, angle measuring display of the left side (P2) will be shown.	Collimate P1 [F1]	
⑥ Collimate the left side of the column (P2) and press the [F4](ENTER) key. After the measurement, angle measuring display of the right side (P3) will be shown.	Collimate P2 [F4]	
⑦ Collimate the right side of the column (P3) and press the [F4](ENTER) key.	Collimate P3 [F4]	
The distance between the instrument and center of the column (P0) will be calculated.		
⑧ To show the relative elevation, press the [◿] key. To show the coordinate value , press the [⌞] key.	[◿]	
⑨ To escape the measuring, press the [ESC] key. The display returns to the previous mode. To return to the procedure ④, press the [F1] (NEXT) key.	[ESC]	

7.4 Conversion Meas. Data File into Coord. Data File [CONV. TO NEZ]

An existing measured data file in internal memory can be converted into Coordinate data file.

Operating procedure	Operation	Display
		DATA COLLECT 2/3 F1:SELECT A FILE F2:CONV. TO NEZ F3:PCODE INPUT P↓
① Press [F2] (CONV. TO NEZ) key from the data collect menu 2/3.	[F2]	MEAS. FILE NAME FN: INPUT LIST --- ENTER
② Press [F2](LIST) key to display the list of file. ※1)	[F2]	AMIDATA /M0123 →*HILDATA /M0345 TOPDATA /M0789 --- SRCH --- ENTER
③ Scroll file list by pressing [▲] or [▼] key and select data file to convert. ※2),3)	[▲] or [▼]	TOPDATA /M0789 → RAPDATA /M0564 SATDATA /M0456 --- SRCH --- ENTER
④ Press [F4] (ENTER) key.	[F4]	COORD. FILE NAME FN: INPUT --- --- ENTER
⑤ Press [F1](INPUT) key and enter Coordinate File Name. Press [F4](ENT) key. The display returns to the menu 2/3.	[F1] Enter FN [F4]	

※1) If you want to input file name directly, press [F1](INPUT) key and enter a file name.
※2) When a file has been selected already, '*' mark is indicated on left of current file name.
※3) Data in a file shown with arrow can be searched by pressing [F2](SRCH) key.

7.5 NEZ Auto Calculation

As measured data is collected, coordinates are calculated and stored for traverse or topo collection. Automatic making out function of coordinate data sets up in CONFIG of data collect. Refer to Chapter 7.7"Setting Parameter of Data Collect [CONFIG.]".
As a default, coordinate data calculated will be saved in a file of the same name as the measurement data file.
When the coordinate data file of the same name as the measurement data file does not exist, it will be generated automatically.
It is possible to change a file for saving coordinate data in the DATA COLLECT Menu 2/3 (F1:SELECT A FILE).
To calculate a coordinate data, it is necessary to add a point name in Data Collect execution.
When a coordinate data of the same point number exist already, it can be replaced with the new data by confirming display.

7.6 Editing PCODE Library [PCODE INPUT]

PCODE data can be entered into PCODE Library in this mode.
A PCODE is linked with a number of 1 to 50.
PCODE can be also edited in MEMORY MANAGER menu 2/3 in the same way.

Operating procedure	Operation	Display
		DATA COLLECT 2/3 F1:SELECT A FILE F2:CONV. TO NEZ F3:PCODE INPUT P↓
① Press [F3](PCODE INPUT) key from Data Collect menu menu 2/3.	[F3]	→001:TOPCON 002:TOKYO EDIT --- CLR ---
② By pressing the following keys, the list will increase or decrease. [▲] or [▼] : Increasing or Decreasing one by one [▶] or [◀] : By ten Increasing or Decreasing.	[▲],[▼], [▶],[◀]	011:URAH →012:AMIDAT 013:HILLTO EDIT --- CLR ---
③ Press [F1](EDIT) key.	[F1]	011:URAH →012=AMIDAT 013:HILLTO 1234 5678 90.- [ENT]
④ Enter PCODE and press [F4](ENT) key. ※1)	Enter PCODE [F4]	011:URAH →012=AMISUN 013:HILLTO EDIT --- CLR ---

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

7.7 Setting Parameter of Data Collect [CONFIG.]

In this mode, the following settings of data collect mode are possible.

- **Setting Items**

Menu	Selecting Items	Contents
F1:DIST MODE	FINE / CRS(1) / CRS(10)	Select Fine /Coarse(1) /Coarse(10) mode in distance measurement mode. The unit to be displayed is as follows. Fine mode: 1mm (0.2mm) Coarse (1) mode: 1mm Coarse (10) mode: 10mm
F2:HD/SD	HD/SD	Select the distance measurement mode Horizontal Distance or Slope distance.
F3:MEAS. SEQ.	N-TIMES / SINGLE / REPEAT	Select to set measurement mode for distance measurement.
F1:DATA CONFIRM	YES/NO	It is possible to confirm the result of measuring data before the data is recorded.
F2:COLLECT SEQ.	[EDIT→MEAS] / [MEAS→EDIT]	Select the procedure of data collection. [EDIT→MEAS]:Measurement is carried out after entering other data. [MEAS→EDIT]:Measurement is carried out before entering other data.
F3:NEZ AUTO.CALC.	ON/OFF	It is possible to calculate coordinate value of data collected and store it into coordinate data file in every data collection.

- **How to Set Items**

Example Setting: DATA CONFIRM : YES

Operating procedure	Operation	Display
		DATA COLLECT 3/3 F1:CONFIG. P↓
① Press [F1] (CONFIG.) key from the data collect menu 3/3. The CONFIG menu 1/2 is shown.	[F1]	CONFIG. 1/2 F1:DIST MODE F2:HD/SD F3:MEAS. SEQ. P↓
② Press [F4] (P↓) key to display the CONFIG menu 2/2.	[F4]	CONFIG. 2/2 F1:DATA CONFIRM F2:COLLECT SEQ. F3:NEZ AUTO CALC.P↓
③ Press [F1] (DATA CONFIRM) key. [ ] indicates the current setting.	[F1]	DATA CONFIRM F1:YES [F2:NO] ENTER
④ Press [F1] (YES) key.	[F1]	DATA CONFIRM [F1:YES] F2:NO ENTER
⑤ Press [F4] (ENTER) key.	[F4]	

8 LAYOUT

LAYOUT mode has two functions which are setting of layout points and setting new points using coordinate data in the internal memory.
Also, if the coordinate data is not stored in the internal memory, this can be input from key board.
The coordinate data is loaded from PC to the internal memory via RS-232C.

- The coordinate data
  The coordinate data is memorized in a file.

For the internal memory, refer to chapter 9 "MEMORY MANAGER MODE".

The GPT-1000 is able to store the coordinate data in the internal memory.
The internal memory is shared by the measured data and the coordinate data for layout.
Maximum 30 files can be generated.

- **The number of coordinate data**
  (In case not using the internal memory in the data collect mode)

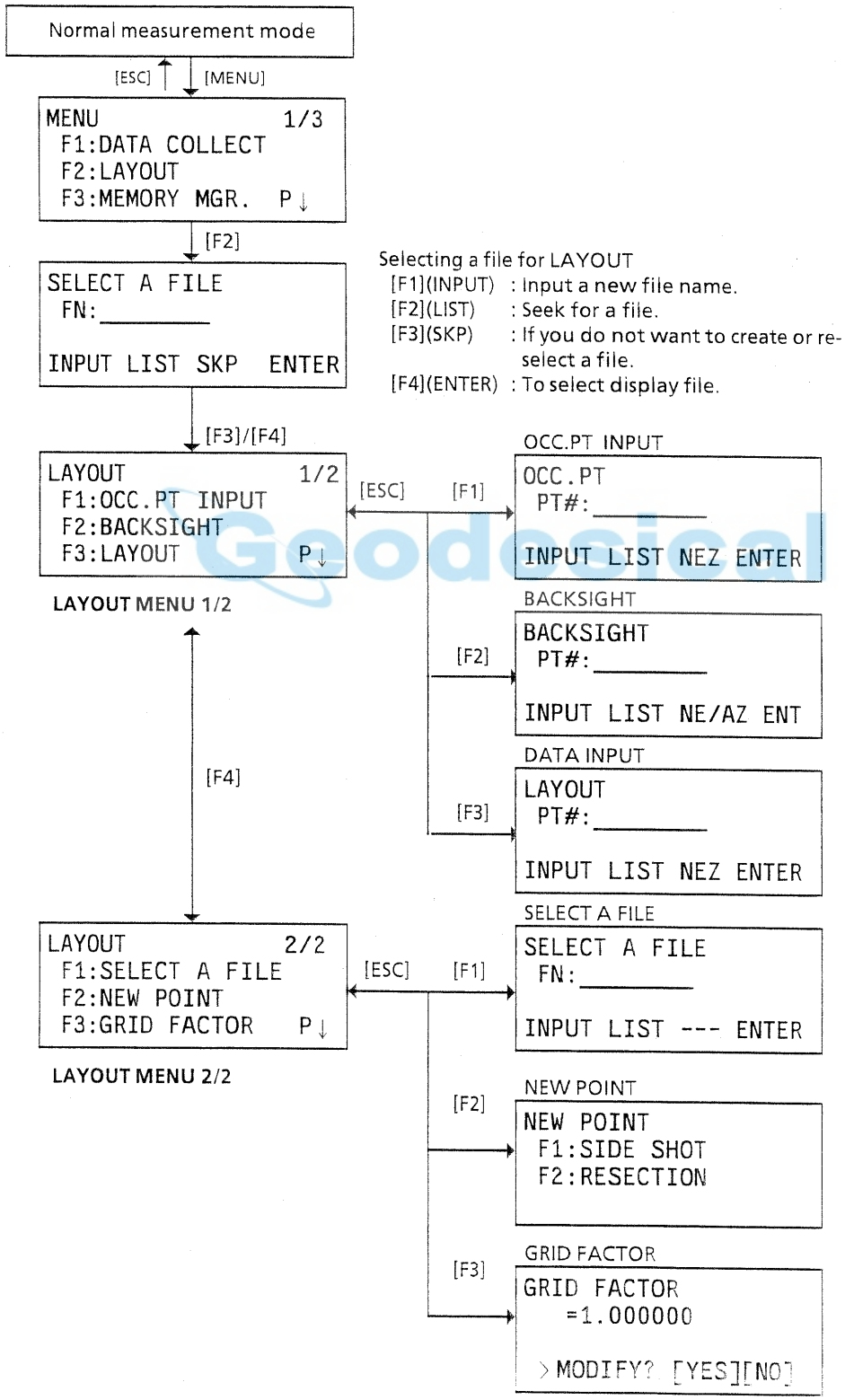
  MAX. 5,000 points

  Because the internal memory covers both data collection mode, and layout mode, the number of coordinate data will be decreased when the data collection mode is used.

1) **When turning off the power, ensure that you are in the main menu screen or main angle measurement mode.**
   This ensures completion of the memory access process and avoids possible damage to the stored data.
2) It is recommended for safety to charge the battery (BT-32Q) beforehand and prepare fully charged spare batteries.
3) When recording new point data, remember to consider the amount of internal memory available.

• Layout menu operation

By pressing the [MENU] key, the instrument will be in MENU 1/3 mode.
Press the [F2](LAYOUT) key, the menu of layout 1/2 will be shown.



8.1 Preparation

8.1.1 Setting the GRID FACTOR

- **Calculation Formula**

1) Elevation Factor

$$Elevation\ Factor = \frac{R}{R + ELEV.}$$

R : The average radius of the earth
$ELEV.$: The elevation above mean sea level

2) Scale Factor

Scale Factor : *Scale Factor at the surveying station*

3) Grid Factor

$Grid\ Factor = Elevation\ Factor \times Scale\ Factor$

Distance Calculation

1) Grid Distance

$$HDg = HD \times Grid\ Factor$$

HDg : Grid distance
HD : Ground distance

2) Ground Distance

$$HD = \frac{HDg}{Grid\ Factor}$$

- **How to Set Grid Factor**

Operating procedure	Operation	Display
		LAYOUT 2/2 F1:SELECT A FILE F2:NEW POINT F3:GRID FACTOR P↓
① Press [F3](GRID FACTOR) key from the Layout menu 2/2.	[F3]	GRID FACTOR =0.998843 >MODIFY? [YES][NO]
② Press [F3](YES) key.	[F3]	GRID FACTOR ELEV.→1000 m SCALE:0.999000 INPUT --- --- ENTER
③ Press [F1] (INPUT) key and enter Elevation. ※1) Press [F4](ENT) key.	[F1] Enter ELEV. [F4]	1234 5678 90.- [ENT]
④ Enter Scale Factor in the same way.	[F1] Enter Scale [F4]	GRID FACTOR ELEV.:2000 m SCALE→1.001000 INPUT --- --- ENTER
Grid Factor is displayed for 1 to 2 second and display returns to Layout menu 2/2.		GRID FACTOR =1.000686

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

- Input Range : Elevation : −9,999 to +9,999 meter (−32,805 to +3,2805 ft, ft+in)
  Scale Factor: 0.990000 to 1.010000

8.1.2 Selecting Coordinate Data File

You can execute a Layout from selected coordinate data file, also you can record New point measured data into the selected coordinate data file.

- The only coordinate data file existing can be selected and you can not make a new file in this mode. For more information about File, refer to Chapter 9 "MEMORY MANAGER MODE".
- When LAYOUT MODE is begun, a file can be selected in the same way.

Operating procedure	Operation	Display
		LAYOUT 2/2 F1:SELECT A FILE F2:NEW POINT F3:GRID FACTOR P↓
① Press [F1](SELECT A FILE) key from the Layout menu 2/2.	[F1]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
② Press [F2](LIST) key to display the list of coordinate data file. ※1)	[F2]	COORDDATA /C0123 →*TOKBDATA /C0345 TOPCDATA /C0789 --- SRCH --- ENTER
③ Scroll file list by pressing [▲] or [▼] key and select a file to use. ※2),3)	[F1]	*TOKBDATA /C0345 → TOPCDATA /C0789 SATIDATA /C0456 --- SRCH --- ENTER
④ Press [F4](ENTER) key. The file will be set .	[F4]	LAYOUT 2/2 F1:SELECT A FILE F2:NEW POINT F3:GRID FACTOR P↓

※1) If you want to input file name directly, press [F1](INPUT) key and enter a file name.
※2) When a file has been selected already, '*' mark is indicated on left of current file name. For the file discrimination mark (*,@,&), refer to Chapter 9.3 "FILE MAINTENANCE".
※3) Data in a file shown with arrow can be searched by pressing [F2](SRCH) key.

8.1.3 Setting Occupied Point

Occupied point can be set by two setting methods as follow.

1) Setting from the coordinate data stored in the internal memory.
2) Direct key input of coordinate data.

- Example setting: Setting the occupied point from the internal coordinate data file

Operating procedure	Operation	Display
① Press [F1](OCC.PT INPUT) key from the Layout menu 1/2. The previous data is shown.	[F1]	OCC.PT PT#:_____ INPUT LIST NEZ ENTER
② Press [F1] (INPUT) key.	[F1]	OCC.PT PT#=PT-01 1234 5678 90.- [ENT]
③ Enter PT#, press [F4](ENT) key. ※1)	Enter PT# [F4]	INSTRUMENT HEIGHT INPUT INS.HT: 0.000 m INPUT --- --- [ENT]
④ Enter INS.HT in the same way.	[F1] Enter INS.HT [F4]	1234 5678 90.- [ENT]
The display returns to layout menu 1/2.		LAYOUT 1/2 F1:OCC.PT INPUT F2:BACKSIGHT F3:LAYOUT P↓

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

- Example setting: Setting Instrument point coordinates directly

Operating procedure	Operation	Display
① Press [F1](OCC.PT INPUT) key from the Layout menu 1/2. The previous data is shown.	[F1]	OCC.PT PT#:_____ INPUT LIST NEZ ENTER
② Press [F3] (NEZ) key.	[F3]	N → 0.000 m E : 0.000 m Z : 0.000 m INPUT --- PT# ENTER
③ Press [F1](INPUT) key and enter coordinate value . Press [F4](ENT) key. ※1),2)	[F1] Enter coord. [F4]	COORD.DATA INPUT PT#:_____ INPUT --- --- ENTER 1234 5678 90.- [ENT]
④ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. ※2)	[F1] Enter PT# [F4]	INSTRUMENT HEIGHT INPUT INS.HT: 0.000 m INPUT --- --- ENTER 1234 5678 90.- [ENT]
⑤ Enter INS.HT in the same way. The display returns to layout menu 1/2.	[F1] Enter INS.HT [F4]	LAYOUT 1/2 F1:OCC.PT INPUT F2:BACKSIGHT F3:LAYOUT P↓

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".
※2) It is possible to record the coordinate value. Refer to Chapter 16."SELECTING MODE".

8.1.4 Setting Backsight Point

The following three setting methods for Backsight point can be selected.

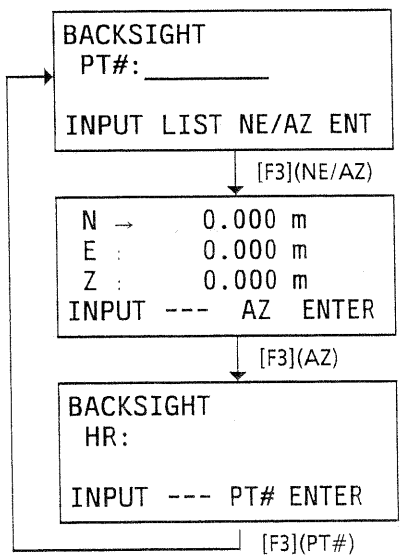
1) Setting from the coordinate data file stored in the internal memory.
2) Direct key input of coordinate data.
3) Direct key input of setting angle.

- Example setting: Setting the backsight point from the internal coordinate data file

Operating procedure	Operation	Display
① Press [F2](BACKSIGHT) key from the Layout menu 1/2.	[F2]	BACKSIGHT PT#:_____ INPUT LIST NE/AZ ENT
② Press [F1] (INPUT) key.	[F1]	BACKSIGHT PT#=BK-01 1234 5678 90.- [ENT]
③ Enter PT#, press [F4](ENT) key. ※1)	Enter PT# [F4]	BACKSIGHT H(B)= 0°00'00" ›Sight ? [YES][NO]
④ Sight the backsight point and press [F3](YES) key. The display returns to the layout menu 1/2.	Sight BK [F3]	

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

- With each press of [F3] key, method of inputting backsight is changed.



- Example setting: Setting the backsight point coordinates directly

Operating procedure	Operation	Display
① Press [F2](BACKSIGHT) key from the Layout menu 1/2. The previous data is shown.	[F2]	BACKSIGHT PT#:_____ INPUT LIST NE/AZ ENT
② Press [F3] (NE/AZ) key.	[F3]	N → 0.000 m E : 0.000 m Z : 0.000 m INPUT --- AZ ENTER
③ Press [F1](INPUT) key and enter coordinate value. Press [F4](ENT) key. ※1), 2)	[F1] Enter coord. [F4]	COORD.DATA INPUT PT#:_____ INPUT --- --- ENTER
④ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. ※1)	[F1] Enter PT# [F4]	BACKSIGHT H(B)= 0°00'00" >Sight ? [YES][NO]
⑤ Sight the backsight point.	Sight BK	
⑥ Press [F3](YES) key. The display returns to the layout menu 1/2.	[F3]	LAYOUT 1/2 F1:OCC.PT INPUT F2:BACKSIGHT F3:LAYOUT P↓

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".
※2) It is possible to record the coordinate value. Refer to Chapter 16."SELECTING MODE".

8.2 Executing a Layout

The following methods can be selected for executing a Layout:

1) Recalling points from internal memory by point number.
2) Direct key input of coordinate values.

Example setting : Recalling point from internal memory.

Operating procedure	Operation	Display
		LAYOUT 1/2 F1:OCC.PT INPUT F2:BACKSIGHT F3:LAYOUT P↓
① Press [F3](LAYOUT) key from the layout menu 1/2.	[F3]	LAYOUT PT#:_____ INPUT LIST NEZ ENTER
② Press [F1](INPUT) key, and enter PT#. ※1) Press [F4](ENT) key.	[F1] Enter PT# [F4]	1234 5678 90.- [ENT]
③ Enter reflector height in the same way.	[F1] Enter R.HT [F4]	REFLECTOR HEIGHT INPUT R.HT : 0.000 m INPUT --- --- ENTER 1234 5678 90.- [ENT]
When the layout point is set, the instrument will start layout calculation. HR: Calculated horizontal angle of the layout point HD: Calculated horizontal distance from the instrument to the layout point		CALCULATED HR= 90°10'20" HD= 123.456 m ANGLE DIST --- ---
④ Collimate the prism, and press the [F1](ANGLE) key. PT#: Layout point ※2) HR: Measured (Actual) horizontal angle. dHR: Horizontal angle to be turned to the layout point = Actual horizontal angle – Calculated horizontal angle. Correct direction when dHR = 0°00'00"	Collimate [F1]	PT#: LP-100 HR: 6°20'40" dHR: 23°40'20" DIST --- NEZ ---

⑤ Press the [F1](DIST) key.
HD: Measuring (Actual) horizontal distance
dHD: Horizontal distance to be turned to the layout point = Actual horizontal distance – Calculated horizontal distance.
dZ: Vertical distance to be turned to the layout point = Actual vertical distance – Calculated vertical distance. ※3)

[F1]

```
 HD*[t]        < m
dHD:             m
 dZ:             m
MODE NEZ NP/P NEXT
```

↓

```
 HD*     143.84 m
dHD:     -43.34 m
 dZ:      -0.05 m
MODE NEZ NP/P NEXT
```

⑥ Press [F1](MODE) key.
The fine mode measuring starts.

[F1]

```
 HD*[r]        < m
dHD:             m
 dZ:             m
MODE NEZ NP/P NEXT
```

↓

```
 HD*     143.845 m
dHD:      -0.005 m
 dZ:      -0.045 m
MODE NEZ NP/P NEXT
```

⑦ When the display value dHR, dHD and dZ are equal to 0, the layout point is established.

⑧ Press [F2](NEZ) key.
The coordinate data is shown.

[F2]

```
 N *     100.000 m
 E :     100.000 m
 Z :       1.015 m
MODE ANGLE NP/P NEXT
```

⑨ Press [F4](NEXT) key to set next layout point.
PT# is automatically incremented.

[F4]

```
LAYOUT
 PT#: LP-101

INPUT LIST NEZ ENTER
```

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".
※2) Point name would not be displayed when data to comply with the inputted coordinate value does not exist in the memory.
※3) Cut & Fill displaying function is available . Refer to Chapter 16 "SELECTING MODE".

● Point Guide Function (Only for Point Guide type)

The point guide function can be used while excuting a Layout.

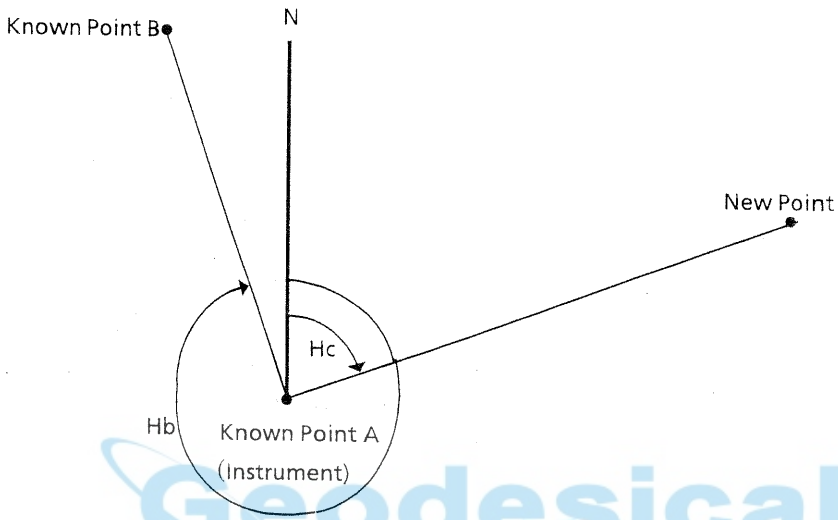
Operating procedure	Operation	Display
		HR: 6°20'40" dHR: 23°40'20" DIST --- NEZ ---
① After measuring Angle, Distance or Coordinate, press [MENU] key.	[MENU]	POINTGUIDE [OFF] --- --- [ON][OFF]
② Press [F3](ON) or [MENU] key.	[F3] or [MENU]	POINTGUIDE [ON] --- --- [ON][OFF]
③ Press [ESC] key to return to the previous display.	[ESC]	HR: 6°20'40" dHR: 23°40'20" DIST --- NEZ ---

8.3 Setting a New Point

New point is required for example when a layout point cannot be sighted from existing control points.

8.3.1 Side Shot Method

Set up the instrument at a known point, and measure the coordinate of the new points by the side shot method



Operating procedure	Operation	Display
		LAYOUT 1/2 F1:OCC.PT INPUT F2:BACKSIGHT F3:LAYOUT P↓
① Press [F4](P↓) key from the layout menu 1/2 to get the layout menu 2/2.	[F4]	LAYOUT 2/2 F1:SELECT A FILE F2:NEW POINT F3:GRID FACTOR P↓
② Press [F2](NEW POINT).	[F2]	NEW POINT F1:SIDE SHOT F2:RESECTION
③ Press [F1](SIDE SHOT) key.	[F1]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
④ Press [F2](LIST) key to display the list of coordinate data file. ※1)	[F2]	COORDDATA /C0123 →*TOKBDATA /C0345 TOPCDATA /C0789 --- SRCH --- ENTER

⑤ Scroll file list by pressing [▲] or [▼] key and select a file to use. ※2),3)	[F1]	*TOKBDATA /C0345 → TOPCDATA /C0789 SATIDATA /C0456 --- SRCH --- ENTER
⑥ Press [F4](ENTER) key. The file will be set .	[F4]	SIDE SHOT PT#:_____ INPUT SRCH --- ENTER
⑦ Press [F1](INPUT) key, and enter the new point name. ※4) Press [F4](ENT) key.	[F1] Enter PT# [F4]	1234 5678 90.- [ENT] REFLECTOR HEIGHT INPUT R.HT : 0.000 m INPUT --- --- ENTER
⑧ Enter reflector height in the same way.	[F1] Enter R.HT [F4]	1234 5678 90.- [ENT] REFLECTOR HEIGHT INPUT R.HT : 1.235 m MEAS --- NP/P ---
⑨ Collimate the new point, and press [F1](MEAS) key. Distance measuring starts.	Collimate [F1]	HR: 123°40'20" HD*[n] < m VD: m >Measuring... <complete> ↓ N : 1234.567 m E : 123.456 m Z : 1.234 m >REC ? [YES][NO]
⑩ Press [F3](YES) key. The name and coordinate value are stored in COORD.DATA. The input menu for next new point is displayed. PT# is automatically incremented.	[F3]	SIDE SHOT PT#:NP-101 INPUT SRCH --- ENTER

※1) If you want to input file name directly, press [F1](INPUT) key and enter a file name.
※2) When a file has been selected already, '*' mark is indicated on left of current file name.
For the file discrimination mark (*,@,&), refer to Chapter 9.3 "FILE MAINTENANCE".
※3) Data in a file shown with arrow can be searched by pressing [F2](SRCH) key.
※4) Refer to Chapter 2.5 "How to enter alphanumeric characters".

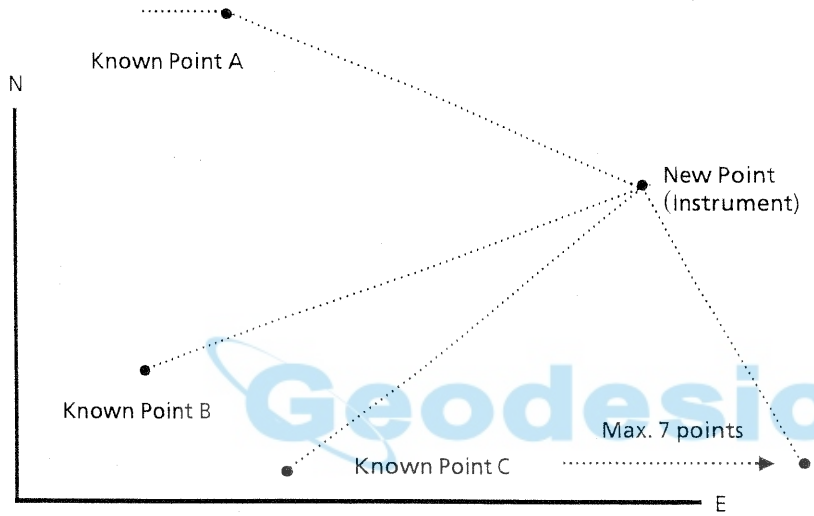
8.3.2 Resection Method

Set up the instrument at a new point, and calculate the coordinate of the new point using the coordinate data of maximum seven known points and the measurements made to these points.

By following observation, resection is possible.

- Resection by distance measurement : 2 or more points must be measured
- Resection by angle measurement only : 3 or more points must be measured

An occupied point coordinate value will be calculated by the method of least squares. (In case that 3 known points are measured by angle measurement only, the value would not be calculated by the method of least squares.)



Operating procedure	Operation	Display
		LAYOUT 1/2 F1:OCC.PT INPUT F2:BACKSIGHT F3:LAYOUT P↓
① Press [F4](P↓) key from the layout menu 1/2 to get the layout menu 2/2.	[F4]	LAYOUT 2/2 F1:SELECT A FILE F2:NEW POINT F3:GRID FACTOR P↓
② Press [F2](NEW POINT).	[F2]	NEW POINT F1:SIDE SHOT F2:RESECTION
③ Press [F2](RESECTION) key.	[F2]	NEW POINT PT#:_____ INPUT SRCH SKP ENTER
④ Press [F1](INPUT) key, and enter the new point name. ※1) ,2) Press [F4](ENT) key.	[F1] Enter PT# [F4]	1234 5678 90.- [ENT]

		INSTRUMENT HEIGHT INPUT INS.HT : 0.000 m INPUT --- --- ENTER 1234 5678 90.- [ENT]
⑤ Enter instrument height in the same way.	[F1] Enter INS.HT [F4]	
		NO01# PT#:_____ INPUT LIST NEZ ENTER 1234 5678 90.- [ENT]
⑥ Enter the known point A number. ※3)	[F1] Enter PT# [F4]	
		REFLECTOR HEIGHT INPUT R.HT : 0.000 m INPUT --- --- ENTER 1234 5678 90.- [ENT]
⑦ Enter reflector height	[F1] Enter R.HT [F4]	
		REFLECTOR HEIGHT INPUT R.HT : 1.235 m ANG DIST NP/P ---
⑧ Collimate the known point A, and press [F1](ANG) or [F2](DIST) key. Example:[F2](DIST) Distance measuring starts.	Collimate [F2]	HR: 123°40'20" HD*[n] < m VD: m >Measuring... <complete>
Known point B entering display will be shown.		NO02# PT#:_____ INPUT LIST NEZ ENTER
⑨ Same as procedure ⑥ to ⑧ proceed to the known point B. When two points have been measured by [F2](DIST) key, the RESIDUAL ERROR will be calculated. ※4)		SELECT GRID FACTOR F1:USE LAST DATA F2:CALC MEAS.DATA
⑩ Select GRID FACTOR for calculation of RESIDUAL ERROR by pressing [F1] or [F2] key. ※5) Example: [F1]	[F1]	RESIDUAL ERROR dHD= 0.015 m dZ = 0.005 m NEXT --- G.F CALC

⑪ Press [F1](NEXT) key to measure other points.
Maximum seven points can be measured.

⑫ Same as procedure ⑥ to ⑧ proceed to the known point C.

[F1]

```
NO03#
 PT#:_______

INPUT LIST NEZ ENTER
```

```
 HR:   123°40'20"
 HD*[n]        < m
 VD:             m
>Measuring...
```

```
     <complete>
```

```
 HR:  123°40'20"
 HD:    123.456 m
 VD:      1.234 m
NEXT ---   ---  CALC
```

⑬ Press [F4](CALC) key.※6)
Standard Deviation will be shown.
Unit : (sec.) or (mGON) or (mMIL)

[F4]

```
Standard Deviation
     =      1.23 sec.
 ---    ↓    ---   NEZ
```

⑭ Press [F2](↓) key.
Standard Deviations of each coordinate will be shown.
Unit : (mm) or (inch)
The display will be changed alternately by pressing [F2](↓) or (↑) key.

[F2]

```
SD(n) :      1.23 mm
SD(e) :      1.23 mm
SD(z) :      1.23 mm
 ---    ↑    ---   NEZ
```

⑮ Press [F4](NEZ) key.
Coordinate data of the new point will be shown.

[F4]

```
 N :     65.432 m
 E :    876.543 m
 Z :      1.234 m
>REC ?     [YES][NO]
```

⑯ Press [F4](YES) key. ※7)
The new point data will be stored into the coordinate data file and the value of occupied coordinate data will change to that of the calculated NEW POINT.

The display returns to new point menu.

[F3]

```
NEW POINT
 F1:SIDE SHOT
 F2:RESECTION
```

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

※2) When there is no need to memorize the new point data, press [F3](SKP) key.

※3) To enter the the known point coordinate data by direct key inputting, press [F3](NEZ) key.

※4) RESIDUAL ERROR;

dHD(Horizontal distance between two known points)=Measured value – Calculated value

dZ=(Z coordinate of the new point calculated from known point A) – (Z coordinate of the new point calculated from known point B)

※5) [F1:USE LAST DATA]; RESIDUAL ERROR is calculated with GRID FACTOR already set.
[F2:CALC MEAS.DATA]; RESIDUAL ERROR is calculated without GRID FACTOR already set. In this case, new GRID FACTOR is calculated from measured data and reset."

●To see the GRID FACTOR value, press [F3](G.F.) key.

※6) In case that the all points are measured by angle measurement only, the following display will be shown. You can select Z coordinate calculation.

```
CALC. Z COORD.
 F1:YES
 F2:NO
```

F1(YES): N,E,Z coordinates will be calculated with measured angle data.

F2(NO) : N and E coordinates will be calculated with measured horizontal angle data. Z coordinate would not be calculated.
(Z coordinate value =0.000m)

When the distance measurement is done even one point, Z coordinate will be calculated as a mean value of relative distance (vertical distance data).

※7) The display shows ">SET ?" when [F3](SKP) key pressed in step ④. In this case, the new point data is not stored into the coordinate data file, only the value of occupied coordinate data changes to that of the calculated NEW POINT.

• Viewing PT# LIST

You can see the PT# List and enter the data from the List, also you can see coordinate data of a point.

[Example: Executing Layout Mode]

Operating procedure	Operation	Display
		LAYOUT PT#:_____ INPUT LIST NEZ ENTER
① While executing the LAYOUT mode, press [F2](LIST) key. The arrow(→) indicates selected data.	[F2]	[TOPCON] →DATA-01 DATA-02 VIEW SRCH --- ENTER
② By pressing the following keys, the list will increase or decrease. [▲] or [▼] : Increasing or Decreasing one by one [▶] or [◀] : By ten Increasing or Decreasing.	[▲],[▼], [▶],[◀]	DATA-49 →DATA-50 DATA-51 VIEW SRCH --- ENTER
③ To show the coordinate of the selected data, press [F1](VIEW) key. It is still possible to scroll the PT# data by pressing [▲] or [▼] key.	[F1]	PT#」DATA-50 N」 100.234 m E」 12.345 m Z」 1.678 m
④ Press [ESC] key. The display returns to the List.	[ESC]	DATA-49 →DATA-50 DATA-51 VIEW SRCH --- ENTER
⑤ Press [F4] (ENTER) key. The selected point number is set as PT#.	[F4]	REFLECTOR HEIGHT INPUT R.HT : 0.000 m INPUT --- --- ENTER

• The operation of [F2](SRCH) is same as the "SEARCH" in the MEMORY MANAGER MODE. For more information, refer to Chapter 9 "MEMORY MANAGER MODE".

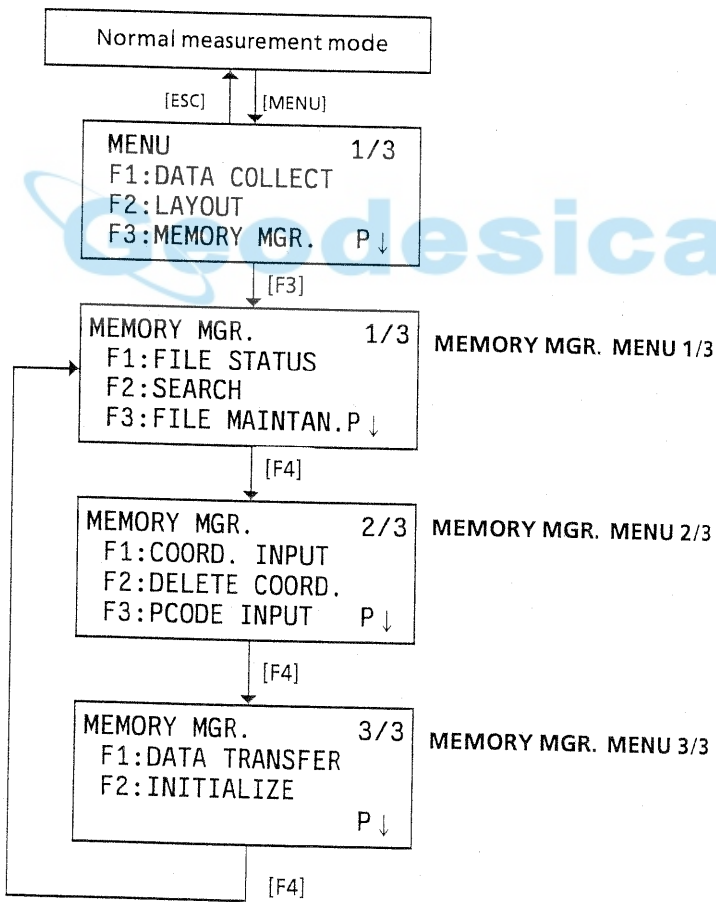
9 MEMORY MANAGER MODE

The following items for internal memory are available in this mode.

1) **FILE STATUS** :Checking the number of stored data / Remaining internal memory capacity.
2) **SEARCH** :Searching the recorded data.
3) **FILE MAINTAN.** :Deleting files / Editing file name
4) **COORD. INPUT**: Inputting coordinate data into Coord. data file.
5) **DELETE COORD.**: Deleting coordinate data from Coord. data file.
6) **PCODE INPUT** : Inputting PCODE DATA into PCODE Library
7) **DATA TRANSFER**: Sending measured data or coordinate data or PCODE Library data / Uploading coordinate data or PCODE Library data / Setting communication parameters
8) **INITIALIZE**: Initializing internal memory.

● Memory manager menu operation

By pressing the [MENU] key, the instrument will be in MENU 1/3 mode.
Press the [F3](MEMORY MGR.) key, the menu of MEMORY MGR. 1/3 will be shown.



9.1 Display Internal Memory Status

This mode is used to check the internal memory status.

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F1](FILE STATUS) key. The total number of stored measured data files and coordinate files are shown.	[F1]	FILE STATUS 1/2 MEAS. FILE : 3 COORD. FILE: 6 [.....] P↓ Remaining memory capacity
③ Press [F4](P↓) key. The total number of stored measured data and coordinate data in all files are shown. ※1)	[F4]	DATA STATUS 2/2 MEAS. DATA :0100 COORD. DATA:0050 [.....] P↓

※1) Each coordinate file has one extra data for working area.

- The FILE/DATA STATUS display will change alternately by pressing [F4](P↓) key.
- To return to MEMORY MGR. menu press [ESC] key.

9.2 Searching Data

This mode is used to search the recorded file data in the DATA COLLECT or LAYOUT mode.
The following 3 search methods in each type of files can be selected.

1: First data search
2: Last data search
3: Point number search(MEAS.DATA, COORD.DATA)
Number search (PCODE LIB.)

MEAS. DATA : Measured data in the data collect mode.
COORD. DATA : Coordinate data for layout, control points and new point data measured in the layout mode.
PCODE LIB. : The data which was registered with a number from 1 to 50 in Point code library.

Point name (PT#, BS#) , ID, PCODE and Height data (INS.HT, R.HT) can be corrected in the searching mode.
Measured value can not be corrected.

9.2.1 Measured Data Searching

Example: Point number searching

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F2](SEARCH) key.	[F2]	SEARCH F1:MEAS. DATA F2:COORD. DATA F3:PCODE LIB.
③ Press [F1](MEAS. DATA) key.	[F1]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
④ Press [F1](INPUT) key and enter File Name. Press [F4](ENT) key. ※1),2)	[F1] Enter FN [F4]	MEAS. DATA SEARCH F1:FIRST DATA F2:LAST DATA F3:PT# DATA
⑤ Press [F3](PT# DATA) key.	[F3]	PT# DATA SEARCH PT#:_____ INPUT --- --- ENTER

⑥ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. ※1)	[F1] Enter PT# [F4]	PT#」TOP-104 1/2 V 」 98°36'20" HR」 160°40'20" TILT」 0°00'00" ↓
⑦ Press [F4](↓) key to scroll data for selected point.		PT#」TOP-104 2/2 PCODE」 R.HT」 1.200 m EDIT ↓

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".
※2) To show the file list, press [F2](LIST) key.

- " 」" represents data shown on the display is the stored data.
- Press [▲] or [▼] key to scroll to next or previous point.
- To search MEAS. DATA of the same point number, press [◀] or [▶] key.

- **To edit the data in searching mode**

Point name (PT#, BS#) , ID, PCODE and Height data (INS.HT, R.HT) can be corrected in the searching mode.
Measured value can not be corrected.

Operating procedure	Operation	Display
		PT#」TOP-104 2/2 PCODE」 R.HT」 1.000 m EDIT ↓
① Press [F1](EDIT) key from last page of displayed data.	[F1]	PT# →TOP-104 PCODE : R.HT : 1.000 m INPUT --- --- ENTER
② Select the item to correct by pressing [▲] or [▼] key.	[▲] or [▼]	PT# :TOP-104 PCODE : R.HT → 1.000 m INPUT --- --- ENTER
③ Press [F1](INPUT) key and enter data.※1) Press [F4](ENT) key.	[F1] Enter Data [F4]	PT#」TOP-104 2/2 PCODE」 R.HT」 1.200 m EDIT ↓
④ Press [F3](YES) key.	[F3]	>SAVE? [YES][NO]

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

- When editing, ID and PCODE are not linked with PCODE LIBRARY.
- Even though the height data (INS.HT, R.HT) are corrected, the measured value can not be corrected.

9.2.2 Coordinate Data Searching

Example searching: Point number searching

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F2](SEARCH) key.	[F2]	SEARCH F1:MEAS. DATA F2:COORD. DATA F3:PCODE LIB.
③ Press [F2](COORD. DATA) key.	[F2]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
④ Press [F1](INPUT) key and enter File Name. Press [F4](ENT) key. ※1)	[F1] Enter FN [F4]	COORD. DATA SEARCH F1:FIRST DATA F2:LAST DATA F3:PT# DATA
⑤ Press [F3](PT# DATA) key.	[F3]	PT# DATA SEARCH PT#:_____ INPUT --- --- ENTER
⑥ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. ※1)	[F1] Enter PT# [F4]	1234 5678 90.- [ENT] PT#┘TOP-104 N┘ 100.234 m E┘ 12.345 m Z┘ 1.678 m

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

- " ┘ " represents data shown on the display is the stored data.
- Press [▲] or [▼] key to scroll to next or previous point.
- To search COORD. DATA of the same point number, press [◀] or [▶] key.

9.2.3 PCODE LIBRARY Searching

Example searching: Number searching

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F2](SEARCH) key.	[F2]	SEARCH F1:MEAS. DATA F2:COORD. DATA F3:PCODE LIB.
③ Press [F3](PCODE LIB.) key.	[F3]	PCODE DATA SEARCH F1:FIRST DATA F2:LAST DATA F3:No. SEARCH
④ Press [F3](No. SEARCH) key.	[F3]	PCODE No. SEARCH No.: INPUT --- --- ENTER
⑤ Press [F1](INPUT) key and enter number. Press [F4](ENT) key. ※1) The number and linked data will be shown. ※2)	[F1] Enter PT# [F4]	1234 5678 90.- [ENT] 011:NAKADAI →012:HILLTOP 013:ITABASH EDIT --- CLR ---

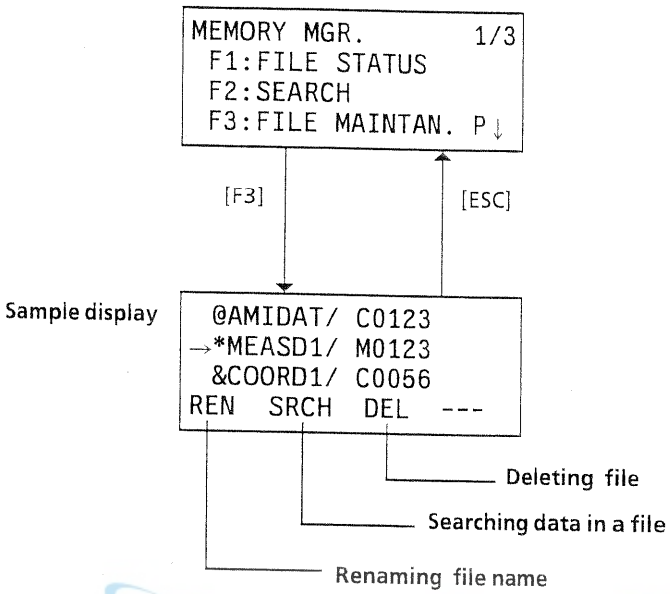
※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".
- Press [▲] or [▼] key to scroll to next or previous PCODE data.

※2) To correct the PCODE data , press [F1](EDIT) key.
To delete the PCODE data, press [F3](CLR) key.

9.3 FILE MAINTENANCE

In this mode, the following items are available.
Renaming file name / Searching data in a file / Deleting files

- **FILE MAINTAN. menu**



Pressing [F3](FILE MAINTAN.) key from MEMORY MANAGER menu 1/3, file list will be shown.

- File discrimination mark (*,@,&)
  File discrimination mark (*,@,&) placed before file name indicates the file status .
  For measured data file
  "*" : selected file for DATA COLLECT mode.
  For coordinate data file
  "*" : selected file for LAYOUT mode.
  "@" : selected coordinate file for DATA COLLECT mode.
  "&" : selected coordinate file for both LAYOUT and DATA COLLECT mode.
- Data discrimination character (M, C)
  Data discrimination character (M, C) placed before four figures indicates the type of data.
  "M" : Measured data
  "C" : Coordinate data.
- Four figures means the total number of data in the file.
  (Coordinate data file has an extra data for working.)
- Press [▲] or [▼] key to scroll to next file.

9.3.1 Rename a File

An existing file in internal memory can be renamed.

Operating procedure	Operation	Display
① Press [F3](FILE MAINTAN.) key from the Memory manager menu 1/3.	[F3]	→MEASD1/ M0123 COORD1/ C0056 REN SRCH DEL ---
② Select a file by pressing [▲] or [▼] key.	[▲] or [▼]	MEASD1/ M0123 →COORD1/ C0056 COORD2/ C0098 REN SRCH DEL ---
③ Press [F1](REN) key.	[F1]	MEASD1/ M0123 =COORD1/ C0056 COORD2/ C0098 1234 5678 90.- [ENT]
④ Enter new file name. Press [F4](ENT) key. ※1)	Enter FN [F4]	MEASD1/ M0123 →COORD5/ C0056 COORD1/ C0098 REN SRCH DEL ---

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".
Existing file name can not be available.
To return to the FILE MAINTAN. Menu , press [ESC] key.

9.3.2 Searching Data in a File

An existing file in internal memory can be searched.

Operating procedure	Operation	Display
① Press [F3](FILE MAINTAN.) key from the Memory manager menu 1/3.	[F3]	→MEASD1/ M0123 COORD1/ C0056 REN SRCH DEL ---
② Select a file to search by pressing [▲] or [▼] key.	[▲] or [▼]	MEASD1/ M0123 →COORD1/ C0056 COORD2/ C0098 REN SRCH DEL ---
③ Press [F2](SRCH) key.	[F2]	SEARCH [COORD1] F1:FIRST DATA F2:LAST DATA F3:PT# DATA
④ Select searching method by pressing [F1] to [F3] key. ※1)		

※1) Because procedures from next are same as procedures of Chapter 9.2 "Searching Data", refer to Chapter 9.2 "Searching Data"
To return to the FILE MAINTAN. Menu , press [ESC] key.

9.3.3 Deleting a File

This mode erases a file from internal memory. Only one file can be erased at a time.

Operating procedure	Operation	Display
① Press [F3](FILE MAINTAN.) key from the Memory manager menu 1/3.	[F3]	→MEASD1/ M0123 COORD1/ C0056 REN SRCH DEL ---
② Select a file to delete by pressing [▲] or [▼] key.	[▲] or [▼]	MEASD1/ M0123 →COORD1/ C0056 COORD2/ C0098 REN SRCH DEL ---
③ Press [F3](DEL) key.	[F3]	MEASD1/ M0123 →COORD1/ C0056 COORD2/ C0098 >DELETE? [NO][YES]
④ Confirm the deleting, and press [F4](YES) key.	[F4]	MEASD1/ M0123 →COORD2/ C0098 COORD3/ C0321 REN SRCH DEL ---

- To return to the FILE MAINTAN. Menu , press [ESC] key.

9.4 Coordinate Data Direct Key Input

Coordinate data for the layout point or control point can be input directly from the keyboard. This data can be stored into a file in the internal memory.

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F4](P↓) key.	[F4]	MEMORY MGR. 2/3 F1:COORD. INPUT F2:DELETE COORD. F3:PCODE INPUT P↓
③ Press [F1](COORD. INPUT) key.	[F1]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
④ Press [F1](INPUT) key and enter File Name you want to input. Press [F4](ENT) key. ※1)	[F1] Enter FN [F4]	1234 5678 90.- [ENT] COORD. DATA INPUT PT#:_____ INPUT LIST --- ENTER
⑤ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. ※1)	[F1] Enter PT# [F4]	1234 5678 90.- [ENT] N→ 100.234 m E: 12.345 m Z: 1.678 m INPUT --- --- ENTER
⑥ Enter coordinate data in the same way. Next input display is shown, point# is automatically incremented.	[F1] Enter COORD. [F4]	1234 5678 90.- [ENT] COORD. DATA INPUT PT#:TOPCON-102 INPUT --- --- ENTER

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

9.5 Delete a Coordinate Data from a File

Coordinate data in a file can be erased.

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F4](P↓) key.	[F4]	MEMORY MGR. 2/3 F1:COORD. INPUT F2:DELETE COORD. F3:PCODE INPUT P↓
③ Press [F2](DELETE COORD.) key.	[F2]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
④ Press [F1](INPUT) key and enter File Name. Press [F4](ENT) key. ※1)	[F1] Enter FN [F4]	1234 5678 90.- [ENT] DELETE COORD. PT#:_____ INPUT LIST --- ENTER
⑤ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. ※1)	[F1] Enter PT# [F4]	1234 5678 90.- [ENT] N: 100.234 m E: 12.345 m Z: 1.678 m >DELETE? [YES][NO]
⑥ Confirm the data and press [F3](YES) key. Deleting starts. The display returns to the previous display.	[F3]	

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

9.6 Editing PCODE Library

PCODE data can be entered into PCODE Library in this mode.
A PCODE is linked with a number of 1 to 50
PCODE can be also edited in DATA COLLECT menu 2/3 in the same way.

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F4](P↓) key.	[F4]	MEMORY MGR. 2/3 F1:COORD. INPUT F2:DELETE COORD. F3:PCODE INPUT P↓
③ Press [F3](PCODE INPUT) key.	[F3]	→001:TOPCON 002:TOKYO EDIT --- CLR ---
④ By pressing the following keys, the list will increase or decrease. [▲] or [▼] : Increasing or Decreasing one by one [▶] or [◀] : By ten Increasing or Decreasing.	[▲],[▼], [▶],[◀]	011:URAH →012:AMIDAT 013:HILLTO EDIT --- CLR ---
⑤ Press [F1](EDIT) key.	[F1]	011:URAH →012=AMIDAT 013:HILLTO 1234 5678 90.- [ENT]
⑥ Enter PCODE and press [F4](ENT) key. ※1)	Enter PCODE [F4]	011:URAH →012=AMISUN 013:HILLTO EDIT --- CLR ---

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

9.7 Data Communications

You can send a data file stored in the internal memory to a computer directly. Also, you can directly load a coordinate data file and PCODE Library data to the internal memory from the computer.

9.7.1 Sending Data

Example: Sending a Measured data file

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F4](P↓) key twice.	[F4] [F4]	MEMORY MGR. 3/3 F1:DATA TRANSFER F2:INITIALIZE P↓
③ Press [F1](DATA TRANSFER) key .	[F1]	DATA TRANSFER F1:SEND DATA F2:LOAD DATA F3:COMM. PARAMETERS
④ Press [F1] key.	[F1]	SEND DATA F1:MEAS. DATA F2:COORD. DATA F3:PCODE DATA
⑤ Select the type of data to send by pressing [F1] - [F3] key. Example : [F1](MEAS. DATA)	[F1]	SELECT A FILE FN:_____ INPUT LIST --- ENTER
⑥ Press [F1](INPUT) key and enter File Name you want to send. Press [F4](ENT) key. ※1),2)	[F1] Enter FN [F4]	SEND MEAS. DATA >OK ? --- --- [YES][NO]
⑦ Press [F3](YES) key .※3) The sending starts. The display returns to menu.	[F3]	SEND MEAS. DATA < Sending Data!> STOP

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".
※2) To scroll the data, press [▲] or [▼] key.
- To show the file list, press [F2](LIST) key.

※3) To cancel the sending, press [F4](STOP) key.

9.7.2 Loading Data

Coordinate data files and PCODE Library data can be loaded from PC.

Example: Loading a coordinate data file

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F4](P↓) key twice.	[F4] [F4]	MEMORY MGR. 3/3 F1:DATA TRANSFER F2:INITIALIZE P↓
③ Press [F1](DATA TRANSFER) key .	[F1]	DATA TRANSFER F1:SEND DATA F2:LOAD DATA F3:COMM. PARAMETERS
④ Press [F2] key.	[F2]	LOAD DATA F1:COORD. DATA F2:PCODE DATA
⑤ Select the type of data to load by pressing [F1] or [F2] key. Example : [F1](COORD. DATA)	[F1]	COORD. FILE NAME FN:_____ INPUT --- --- ENTER
⑥ Press [F1](INPUT) key and enter New File Name you want to receive. Press [F4](ENT) key. ※1)	[F1] Enter FN [F4]	LOAD COORD. DATA >OK ? --- --- [YES][NO]
⑦ Press [F3](YES) key .※2) The loading starts. The display returns to menu.	[F3]	LOAD COORD. DATA < Loading Data!> STOP

※1) Refer to Chapter 2.5 "How to enter alphanumeric characters".

※2) To cancel the loading, press [F4](STOP) key.

9.7.3 Setting Parameter of Data Communications

- **Items of the Parameter**

Items	Selecting Items	Contents
F1: Protocol	[ACK/NAK], [ONE WAY]	Setting Protocol [ACK/NAK] or [ONE WAY] communication
F2: Baud rate	300, 600, 1200, 2400, 4800, 9600	Setting transfer speed 300/600/1200/2400/4800/9600 baud rate
F3: Char. / Parity	[7/EVEN], [7/ODD], [8/NON]	Setting data length and parity. [7bit, even], [7bit, odd], [8bit,none]
F1: Stop Bits	1, 2	Setting Stop 1 bit or 2bits

- **Example Setting** Baud rate : 4800

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F4](P↓) key twice.	[F4] [F4]	MEMORY MGR. 3/3 F1:DATA TRANSFER F2:INITIALIZE P↓
③ Press [F1](DATA TRANSFER) key .	[F1]	DATA TRANSFER F1:SEND DATA F2:LOAD DATA F3:COMM. PARAMETERS
④ Press [F3](COMM. PARAMETERS) key.	[F3]	COMM. PARAMETERS 1/2 F1:PROTOCOL F2:BAUD RATE F3:CHAR./PARITY P↓
⑤ Press [F2](BAUD RATE) key . [ ] indicates present setting.	[F2]	BAUD RATE [300] 600 1200 2400 4800 9600 ENTER
⑥ Select the items by pressing [▲] , [▼] , [◀] and [▶] keys. ※1)	[▶] [▼]	BAUD RATE 300 600 1200 2400 [4800] 9600 ENTER
⑦ Press [F4](ENTER) key.	[F4]	COMM. PARAMETERS 1/2 F1:PROTOCOL F2:BAUD RATE F3:CHAR./PARITY P↓

※1) To cancel setting, press [ESC] key.

9.8 Initialization

This mode is used to initialize the internal memory.
Following data can be initialized.
FILE DATA:All files of measuring data and coordinate data
PCODE DATA: PCODE library data
ALL DATA: FILE DATA and PCODE DATA
Note that the following data are not initialized even if initialization is executed.
: Coordinates of the instrument, Instrument height and Reflector height.

Example Initialization : **ALL DATA** (FILE data and PCODE data)

Operating procedure	Operation	Display
① Press [F3](MEMORY MGR.) key from the menu 1/3.	[F3]	MEMORY MGR. 1/3 F1:FILE STATUS F2:SEARCH F3:FILE MAINTAN. P↓
② Press [F4](P↓) key twice.	[F4] [F4]	MEMORY MGR. 3/3 F1:DATA TRANSFER F2:INITIALIZE P↓
③ Press [F2](INITIALIZE) key .	[F2]	INITIALIZE F1:FILE DATA F2:PCODE LIST F3:ALL DATA
④ Select the data to initialize by pressing one of [F1] to[F3] key. Example : [F3](ALL DATA)	[F3]	INITIALIZE DATA ERASE ALL DATA ! >OK ? [NO][YES]
⑤ Confirm the erase data, press [F4](YES) key . Initializing will start. The display returns to menu.	[F4]	INITIALIZE DATA <Initializing!> ↓ MEMORY MGR. 3/3 F1:DATA TRANSFER F2:INITIALIZE P↓

10 SET AUDIO MODE

The light acceptance quantity level for the EDM (SIGNAL), the atmospheric correction value (PPM) and correction value of prism constant (PSM) are displayed in this mode.
When reflected light from the prism is received a buzzer sounds. This function is good for easy collimation when the target is difficult to find.

Operating procedure	Operation	Display
① Make sure the mode is in the distance measuring mode on page 2.		MEAS MODE NP/P P1↓ OFSET SO S/A P2↓
② Pressing [F3](S/A) key, mode changes to set audio mode. The display indicates correction value of prism constant (PSM), non-prism constant (NPM), atmospheric correction (PPM) and reflection light level (SIGNAL).	[F3]	PSM:0.0 PPM:0.0 NPM:0.0 SIGNAL:[■■■■■] PRISM PPM T-P ---

- When receiving reflected light, buzzer sounds.
- The [F1] ~ [F3] keys are used for setting atmospheric correction and prism constant.
- To return to normal measuring mode, press [ESC] key.

11 SETTING THE PRISM / NON-PRISM CONSTANT VALUE

The prism constant value of Topcon is set to zero. When using prisms other than Topcon's, it is necessary to set the prism constant correction value of that specific prism.
Once you set the correction value for prism constant, it is retained after power is OFF.

Note: Confirm the Non-prism Constant Value is set at 0 when measuring target such as walls in Non-prism mode.

Operating procedure	Operation	Display
① Press [F3](S/A) key to set Set Audio Mode from distance or coordinate measurement mode.	[F3]	PSM: 0.0 PPM: 0.0 NPM: 0.0 SIGNAL:[▮▮▮▮▮▮] PRISM PPM T-P ---
② Press [F1](PRISM) key. The current setting value will be displayed.	[F1]	PRISM CONST. SET PRISM> 0.0mm N-PSM: 0.0mm INPUT --- --- ENTER
③ Select a mode by pressing the [▲] or [▼] key. **PRISM** : Prism Constant Correction Value **N-PSM** : Non-prism Constant Correction Value	[▲] or [▼]	PRISM CONST. SET PRISM> 0.0mm N-PSM: 0.0mm INPUT --- --- ENTER
④ Enter the value after pressing the [F1](INPUT) key.	[F1] Enter Value	PRISM CONST. SET PRISM>14.0mm N-PSM: 0.0mm 1234 5678 90.- [ENT]
⑤ Press the [F4](ENT) key. The display returns to set audio mode.	[F4]	PSM: 14.0 PPM: 0.0 NPM: 0.0 SIGNAL:[▮▮▮▮▮▮] PRISM PPM T-P ---

- Input range : −99.9mm to +99.9mm, 0.1mm step

12 SETTING ATMOSPHERIC CORRECTION

The velocity of light through air is not constant and depends on the atmospheric temperature and pressure. The atmospheric correction system of this instrument corrects automatically when the correction value is set. 15°C, 1013.25hPa or 760mmHg (56°F, and 29.6 inHg) is as a standard value for 0ppm in this instrument. The values are kept in the memory even after power is OFF.

12.1 Calculation of Atmospheric Correction

The followings are the correction formulas.
Unit; meter

$$Ka=\left\{279.14-\frac{79.381\times P}{273.15+t}\right\}\times 10^{-6}$$

Ka : Atmospheric correction value
P : Ambient atmospheric pressure(hPa)
t : Ambient Atmospheric temperature(℃)

The distance L(m) after atmospheric correction is obtained as follow.

$$L=l\,(1+Ka)$$

l : Measured distance when atmospheric correction is not set.

Example : In case Temperature +20℃ , Air pressure 847hPa, l= 1000 m

$$Ka=\left\{279.14-\frac{79.381\times 847}{273.15+20}\right\}\times 10^{-6}$$

$$\fallingdotseq 50\times 10^{-6}\,(50\text{ppm})$$

$$L\ =1000\,(1+50\times 10^{-6})\ =1000.050\text{ m}$$

12.2 Setting of Atmospheric Correction Value

• How to Set Temperature and Pressure Value Directly

Measure the temperature and air pressure surrounding the instrument beforehand.
Example : Temperature: +26 °C, Pressure: 1017 hPa

Operating procedure	Operation	Display
① Press [F3](S/A) key to set Set Audio Mode from distance or coordinate measurement mode.	[F3]	PSM: 0.0 PPM: 0.0 NPM: 0.0 SIGNAL:[▮▮▮▮▮] PRISM PPM T-P ---
② Press [F3](T-P) key.	[F3]	TEMP. & PRES. SET TEMP. → 15.0 °C PRES. : 1013.2 hPa INPUT --- --- ENTER
③ Input Temp.value and Pressure value. ※1) Mode returns to Set Audio mode.	Enter Temp. Enter Pres.	TEMP. & PRES. SET TEMP. : 26.0 °C PRES. → 1017.0 hPa INPUT --- --- ENTER

※1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters ".

- Range : Temp. −30 to +60 °C (0.1°C step) or −22 to +140°F (0.1°F step)
  Pres. 420 to 800mmHg(0.1mmHg step) ,16.5 to 31.5 inHg (0.01 inHg step) or 560 to 1066hPa(0.1hPa step)
- When the atmospheric correction value which is calculated from the input temperature and pressure values exceeds the range ± 99.9ppm, the operating procedure returns to step ③ automatically. Input values again.

• How to Set the Atmospheric Correction Value Directly

Measure the temperature and air pressure to find atmospheric correction value(PPM) from the chart or correction formula.

Operating procedure	Operation	Display
① Press [F3](S/A) key to set Set Audio Mode from distance or coordinate measurement mode.	[F3]	PSM: 0.0 PPM: 0.0 NPM: 0.0 SIGNAL:[▮▮▮▮▮▮] PRISM PPM T-P ---
② Press [F2](PPM) key. Current setting value is displayed.	[F2]	PPM SET PPM : 0.0 ppm INPUT --- --- ENTER
③ Enter atmospheric correction value. ※1) Mode returns to Set Audio mode.	[F1] Enter Data [F4]	1234 5678 90.- [ENT]

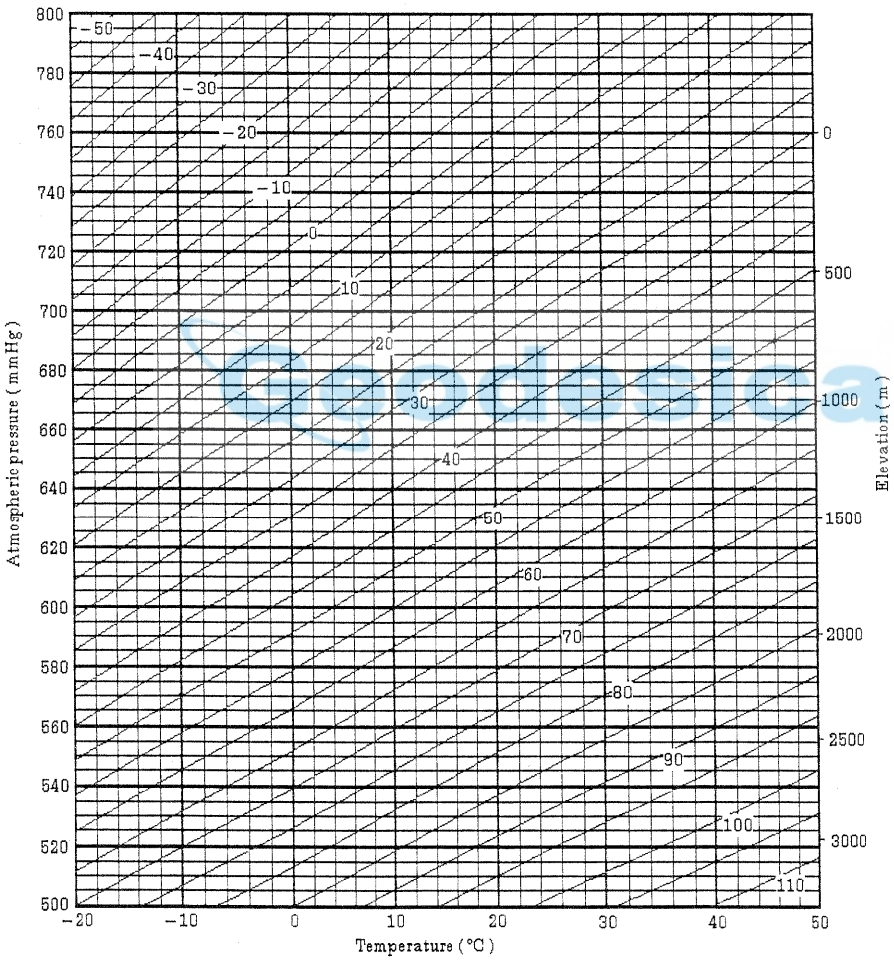
※1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters ".

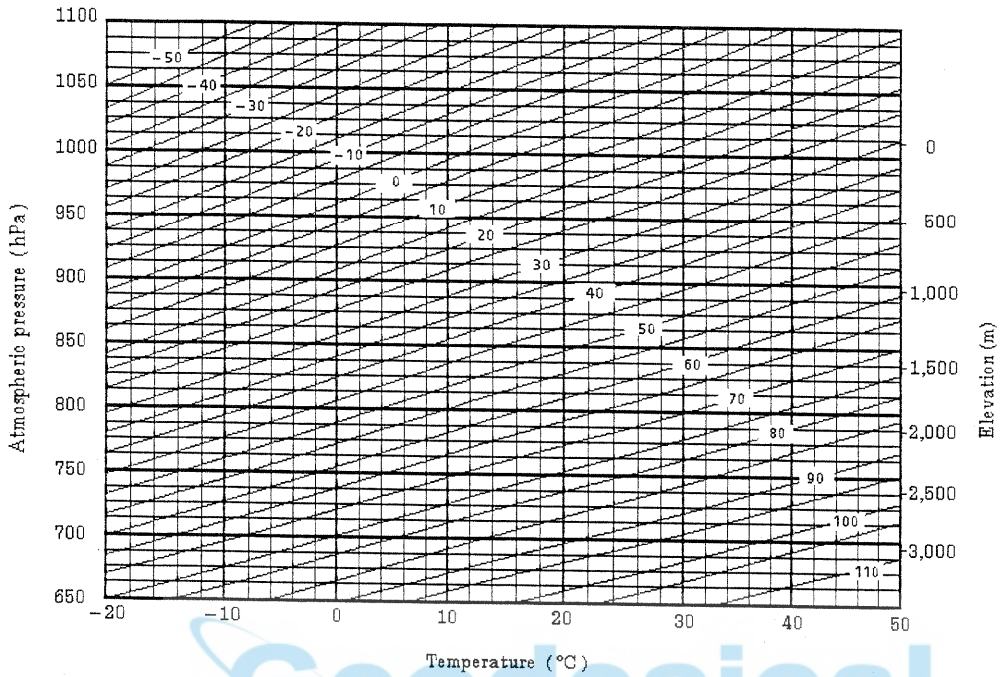
- Input range : −99.9ppm to +99.9ppm、0.1ppm step

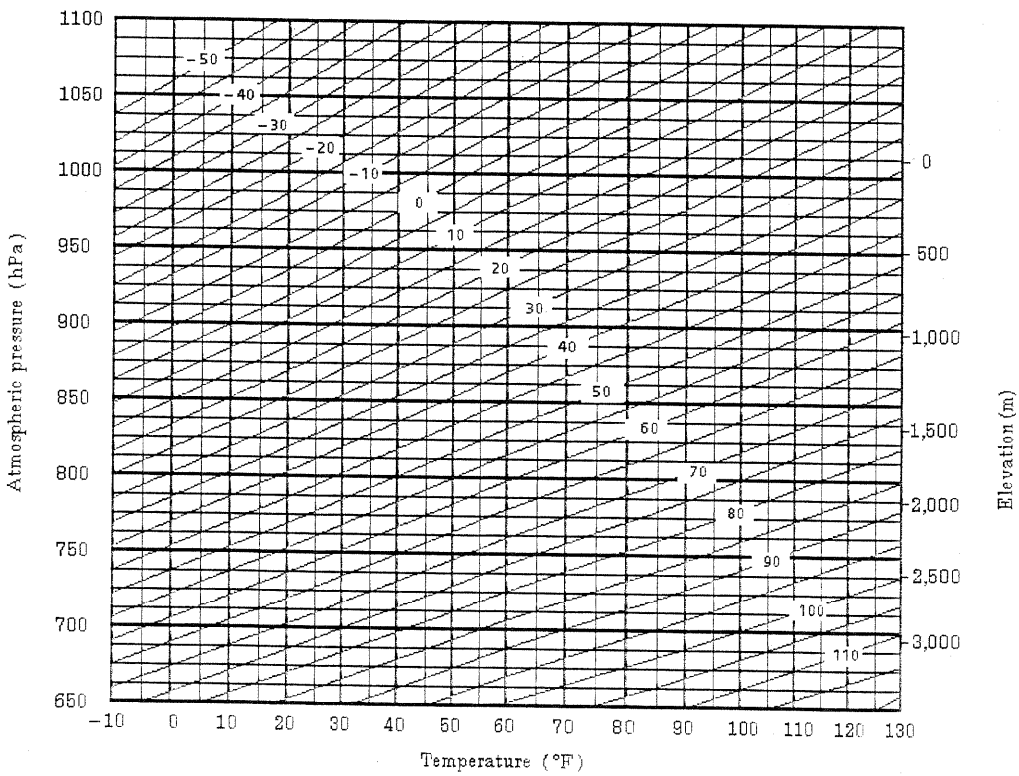
Atmospheric Correction Chart (For your reference)

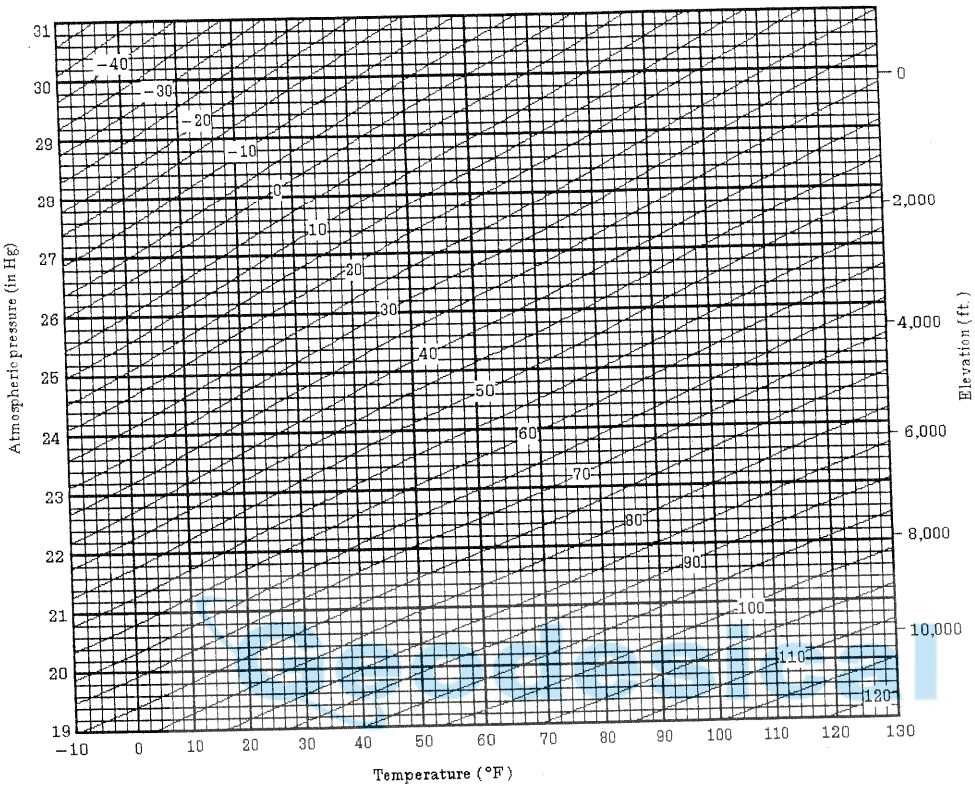
The atmospheric correction value is obtained easily with the atmospheric correction chart.
Find the measured temperature in horizontal, and pressure in vertical on the chart.
Read the value from the diagonal line, which represents the required atmospheric correction value.

Example:
The measured temperature is +26°C
The measured pressure is 760mmHg
There fore,
The correction value is +10ppm




Atmospheric pressure (hPa)
1100
1050
1000
950
900
850
800
750
700
650
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
70
80
90
100
110
-20
-10
0
10
20
30
40
50
Temperature (°C)
0
500
1,000
1,500
2,000
2,500
3,000
Elevation (m)


Atmospheric pressure (hPa)
1100
1050
1000
950
900
850
800
750
700
650
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
70
80
90
100
110
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Temperature (°F)
0
500
1,000
1,500
2,000
2,500
3,000
Elevation (m)


Atmospheric pressure (in Hg)
31
30
29
28
27
26
25
24
23
22
21
20
19
−40
−30
−20
−10
0
10
20
30
40
50
60
70
80
90
100
110
120
0
2,000
4,000
6,000
8,000
10,000
Elevation (ft.)
−10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Temperature (°F)

13 CORRECTION FOR REFRACTION AND EARTH CURVATURE

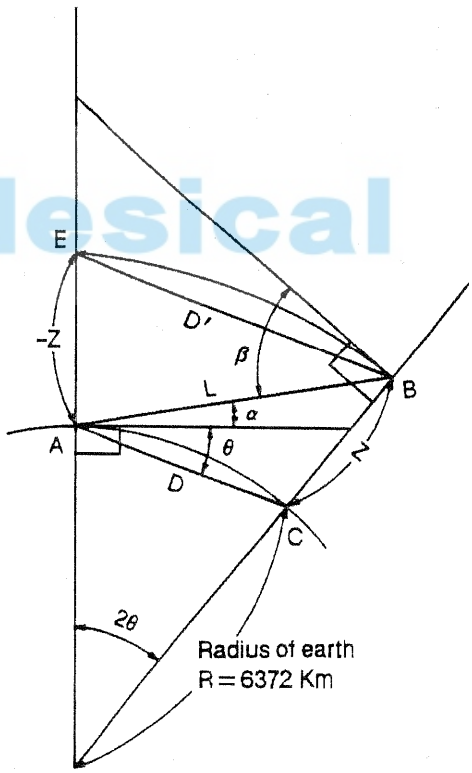
The instrument measures distance, taking into account correction for refraction and earth curvature.

Note : If the telescope is positioned within ±9° from the nadir or zenith, no measurement will result even if the correction function for refraction and earth curvature works. The display shows "W/C OVER".

13.1 Distance Calculation Formula

Distance Calculation Formula; with correction for refraction and earth curvature taken into account. Follow the Formula below for converting horizontal and vertical distances.

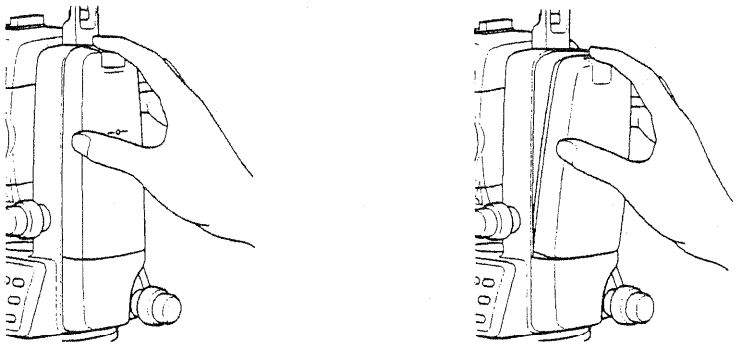
Horizontal distance $D = AC(\alpha)$ or $BE(\beta)$
Vertical distance $Z = BC(\alpha)$ or $EA(\beta)$
$D = L\{\cos\alpha - (2\theta - \gamma)\sin\alpha\}$
$Z = L\{\sin\alpha + (\theta - \gamma)\cos\alpha\}$
$\theta = L\cdot\cos\alpha/2R$ ..... Earth curvature correcting item
$\gamma = K\cdot L\cos\alpha/2R$ ..... Atmospheric refraction correcting item
$K = 0.14$ or 0.2 ..... Coefficient of refraction
$R = 6372$km ..... Radius of earth
α (or β) ..... Altitude angle
L ..... Slope distance



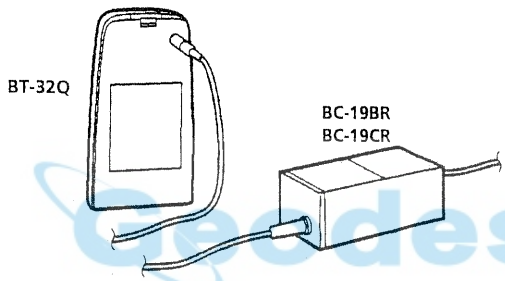
- The conversion formula for horizontal and vertical distances is as follows when correction for refraction and earth curvature is not applied.
  $D = L\cdot\cos\alpha$
  $Z = L\cdot\sin\alpha$

Note : The coefficient of the instrument has been set at 0.14 before shipment (K = 0.14). if the "K" value is to be changed, refer to "16. Selecting mode".

14 POWER SOURCE AND CHARGIN



1) **For removing**
   Push the lock lever downward and pull out the on-board battery.
2) **Installation**
   Place the base of the on-board battery into the main body, push the on-board battery toward the instrument side till the battery clicks into position.
3) **For charging**

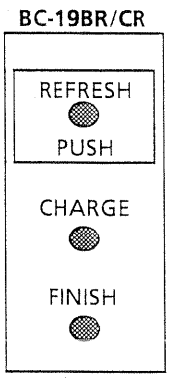


① Plug the charger into an outlet (BC-19BR is for AC 120V use and BC-19CR is for AC 230V use.).
② Connect the charger connector (BC-19BR or BC-19CR) to the on-board battery at the connector, the on-board battery should be removed from the instrument when recharging.
③ Check to see that the red light of the charger is lit.
④ Charging will take approximately 1.5 hours (The green light of the charger will light.).
Remove the battery source from the charger. .

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 specified charging time may shorten the life of the battery and should be avoided if possible.
3 : The battery source will discharge when stored and should be checked before using with instrument .
4 : Be sure to charge a stored battery every 3 or 4 months and store in a place at 30°C or below when it will not used for a long period.
If you allow the battery to be completely discharged, it will have an effect on the overall performance for proper charging in the future.
Keep batteries charged at all times.
5 : For further information, see APPENDIX 2 Precaution when Charging or Storing Batteries.

Refreshing switch

Battery can be used repeatedly by charging. If charging is repeated by the state that capacity of handle battery still left, operating time of handle battery may shorten.
In this case, the voltage of handle battery will be recovered by refreshing and operating time can be improved.
When refreshing switch is pressed, discharge will be started, and refreshing lamp will turn on yellow. When discharge is completed, charge will be started.
Time discharging handle battery charged fully is approximately 8 hours.



15 DETACH/ATTACH OF TRIBRACH

The instrument is easily detached or attached to the tribrach, with a tribrach fixing lever loosened or tightened for this purpose.

●Detachment

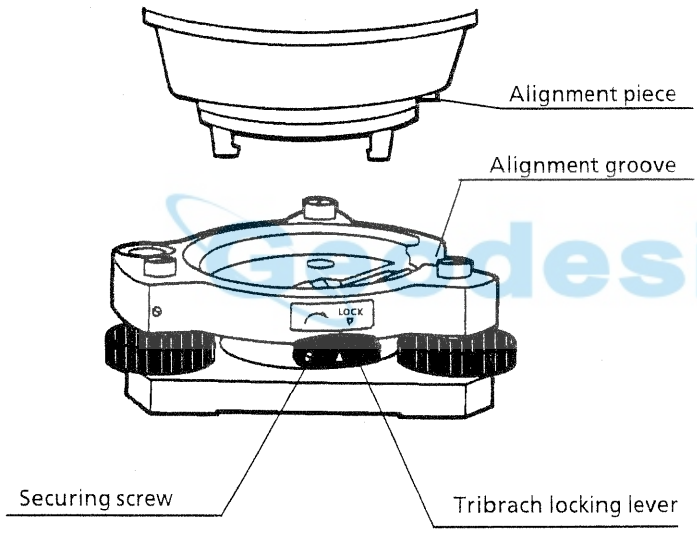
① Loosen the tribrach fixing lever, by revolving it 180° or 200g in the counterclockwise direction (which will point the triangle mark upwards).

② Grip the carrying handle firmly with one hand while holding the tribrach with the other. Then lift the instrument straight upwards and off.

●Attachment

① Hold the instrument by the carrying handle, with one hand, and carefully lower it on top of the tribrach while, at the same time, coinciding the alignment piece with the tribrach alignment groove on the instrument and tribrach respectively.

② When fully seated, revolve the tribrach fixing lever 180° or 200g clockwise (which will point the triangle mark downwards again).



●Locking the Tribrach Fixing Lever

The tribrach fixing lever can be locked, to prevent it be accidentally removed, especially if the upper instrument section is not being detached very often. Simply tighten the securing screw on the fixing lever with the accessory screwdriver, found in the case.

16 SELECTING MODE

16.1 Items of the Selecting Mode

The following modes are available.

Menu	Items	Selecting item	Contents
1: UNIT SET	TEMP. & PRES.	°C / °F hPa / mmHg /inHg	Select the unit of temperature for atmospheric correction. Select the unit of air pressure for atmospheric correction .
	ANGLE	DEG(360°) / GON(400G) / MIL(6400M)	Choose degree, gon or mil unit for measuring angle.
	DISTANCE	METER / FEET / FEET and inch	Choose measuring unit for distance meter , feet or feet and inch.
	FEET	US SURVEY / INTERNATIONAL	Select the meter / feet conversion factor. US SURVEY feet 1m = 3.280833333333333 ft. INTERNATIONAL feet 1m = 3.280839895013123 ft.
2: MODE SET	POWER ON MODE	ANGLE MEAS./ DISTANCE MEAS.	Select to set the measurement mode for angle or distance when the power is turned on.
	FINE/CRS/ TRK	FINE / COARSE / TRACK	Select Fine /Coarse / Tracking mode in distance measurement mode, when the power is turned on..
	HD&VD/SD	HD&VD /SD	Specify which is displayed first, horizontal and vertical distance or slope distance, when the power is turned on.
	V ANGLE Z0/H0	Zenith 0 / Horizontal 0	Choose the vertical angle reading from zenith or from level.
	N-TIMES / REPEAT	N-TIMES /REPEAT	Select the measurement mode for distance when the power is turned on.
	TIMES OF MEAS.	0~99	Set N (number of times) for times of distance measurement. When setting number of times as 1, it is single measurement.
	NEZ / ENZ	NEZ / ENZ	Select a coordinate displaying order either NEZ or ENZ.
	HA-0-INDEX	ON-MEMORY / ON / OFF	Horizontal angle can have zero position same as vertical angle(ON). In this case, it is able to retain presetting angle after turning switch off (ON-MEMORY)
	ESC KEY MODE	DATA COLLECT / LAYOUT / REC / OFF	You can select a function of the [ESC] key . DATA COLLECT/LAYOUT: It is possible to enter data input mode (in DATA COLLECT) or Layout Menu from normal measuring mode directly. REC: While executing normal or offset measuring, the measuring data can be output. OFF: Returns to normal function.
	COORD. CHECK	ON / OFF	Select coordinate displaying ON or OFF when setting a point.

	EDM OFF TIME	0~99	The time when EDM is cut off from distance measurement is completed can be changed. This function is effective for shortening the first time measuring time when distance measurement is started from distance measurement completing state. (Default:3minutes) 0 : After completing distance measurement, EDM is cut off immediately. 1~98 : EDM is cut off after 1~98 minutes. 99 : EDM is always switched ON.
	FINE READING	0.2/1mm	Select 1mm or 0.2mm for the minimum reading unit in the distance mode (FINE mode).
	OFFSET V ANG.	FREE/ HOLD	Select Vertical angle setting in the Angle Offset measuring mode. FREE: Vertical angle varies by the angle of the telescope. HOLD: Vertical angle is fixed even if the angle of the telescope changes.
	NON-PSM / PRISM	NON-PSM / PRISM	Select the distance measuring mode when the power is turned ON.
3: OTHERS SET	H-ANGLE BUZZER	ON / OFF	Specify whether the buzzer sounds or not for every horizontal angle 90°.
	S/A BUZZER	ON / OFF	Specify whether the buzzer sounds or not in the set audio mode.
	W-CORRECTION	OFF / K=0.14 / K=0.20	Set correction for refraction and earth curvature, coefficient of refraction as ; K=0.14, K=0.20 or no correction.
	NEZ MEMORY	ON / OFF	It is possible to retain the coordinate of instrument point, the instrument height and prism height after power off.
	REC TYPE	REC-A / REC-B	Select REC-A or REC-B for data output. REC-A : The measurement is made again and this new data is output. REC-B : The data being displayed is output.
	CRLF	ON / OFF	It is possible to output the data with carriage return and line feed.
	NEZ REC FORM	STANDARD / with RAW	Select to record coordinates in standard or 11 digits with raw data.
	MANUAL NEZ REC	ON/ OFF	In the layout or data collection mode, it is possible to record coordinates entered directly from the keyboard.
	LANGUAGE※	ENGLISH/ OTHER ※	Select the displaying language.
	ACK MODE	STANDARD / OMITTED	Set the procedure of the communication with external device. STANDARD:Normal procedure OMITTED : Even though the [ACK] is omitted from the external device, the data is not sent again.
	GRID FACTOR	USE G.F. / DON'T USE	Select using GRID FACTOR in calculation of measurement data.
	CUT & FILL	STANDARD / CUT&FILL	In the layout mode, CUT & FILL can be displayed instead of dZ.
	ECHO BACK	ON / OFF	It is possible to output the data of echo back type.

※LANGUAGE selection is different in different countries.

16.2 How to Set Selecting Mode

<Example>:Setting unit in hPa, °F, NEZ MEMORY:ON

Operating procedure	Operation	Display
① While pressing [F2] key, turn power ON.	[F2] + Power ON	PARAMETERS 2 F1:UNIT SET F2:MODE SET F3:OTHERS SET
② Press [F1](1:UNIT SET) key.	[F1]	UNIT SET 1/2 F1:TEMP. & PRES. F2:ANGLE F3:DISTANCE
③ Press [F1](1:TEMP. & PRES.) key.	[F1]	TEMP. & PRES. UNIT TEMP. = °C PRES. = mmHg °C °F --- ENTER
④ Press [F2](°F) key, and press [F4](ENTER) key.	[F2] [F4]	TEMP. & PRES. UNIT TEMP. = °F PRES. = mmHg hPa mmHg inHg ENTER
⑤ Press [F1](hPa) key, and press [F4](ENTER) key. Returns to unit set menu.	[F1] [F4]	UNIT SET 1/2 F1:TEMP. & PRES. F2:ANGLE F3:DISTANCE
⑥ Press [ESC] key. Returns to PARAMETERS 2 menu.	[ESC]	PARAMETERS 2 F1:UNIT SET F2:MODE SET F3:OTHERS SET
⑦ Press [F3](3:OTHERS SET) key.	[F3]	OTHERS SET 1/4 F1:H-ANGLE BUZZER F2:S/A BUZZER F3:W-CORRECTION P↓
⑧ Press [F4](P↓) key, to get the function in page 2 .	[F4]	OTHERS SET 2/4 F1:NEZ MEMORY F2:REC TYPE F3:CR,LF P↓
⑨ Press [F1] key.	[F1]	NEZ MEMORY [OFF] [ON] [OFF] --- ENTER
⑩ Press [F1](ON) key, and press [F4] (ENTER) key. Returns to OTHERS SET menu.	[F1] [F4]	OTHERS SET 2/4 F1:NEZ MEMORY F2:REC TYPE F3:CR,LF P↓
⑪ Power off	Power OFF	

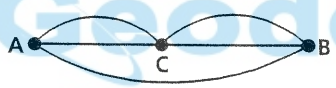
17 CHECK AND ADJUSTMENT

17.1 Checking and adjusting of instrument constant

Each of the Prism mode and Non-prism mode has instrument constant.
You must obtain the instrument constant of prism mode. If you reset the instrument constant of the prism mode, you must vary the non-prism constant by the same quantity as the amount of increase or decrease of the instrument constant of the prism mode.

Normally, the instrument constant does not have discrepancy. It is recommended you measure and compare with an accurately measured distance at a location where the precision is specifically monitored on a consistent basis. If such a location is not available, establish your own base line over 20m (when purchasing the instrument) and compare the data measured with the newly purchased instrument.
In both cases note that the setup displacement of the instrument position over the point, the prism, baseline precision, poor collimation, atmospheric correction, and correction for refraction and earth curvature determine the inspection precision. Please keep in mind these points.
Also, when providing a base line in a building, please note that differences in temperature greatly affect the length measured.
If a difference of 5mm or over is the result from the comparative measurement, the following procedure as shown below could be used to change the instrument constant.

① Provide point C on a straight line, connecting straight line AB which is almost level and about 100m long. Measure straight lines AB, AC and BC.



② Obtain the instrument constant by repeating ① above several times.
Instrument constant = AC + BC − AB
③ When there is error between written instrument constant value and calculated value, review the Chapter 17.4 "How to set the instrument constant" procedure.
④ Once again, measure at a calibrated baseline and compare results.
⑤ If using above procedure and no difference is found from the instrument constant at the factory or a difference of over 5mm is found, contact TOPCON or your TOPCON dealer.

14.1.1 Checking of the accuracy of the non-prism mode

If you reset the instrument constant, you must check the accuracy of the non-prism mode.
① Set a prism 20 to 50 meter apart from the instrument and measure the distance to the prism by prism mode.
② Take off the prism and set a (white) board.
③ Change the mode to the non-prism mode and measure the distance to the board.
④ Repeat above procedure and measure some points.
If the difference of the prism mode and non-prism mode is the range of ±10mm even one time, the instrument is normal.
If the difference is never the range of ±10mm, contact TOPCON or your TOPCON dealer.

17.2 Checking/Adjusting the Theodolite Functions

●Pointers on the Adjustment

① Adjust the eyepiece of the telescope properly prior to any checking operation which involves sighting through the telescope.
Remember to focus properly, with parallax completely eliminated.

② Carry out the adjustments in the order of item numbers, as the adjustments are dependent one upon another. Adjustments carried out in the wrong sequence may even nullify previous adjustment.

③ Always conclude adjustments by tightening the adjustment screws securely (but do not tighten them more than necessary, as you may strip the threads, twist off the screw or place undue stress on the parts).
Furthermore, always tighten by revolving in the direction of tightening tension.

④ The attachment screws must also be tightened sufficiently, upon completion of adjustments.

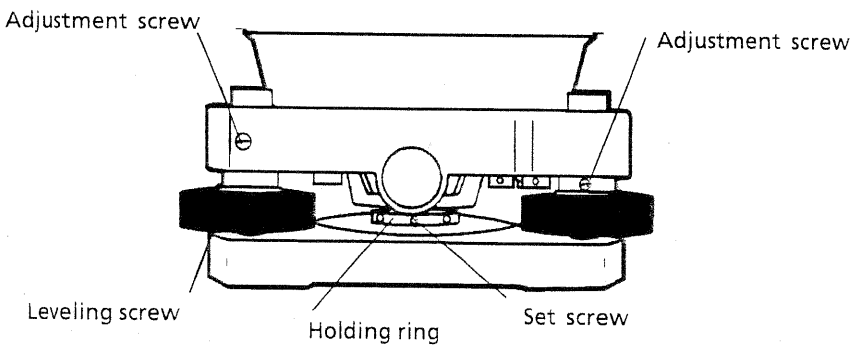
⑤ Always repeat checking operations after adjustments are made, in order to confirm results.

●Notes on the Tribrach

Note that the angle measuring precision may be effected directly if the tribrach has not been installed firmly.

① If any leveling screw becomes loose and slack or if collimation is unstable due to the looseness of leveling screws, adjust by tightening the adjusting screws (in 2 places) installed over each leveling screw with a screwdriver

② If there is any slack between the leveling screws and the base, loosen the set screw of the holding ring and tighten the holding ring with adjusting pin, until it is properly adjusted. Re-tighten the set screw on completing the adjustment.



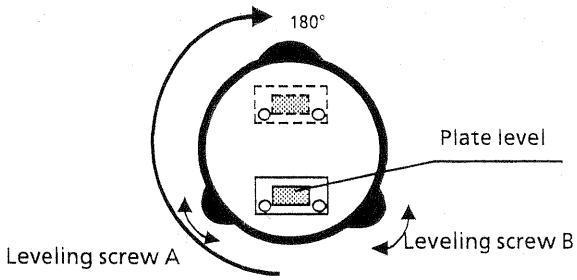
17.2.1 Checking /Adjusting the Plate Level

Adjustment is required if the axis of the plate level is not perpendicular to the vertical axis.

●Check

① Place the plate level parallel to a line running through the centers of two leveling screws, say, A and B. Use these two leveling screws only and place the bubble in the center of the plate level.

② Rotate the instrument 180° or 200g around the vertical axis and check bubble movement of the plate level. If the bubble has been displaced, then proceed with the following adjustment.

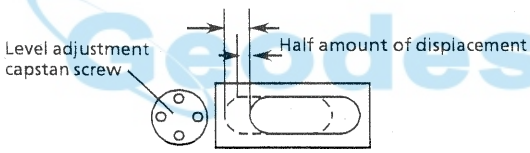


●Adjustment

① Adjust the level adjustment capstan screw, with the accessory adjusting pin and return the bubble towards the center of the plate level. Correct only one-half of the displacement by this method.

② Correct the remaining amount of the bubble displacement with the leveling screws.

③ Rotate the instrument 180° or 200g around the vertical axis once more and check bubble movement. If the bubble is still displaced, then repeat the adjustment.



17.2.2 Checking /Adjusting the Circular Level

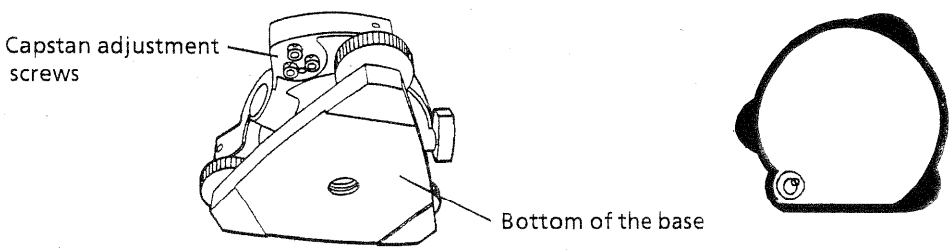
Adjustment is required if the axis of the circular level is also not perpendicular to the vertical axis.

●Check

① Carefully level the instrument with the plate level only. If the bubble of the circular level is centered properly, adjustment is not required. Otherwise, proceed with the following adjustment.

●Adjustment

① Shift the bubble to the center of the circular level, by adjusting three capstan adjustment screws on the bottom surface of the circular level, with the accessory adjusting pin.



17.2.3 Adjustment of the Vertical Cross-hair

Adjustment is required if the vertical cross-hair is not in a place perpendicular to the horizontal axis of the telescope (since it must be possible to use any point on the hair for measuring horizontal angles or running lines).

●Check

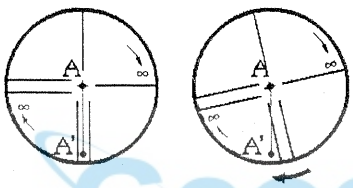
① Set the instrument up the tripod and carefully level it.

② Sight the cross-hairs on a well defined Point A at a distance of, at least, 50 meters (160ft.) and clamp horizontal motion.

③ Next swing the telescope vertically using the vertical tangent screw, and check whether the point travels along the length of the vertical cross-hair.

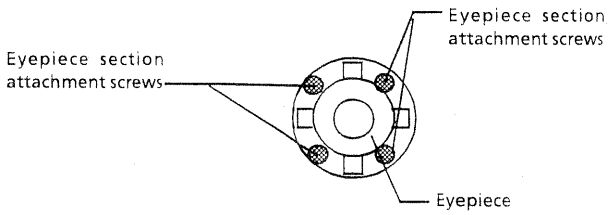
④ If the point appears to move continuously on the hair, the vertical cross-hair lies in a plane perpendicular to the horizontal axis (and adjustment is not required).

⑤ However, if the point appears to be displaced from the vertical cross-hair, as the telescope is swung vertically, then proceed with the following adjustment.



●Adjustment

① Unscrew the cross-hair adjustment section cover, by revolving it in the counterclockwise direction, and take it off. This will expose four eyepiece section attachment screws.



② Loosen all four attachment screws slightly with the accessory screw-drive (while taking note of the number of revolutions).
Then revolve the eyepiece section so that the vertical cross-hair coincides to Point A'.
Finally, re-tighten the four screws by the amount that they were loosened.

③ Check once more and if the point travels the entire length of the vertical cross-hair, further adjustment is not required.

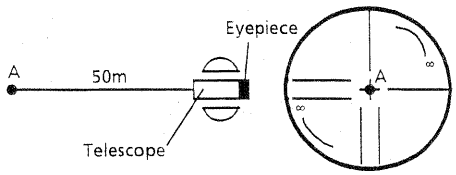
Note : Perform following adjustment after completing the above adjustment . Chapter 17.2.4 "Collimation of the Instrument", Chapter 17.2.6 "Adjustment of Vertical Angle Zero Datum" .

17.3.4 Collimation of the Instrument

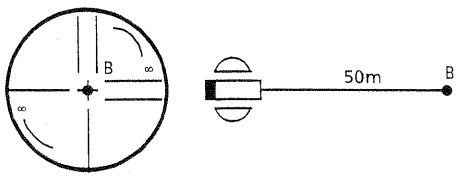
Collimation is required to make the line of sight of the telescope perpendicular to the horizontal axis of the instrument, otherwise, it will not be possible to extend a straight line by direct means.

●Check

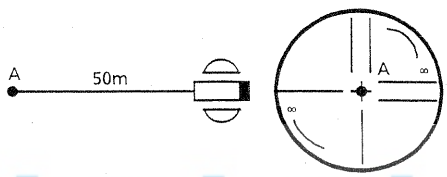
① Set the instrument up with clear sights of about 50 to 60meters (160 to 200 ft.) on both sides of the instrument.
② Level the instrument properly with the plate level.
③ Sight Point A at approximately 50 meters (160 t.) distance.



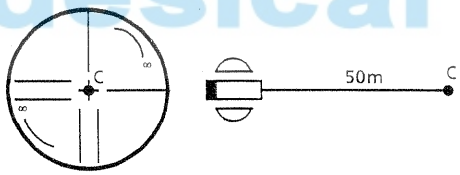
④ Loosen the vertical motion clamp only, and rotate the telescope 180° or 200g around the horizontal axis, so that the telescope is pointed in the opposite direction.
⑤ Sight Point B, at equal distance as Point A and tighten the vertical motion clamp.



⑥ Loosen the horizontal motion clamp and rotate the instrument 180° or 200g around the vertical axis. Fix a sight on Point A once more and tighten the horizontal motion clamp.

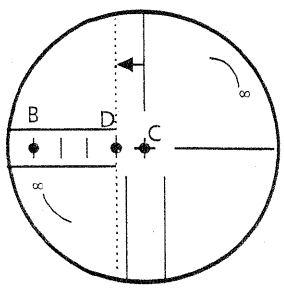


⑦ Loosen the vertical motion clamp only and rotate the telescope 180° or 200g around the horizontal axis once more and fix a sight on Point C, which should coincide with previous Point B.
⑧ If Points B and C do not coincide, adjust in the following manner.

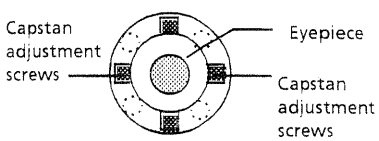


●Adjustment

① Unscrew the cross-hair adjustment section cover.
② Find Point D at a point between Points C and B, which should be equal to 1/4th the distance between Points B and C and measured from Point C. This is because the apparent error between Points B and C is four times the actual error since the telescope has been reversed twice during the checking operation.



③ Shift the vertical cross-hair line and coincide it with Point D, by revolving the left and right capstan adjustment screws with the adjusting pin.Upon completing the adjustment, repeat the checking operation once more. If Points B and C coincide, further adjustment is not required. Otherwise , repeat the adjustment.



Note 1):	First, loosen the capstan adjustment screw on the side to which the vertical cross-hair line must be moved. Then tighten the adjustment screw on the opposite side by an equal amount which will leave the tension of the adjustment screws unchanged. Revolve in the counterclockwise direction to loosen and in the clockwise direction to tighten, but revolve as little as possible.
Note 2):	Perform following adjustment after completing above adjustment . Chapter 17.2.6 "Adjustment of Vertical Angle 0 Datum".

17.2.5 Checking / Adjusting the Optical Plummet Telescope

Adjustment is required to make the line of sight of the optical plummet telescope coincide with the vertical axis (otherwise the vertical axis will not be in the true vertical when the instrument is optically plumbed).

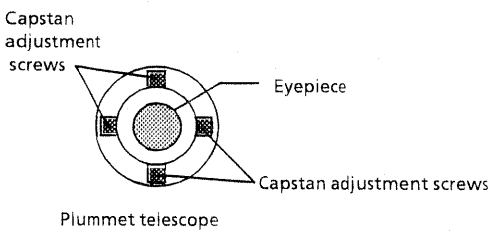
●Check

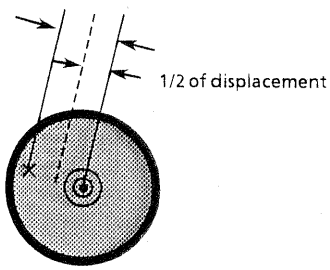
① Coincide the center mark and the point.(See Chapter 2 "PREPARATION OF MEASUREMENT".)

② Rotate the instrument 180° or 200g around the vertical axis and check the center mark. If the point is properly centered in the center mark, adjustment is not required. Otherwise, adjust in the following manner.

●Adjustment

① Take off the adjustment section cover of the optical plummet telescope eyepiece. This will expose four capstan adjustment screws which should be adjusted with the accessory adjusting pin to shift the center mark to the point. However, correct only one-half of the displacement in this manner.





② Use the leveling screws and coincide the point and center mark.

③ Rotate the instrument 180° or 200g around the vertical axis once more and check the center mark. If it is coincided to the point, then further adjustment is not required. Otherwise, repeat the adjustment.

Note:	First, loosen the capstan adjustment screw on the side to which the center mark must be moved. Then tighten the adjustment screw on the opposite side by an equal amount which will leave the tension of the adjustment screws unchanged. Revolve in the counterclockwise direction to loosen and in the clockwise direction to tighten, but revolve as little as possible.

17.2.6 Adjustment of Vertical Angle 0 Datum

If when measuring the vertical angle of target A at telescope position normal (direct) and reverse settings, the amount of normal and reverse measurements combined is other than 360° (ZENITH-0), half of the difference from 360° is the error amount from corrected 0 setting. Carry out adjustment. As adjustment for vertical angle 0 setting is the criteria for determining instrument coordinate origin, use special care for adjustment.

Operating procedure	Operation	Display
① Level the instrument properly with the plate level.		
② While pressing [F1]key, turn power switch ON.	[F1] + Power ON	ADJUSTMENT MODE 1/2 F1:V ANGLE 0 POINT F2:INST. CONSTANT F3:V0 AXIS P↓
③ Press [F1] key. Turn the telescope to do 0set.	[F1] Turn telescope	V 0SET TURN ↓
④ collimate target A from the telescope properly in normal setting.	Collimate A (Normal)	V0 ADJUSTMENT <STEP-1> FRONT V: 90°00'00" ENTER
⑤ Press [F4](ENTER) key.	[F4]	V0 ADJUSTMENT <STEP-2> REVERSE V: 270°00'00" ENTER
⑥ Collimate target A in reverse telescope setting.	Collimate A (Reverse)	
⑦ Press [F4](ENTER) key. Measured value is set and carry out normal angle measurement.	[F4]	<SET!> ↓ V : 270°00'00" HR: 120°30'40" 0SET HOLD HSET P1↓
⑧ Check that the total amount of normal and reverse angular travel is 360° collimating the target A by normal and reverse positions.		

17.3 How to Set the Instrument Constant Value

To set the Instrument constant which is obtained in Chapter 17.1 "Check and adjusting of instrument constant", follow as below.

Each of the Prism mode and Non-prism mode has instrument constant.
You must obtain the instrument constant of prism mode. If you reset the instrument constant of the prism mode, you must vary the non-prism constant by the same quantity as the amount of increase or decrease of the instrument constant of the prism mode.

Example setting: Instrument Constant of NON-PRISM mode

Operating procedure	Operation	Display
① While pressing [F1] key, turn power switch ON.	[F1] + POWER ON	ADJUSTMENT MODE F1:V ANGLE 0 POINT F2:INST. CONSTANT F3:V0 AXIS
② Press [F2] key.	[F2]	INST. CONSTANT SET F1:PRISM F2:NON-PRISM
③ Press [F2] key.	[F2]	INST. CONSTANT SET NON-PRISM : - 0.6 mm INPUT --- --- ENTER
④ Enter the constant value. ※1),2)	[F1] Enter value [F4]	INST. CONSTANT SET NON-PRISM : - 0.7 mm INPUT --- --- ENTER
⑤ Turn the power switch OFF.	Power OFF	

※1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters ".
※2) To cancel the setting, press [ESC] key.

17.4 Adjustment of Compensation Systematic Error of Instrument (Only for GPT-1003)

Operating procedure	Operation	Display
① Level the instrument properly with the plate level. ② While pressing [F1] key, turn power switch ON.	[F1] + Power ON	ADJUSTMENT MODE F1:V ANGLE 0 POINT F2:INST. CONSTANT F3:V0 AXIS
③ Press [F3] key.	[F3]	V0 AXIS F1:MEASUREMENT F2:CONSTANT LIST
④ Press [F1] key. Turn the telescope to do zero set.	[F1] Turn telescope	V0/AXIS ADJUSTMENTS
		ERROR CORRECTION (A)COLLIMATION (B)H AXIS
⑤ Collimate target A (around 0° in horizontal within ±3°) in normal telescope setting (FACE (1)).	Collimate A (Normal)	FRONT FACE1 /0 V: 89°55'50" LEVEL ±0 SKIP SET
⑥ press [F4](SET) key. ※1) The sample display shows that the measurement is made 5 times in FACE 1.	[F4]	
⑦ Turn the telescope in reverse telescope setting (FACE (2)).	Turn telescope	REVERSE FACE2 /5 V: 270°04'20" LEVEL ±0
⑧ Collimate target A.	[F4]	SET
⑨ Press [F4](SET) key. Repeat the procedures in step ⑧ and ⑨ so that the count of measured times matches to the one in FACE(1). ※2),3),4) The title display will be shown automatically.		(B)HORIZONTAL AXIS

⑩ Collimate target B (more than ±10° from the level) in reverse telescope setting (FACE(2)). ※5)	Collimate B (Reverse)	REVERSE FACE 2 /0 V: 270°04'20" LEVEL ±10° SET
⑪ Press [F4](SET) key. ※5)	[F4]	
⑫ Turn the telescope in normal telescope setting (FACE(1)).	Turn telescope	FRONT FACE 1 /5 V: 89°55'50" LEVEL ±10° SKIP SET
⑬ Collimate target B.	[F4]	
⑭ Press [F4](SET) key. Repeat the procedures in step ⑬ and ⑭ so that the count of measured times matches to the one in FACE(2). Then the display returns to main menu.		COMPLETE
• To show the constant list of systematic error of instrument		ADJUSTMENT MODE F1:V ANGLE 0 POINT F2:INST. CONSTANT F3:V0 AXIS
① Press [F3] key from Adjustment Mode menu 1/2.	[F3]	V0 AXIS F1:MEASUREMENT F2:CONSTANT LIST
② Press [F2] key. Correction values are displayed.	[F2]	VCo: -1°57'12" HCo: -0°00'20" HAx: -0°00'20" EXIT
③ Press [F1] key. The display returns to previous menu.	[F1]	

※ 1) It is able to get the average value from 1 to 10 measurements. To get the average, repeat the procedures in steps ⑤,⑥ or ⑩,⑪. The measured times is counted in the second line of display.

※ 2) The compensation values of 1) Error of vertical axis (X,Y tilt sensor offset), 2) Collimation error, and 3) Error of vertical angle 0datum will be set and memorized internally.

※ 3) The operating procedure steps to set compensation value of 4) Error of horizontal axis.

※ 4) Pressing [F1](SKIP) key enables to set next step without changing the last compensated value.

※ 5) Pressing [F1](SKIP) key makes end of setting without changing compensation value.

18 PRECAUTIONS

1. For transportation, hold by the handle or yoke of the instrument. Never hold by the lens barrel as it can affect the fixing bracket inside and reduce the accuracy of the instrument.

2. Never expose the instrument without a filter to direct sunlight. It may damage the components inside the instrument.

3. Never leave the instrument unprotected in high temperature. The temperature inside instrument may easily reach up to 70°C or above and will reduce the service life.

4. When a high degree of precision is required for measurement, provide shade against direct sunlight for the instrument and tripod.

5. Any sudden change of temperature to the instrument or prism may result in a reduction of measuring distance range, i.e. when taking the instrument out from a heated vehicle.

6. When opening the carrying case and taking out the instrument, place the case horizontally, then open the case.

7. When returning the instrument to its case, be sure to match the white positioning marks provided with the case and place the instrument with the eyepiece upward.

8. For transportation, provide dampening or a cushion appropriately to avoid sudden shock or vibration.

9. For cleaning the instrument after use, remove dust using a cleaning brush, then wipe off with a cloth.

10. For cleaning the lens surface, use a cleaning brush to remove the dust, then use a clean lintless cotton cloth. Moisten it with alcohol (or mixture with ether) to wipe gently in a rotational motion from the center out.

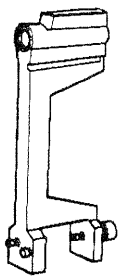
11. Even if any abnormality occurs, never attempt to disassemble or lubricate the instrument yourself. Always consult with TOPCON or your dealer.

12. To remove the dust on the case, never use thinner or benzine. Use a clean cloth moistened with neutral detergent.

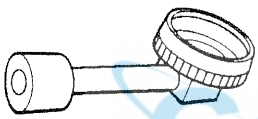
13. Check each part of the tripod after extended use. Parts (screws or clamps) may work themselves free.

19 SPECIAL ACCESSORIES

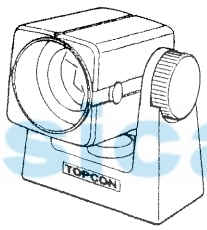
Data entry keyboard DK-7
Occupied point , coordinate data and other data can be input from DK-7. It is also possible to control GPT-1000 from DK-7.



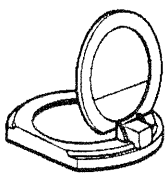
Trough compass, Model 6
Shock proof construction. No clamp is necessary when carrying the instrument.
When using this compass , use with the handle.



Diagonal eyepiece, Model 10
Observation in an easy posture will be provided up to the zenith position

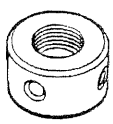


Mini prism
The mini prism (25.4mm) is made from precision ground glass and mounted in high impact plastic housings.
The mini has the unique capability of being positioned either at a "0" or "−30" with the same prism.

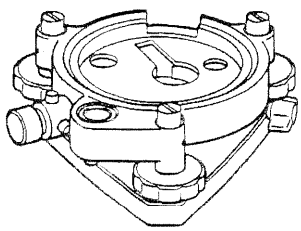


Solar filter, Model 6
A filter designed exclusively for direct collimation of the sun.
Solar filter of flap-up type.

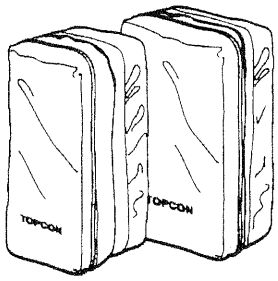
Prism sets
See the description on Chapter 20 "PRISM SYSTEM".



Solar reticle, Model 6
A reticle designed for collimation of the sun.
Can be used together with Solar Filter.



Optical plummet tribrach
This is detachable tribrach having built-in optical plummet telescope.
(Compatible with Wild)



Prism unit case, Model 6

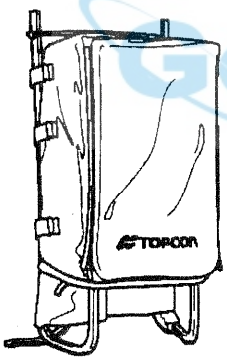
Fixed 9 prisms unit or tilting 3 prisms unit can be stored in this case. Especially, this is a very easy case to carry. Soft material is used.

- External dimensions:
  250(L)×120(W)×400(H) mm
- Weight:0.5kg

Prism unit case, Model 5

1 prisms unit or fixed 3 prisms unit can be stored in this case. Especially, this is a very easy case to carry. Soft material is used.

- External dimensions:
  200(L)×200(W)×350(H) mm
- Weight:0.5kg



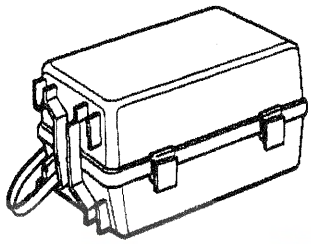
Back pack, Model 2

Convenient for use in mountainous terrain.

Gadget case, Model 1

A case to store and carry accessories.

- External dimensions:
  300(L)×145(W)×220(H) mm
- Weight:1.4kg

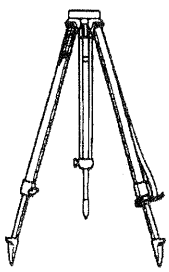


Prism unit case, Model 3

This is the plastic case to store and carry various sets of prisms.

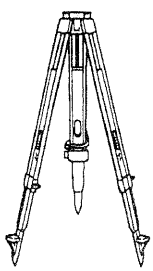
The case covers one of the following prism sets:

- Tilt single prism set
- Tilt single prism set with a target plate
- Fixed triple prism unit
- Fixed triple prism unit with a target plate
- External dimensions:
  427(L)×254(W)×242(H) mm
- Weight:3.1kg



Aluminum extension leg tripod, Type E

- Flat head 5/8" × 11 threads with adjustable legs.

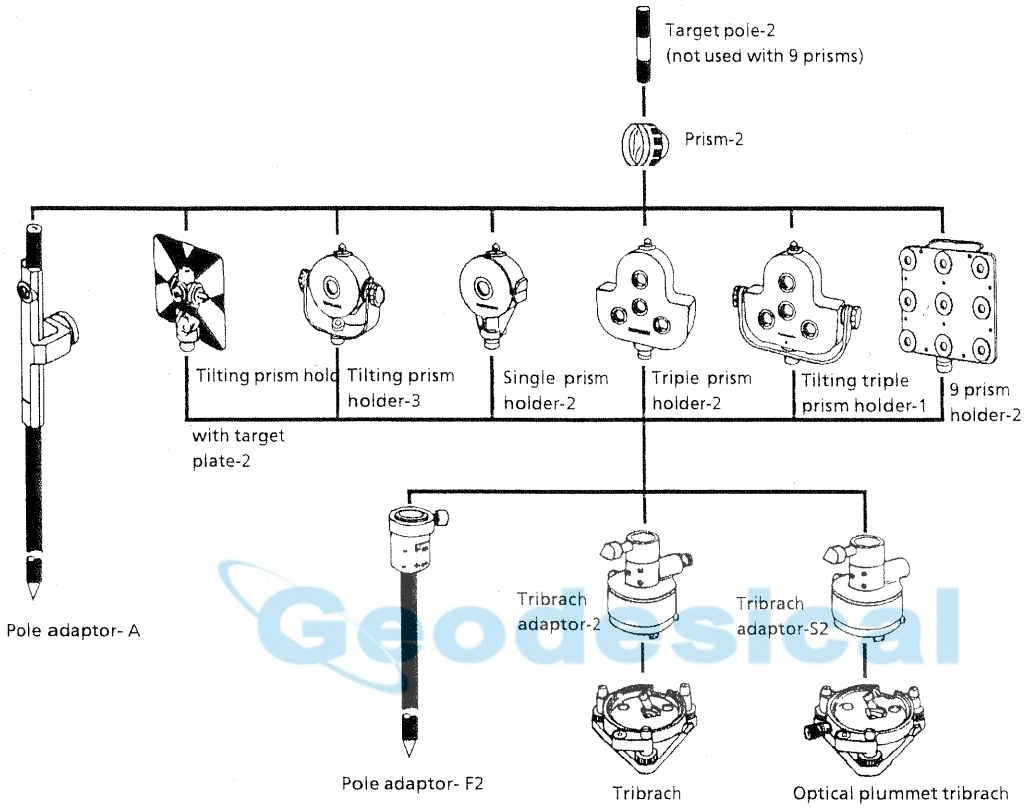


Wide-frame extension leg tripod, Type E (Wood)

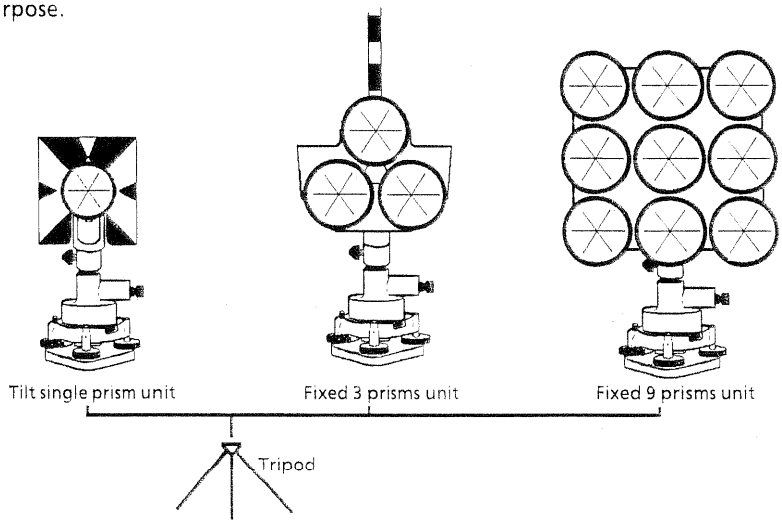
- Flat head 5/8" × 11 threads with adjustable legs.

20 PRISM SYSTEM

Arrangement according to your needs is possible.



It is possible to change the combination according purpose.



Use the above prisms after setting them at the same height as the instruments. To adjust the height of prism set, change the position of 4 fixing screws.

21 ERROR DISPLAYS

Error code	Description	Countermeasures
3 point required	When area calculating, there are less than 3 points coordinate data in selected file.	Confirm the file data and calculate again.
CALC ERROR	Calculation is impossible from the data input.	Confirm the input data.
DELETE ERROR	When deleting coordinate data, it can not be done successful.	Confirm the data and delete again.
SIGNAL OVER	Displayed when you measure the prism of short distance with non-prism mode, or when the telescope received too much light.	Measure by using a target without using a prism, or change the mode from non-prism mode to prism mode.
E01	Displayed when the instrument rotated too fast (2 rotates / sec.).	Pressing [F1](0set) key, returns to measuring mode.
E02	Displayed when the telescope rotated too fast (2 rotates / sec.).	Press [F1](0set) key, and after display of "V-0 set", set vertical angle zero by rotating telescope.
E03	Displayed when an internal problem exists with the measuring system.	Switch OFF the power , then ON again. Sometimes error occurs when vibrates, clear the vibration.
E35	Displayed when REM measurement carried out to the range from zenith or nadir ± 6°.	Operate in the range out of ± 6° from the zenith or nadir.
E60's	Any abnormality occurs with EDM (distance measuring system).	Repair is required.
E71	Displayed when vertical angle 0 position is set with incorrect procedure.	Confirm the procedure and readjust.
E72	Displayed when Vertical angle -position is adjusted in wrong position.	Repair is required.
E73	The instrument was not leveled when Vertical angle 0-position is adjusted.	Level the instrument then carry the adjustment work.
E80's	Mainly at the time data transmission between GPT-1000 series and external instrument.	Confirm operation procedure is correct or the connection cables are correct.
E90's	Abnormality in internal memory system.	Repair is required.
FILE EXISTS	The same file name exists.	Use another file name.

FULL FILES	When making a file, 30 files already exist.	If necessary, send or delete files.
FAILED INITIALIZE	Initializing can not be done successful.	Confirm initializing data and try to initialize again.
LIMIT OVER	Limit of input data exceeded.	Input again.
MEMORY ERROR	Any abnormality occurs with internal memory.	Initialize the internal memory.
MEMORY POOR	Shortage of capacity of the internal memory.	Download data from internal memory to PC.
MODE ERROR	Any abnormality occurs with measuring controlling.	
NO DATA	The data is not found in the search mode	Confirm the data and search again.
NO FILE	There is no file in internal memory.	If necessary, make files.
FILE NOT SELECTED	When using a file, no file is selected.	Confirm the file and select a file
P1-P2 distance too short	When in point to line measurement, the horizontal distance between first point and second point is within 1m.	The horizontal distance between first point and second point must be more than 1m.
PT# EXIST	Same new point name is already memorized in the memory.	Confirm the new point name and input again.
PT# DOES NOT EXIST	When you enter incorrect name or PT# does not exist in the internal memory.	Enter the correct name or enter point in the internal memory.
RANGE ERROR	When setting a new point, calculation is impossible from the measured data.	Measure again.
Tilt Over	Instrument tilts over more than 3 minutes.	Level the instrument properly.
Unexpected Error	Any abnormality occurs with internal program.	
W/C ERROR	Displayed when measurement carried out within ±9° from zenith or nadir at the Earth curvature and refraction correction mode is ON.	Set correction for refraction and earth curvature mode OFF or measure out of ±9° from the zenith or Nadir.

22 SPECIFICATIONS

Telescope

Length	:	150mm
Objective lens	:	45mm (EDM 50mm)
Magnification	:	30×
Image	:	Erect
Field of view	:	1°30′
Resolving power	:	2.5"
Minimum focus	:	1.3m
Reticle illumination	:	Provided

Distance measurement

Measurement range

Non-prism mode (Target:White wall) : 100m (330ft) (In low light condition)
130m (426ft) (Without sun glare on target)

Prism mode:

Model	Prism	Atmospheric conditions
		Condition 1
GPT-1003	Mini prism	2,000m (6,600ft)
	1 prism	6,000m (19,700ft)
GPT-1004	Mini prism	2,000m (6,600ft)
	1 prism	6,000m (19,700ft)

Condition 1: Sight haze with visibility about 20km (12.5miles)
moderate sunlight with light heat shimmer.

Measurement accuracy		
Non-prism mode	:	±10mm (3m~ / Diffusing Surface)
Prism mode	:	±(3mm + 2ppm) m.s.e.
Least Count in Measurement		
Fine measurement mode	:	1mm (0.005ft.) / 0.2mm (0.001ft.)
Coarse measurement mode	:	10mm (0.02ft.) / 1mm (0.005ft.)
Tracking measurement mode	:	10mm (0.02ft.)
Measurement Display	:	11 digits : max. display 9999999.9999
Measurement Time		
Fine measurement mode	:	1mm :1.0sec. (Initial 3 sec.)
		0.2mm :3.0sec. (Initial 4 sec.)
Coarse measurement mode	:	10mm :0.5sec. (Initial 2.5 sec.)
	:	1mm :0.5sec. (Initial 2.5 sec.)
Tracking measurement mode	:	0.3sec. (Initial 2.5 sec.)
		(The initial time will be different by a condition.)
Atmospheric Correction Range	:	−99.9 ppm to +99.9 ppm , in 0.1 ppm increments
Prism Constant Correction Range	:	−99.9 mm to +99.9 mm , in 0.1 mm increments
Coefficient Factor	:	Meter / Feet 1meter = 3.2808398501 ft.
Ambient Temperature Range	:	−20°C to +50°C (−4°F to +122°F)

Electronic Angle Measurement

Method		:	Incremental reading
Detecting system:			
Horizontal angle			
	GPT-1003	:	2 sides
	GPT-1004	:	1 side
Vertical angle		:	1 sides
Minimum reading			
	GPT-1003	:	5"/1"(1mgon / 0.2mgon) reading
	GPT-1004	:	5"/1"(1mgon / 0.2mgon) reading
Accuracy(Standard deviation based on DIN 18723)			
	GPT-1003	:	5"(1.5mgon)
	GPT-1004	:	6"(1.8mgon)
Diameter of circle		:	71mm

Tilt Correction (Automatic index)

Tilt sensor	GPT-1003	:	Automatic vertical and horizontal compensator
	GPT-1004	:	Automatic vertical compensator
Method		:	Liquid type
Compensating Range		:	±3′
Correction unit		:	1"

Others

Water protection		:	IPX 4
Instrument height		:	176mm (6.93in) Base unit detachable (Height from the tribrach dish to the center of telescope)
Level sensitivity			
Circular level		:	10′/2mm
Plate level	GPT-1003	:	30"/2 mm
	GPT-1004	:	40"/2 mm
Optical Plummet Telescope			
Magnification		:	3×
Focusing range		:	0.5m to infinity
Image		:	Erect
Field of view		:	5°(114mmϕ/1.3m)
Dimension			
(with carrying handle)		:	343(H)×184(W)×150(L) mm (13.5(H)×7.2(W)×5.9(L) in)
(without carrying handle)		:	293(H)×184(W)×150(L) mm (11.5(H)×7.2(W)×5.9(L) in)
Weight			
Instrument (with carrying handle and battery)		:	5.1kg (11.2 lbs)
Plastic carrying case		:	3.7kg (8.2 lbs)

On-board Battery BT-32Q

Out put voltage	:	7.2 V
Capacity	:	1.4 AH
Maximum operating time(when fully recharged) at +20°C (+68°F)		
Including distance measurement	:	1.5hours
Angle measurement only	:	18hours
Weight	:	0.3kg (0.7 lbs)

Battery Charger BC-19BR / BC-19CR

Input voltage	:	AC 120V(BC-19BR), AC 230V(BC-19CR)
Frequency	:	50/60Hz
Recharging time (at +20°C / +68°F)		
On-board battery BT-32Q	:	1.5 hours
Discharding time (at +20°C / +68°F)		
On-board battery BT-32Q	:	8 hours (in case of full charge)
Operating temperature	:	+10°C to +40°C (+50°F to 104°F)
Charging signal	:	Red lamp illumination
Refreshing signal	:	Yellow lamp illumination
Finishing signal	:	Green lamp illumination
Weight	:	0.5kg (1.1 lbs)

- Battery using time will vary depending on environmental conditions and operations done with GPT-1000 series.

1 Dual Axis Compensation

Inclination of the vertical axis with respect to true vertical will result in incorrectly measured horizontal angles. The extent of the error in horizontal angle measurement due to axis tilt depends on three factors :

- the amount of the tilt of axis
- the elevation of the target
- the horizontal angle between the direction of till of the vertical axis and the target.

These factors are related by the following formula :

$$Hz_{err} = V \cdot \sin\alpha \cdot \tan h$$

where v = tilt of axis in arcseconds
α = azimuth angle between vert. axis direction and target
h = elevation of target
Hz_{err} = error in horizontal angle

Example: When the vertical axis is tilted by 30 arcseconds, the target is 10° above the horizon and rotated 90° in azimuth from the direction of the vertical axis error.

$$Hz_{err} = 30'' \cdot \sin\alpha \cdot \tan 10°$$
$$Hz_{err} = 30'' \cdot 1 \cdot 0.176326 = 5.29''$$

From the above example it can be seen that horizontal angle errors will increase with steeper vertical sights (tangent will increase as vertical angle increases) and will be at a maximum when the target is at right angles (sin 90° = 1) to the direction of the vertical axis error. Errors will be at a minimum when the sights are nearly horizontal (h = 0, tan0 = 0) and in the same direction as the vertical axis error (α = 0, sin0 = 0). Please refer to the table below to see the relationship between axis tilt (v) and elevation (h) and the error in horizontal angles which results from these factors.

v \ h	0°	1°	5°	10°	30°	45°
0"	**0"**	**0"**	**0"**	**0"**	0"	0"
5"	**0"**	**0.09"**	**0.44"**	**0.88"**	2.89"	5"
10"	0"	0.17"	0.87"	1.76"	5.77"	10"
15"	0"	0.26"	1.31"	2.64"	8.66"	15"
30"	0"	0.52"	2.62"	5.29"	17.32"	30"
1'	0"	1.05"	5.25"	10.58"	34.64"	1'

It is clear from the table that dual axis compensation has the most benefit when the elevation of the target is greater then 30° and the axis is tilted more than 10". The entries indicated in bold in the table show, in fact, that for many common surveying applications i.e. target elevation <30° and axis error <10", virtually no correction would be required. Dual axis compensation is especially suited then for applications where the sights are very steep.

Even though the compensators can correct horizontal angles for vertical axis errors, ***it is still important to use care in setting up the instrument.***
Centering error, for instance, cannot be corrected by the compensators. If the vertical axis is tilted by 1' with the instrument 1.4meters above the ground, a centering error of approx. 0.4mm will result. The maximum effect of this error at 10m is about 8" of horizontal angle error.

In order to maintain the increased accuracy possible through dual axis compensation, it is necessary to keep the compensators in proper adjustment.The compensators must agree with the actual level condition of the instrument. Through various environmental stresses, the agreement between the level condition sensed by the compensators and the true level condition of the instrument may be disturbed. In order to reestablish the correct relationship between the compensator and the true level condition of the instrument, it is necessary to carry out the vertical indexing procedure listed on chapter 17.3.6 "Adjustment of vertical Angle 0 Datum". This adjustment will both reset the vertical index (cause a direct + indirect zenith reading to the same elevation to equal 360°) and zero the level reference for the horizontal compensator. While correct vertical angles can be obtained by averaging direct and indirect reading even when the index is improperly adjusted, the same is not true for horizontal angles. Since the vertical axis error is fixed for a given setup, its effect cannot be removed by averaging two readings. ***For this reason, it is extremely important to maintain the vertical indexing adjustment to insure proper correction of the horizontal angles.***

2 Precaution when Charging or Storing Batteries

The capacity of battery will be affected and its service life shortened in any of the following cases while it is recharged, discharged or stored.

1. Recharging

Fig. 1 shows how ambient temperature at recharging is related to charging efficiency or as affecting discharge capacity. As seen from the figure, charging at normal temperature is best, and the efficiency decreases as the temperature rises. It is best, therefore, to always recharge the battery at normal temperature to obtain full use of battery capacity and enjoy maximum operation per charge. And the service life of your battery will be shortened if it is frequently overcharged or recharged at high temperature.

Note : 0.1C charge means that the battery is recharged with 0.1 -time current as against its capacity.

2. Discharge

Fig. 2 shows discharge temperature characteristics. Discharge characteristics at high temperature are the same as those at normal temperatures. The battery is likely to have reduced discharge capacity as well as lower discharged voltage when discharged at low temperature. And the service life of your battery will be shortened if it is greatly overcharged.

Note : 1C discharge means one with 1 -time current over battery capacity.

3. Storage

See Fig. 3 for how storing period at different temperature levels is related to the remaining capacity. The battery will lose its capacity as storage temperature rises and the storage period increases. This does not mean, however , that the battery performance is damaged when the battery is stored. The battery, reduced in capacity, will be restored once it is recharged. Always recharge your battery before use. And recharge and discharge the battery 3 or 4 times to restore its capacity if it has been stored for a long period or at high temperature. Storing at high temperature can adversely affect the service life of your battery.

Your battery has been fully charged before leaving the factory, but its capacity may be affected considerably when it takes several months to reach you, if it is stored at high temperature area or passes through a high-temperature region. Then, the battery must be recharged and discharged 3~4 times to fully restore its capacity.

And the battery should always be stored at normal temperature or lower if it will not be used for any long period. This helps your battery have a longer service life.

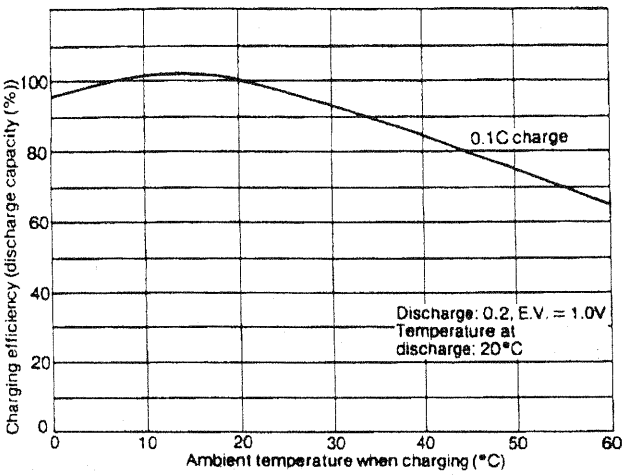


Fig. 1 Recharging

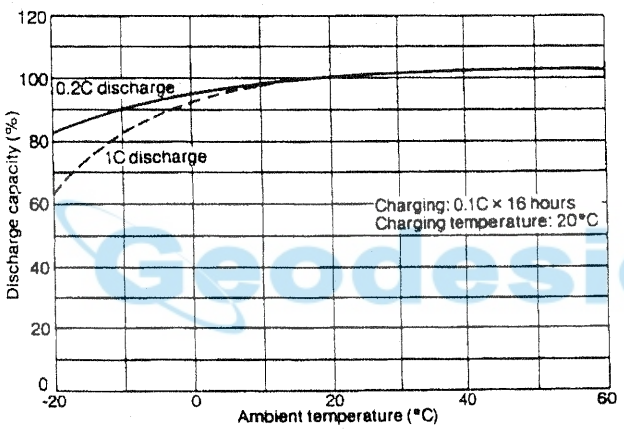


Fig. 2 Discharge

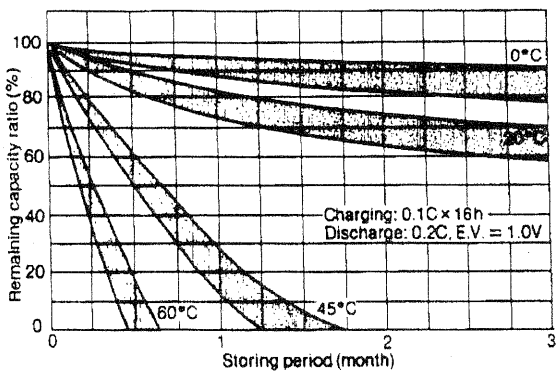


Fig. 3 Storage

TOPCON CORPORATION

75-1 Hasunuma-cho, Itabashi-ku, Tokyo, 174 Japan.
Phone: 3-3558-2520 Fax: 3-3960-4214 http://www.topcon.co.jp

TOPCON AMERICA CORPORATION

CORPORATE OFFICE
37, West Century Road, Paramus, New Jersey 07652, U.S.A.
Phone: 201-261-9450 Fax: 201-387-2710 www.Topcon.com

TOPCON CALIFORNIA
3380 Industrial BLVD, Suite 105, West Sacramento, CA 95691, U.S.A.
Phone: 916-374-8575 Fax: 916-374-8329

TOPCON MIDWEST
891 Busse Road, Elk Grove Village, IL 60007, U.S.A.
Phone: 847-734-1700 Fax: 847-734-1712

TOPCON DENVER
109 Inverness DR, E Uniti Englewood, Co 80112, U.S.A.
Phone: 303-706-0920 Fax: 303-706-0921

TOPCON LASER SYSTEMS, INC.

5758 West Las Positas Blvd. Pleaasanton, CA 94588, U.S.A.
Phone: 925-460-1300 Fax: 925-460-1315 www.topconlaser.com

TOPCON EUROPE B.V.

ESSE Baan 11, 2908 LJ Capelle a/d IJssel, The Netherlands.
Phone: 010-4585077 Fax: 010-4585045 www.topconeurope.com

TOPCON BELGIUM

Preenakker 8, 1785 Merchtem, Belgium
Phone: 052-37.45.48 Fax: 052-37.45.79

TOPCON DEUTSCHLAND G.m.b.H.

Halskestr. 7,47877 Willich, GERMANY
Phone: 02154-9290 Fax: 02154-929-111 Telex: 8531981 TOPC D

TOPCON S.A.R.L.

104/106, Rue Rivay, 92300 Levallois-Perret, FRANCE
Phone: 01-4106 9494 (MEDICAL) 1-4106 9490 (TOPOGRAPHIE)
Fax: 01-47390251

TOPCON ESPAÑA S.A.

HEAD OFFICE
Frederic Mompou, 5 08960, Sant Just Desvern Barcelona, SPAIN.
Phone: 93-473-4057 Fax: 93-473-3932

MADRID OFFICE
Avenida Ciudad de Barcelona 81,1 Planta 28007, Madrid, SPAIN.
Phone: 91-552-4160 Fax: 91-552-4161

TOPCON SCANDINAVIA A. B.

Industrivägen 4 P.O. Box 2140 43302 Sävedalen SWEDEN.
Phone: 031-261250 Fax: 031-268607 Telex: 21414

TOPCON (GREAT-BRITAIN) LTD.

HEAD OFFICE
Coach House,London Road, Hurst Green,EastSussexTN19 7QP U.K.
Phone: 01580-860801 Fax: 01580-860802

TOPCON SINGAPORE PTE. LTD.

Alexandra Distripark, Block 4, #05-15, Pasir Panjang Road, SINGAPORE 118491
Phone: 2780222 Fax: 2733540 Telex: RS 26622 E-mail: topconts@singnet.com.sg

TOPCON AUSTRALIA PTY. LTD.

408 Victoria Rode, Gladesville, NSW 2111 AUSTRALIA
Phone: 02-9817-4666 Fax: 02-9817-4654

TOPCON INSTRUMENTS (THAILAND) CO.,LTD.

77/162 Sinn Sathorn Tower, 37th Fl.,
Krungdhonburi Rd., Klongtonsai, Klongsarn, Bangkok 10600 Thailand.
Phone: 662-440-1152~7 Fax: 662-440-1158

TOPCON INSTRUMENTS (MALAYSIA) SDN.BHD.

Lot 226 Jalan Negara 2, Pusat Bandar Taman Melawati,
Taman Melawati, 53100, Kuala Lumpur, Malaysia.
Phone: 03-4079801 Fax: 03-4079796

TOPCON KOREA CORPORATION

Hyobong Bldg., 1-1306, Seocho-Dong, Seocho-Gu, Seoul, KOREA
Phone: 02-3482-9231 Fax: 02-3481-1928

TOPCON OPTICAL (H.K.) LIMITED

2-4/F Meeco Industrial Bldg, NO. 53-55
Au Pui Wan Street, Fo Tan Road, Shatin, N.T. HONG KONG
Phone: 2690-1328 Fax: 2690-2221 E-mail: sales@topcon.com.hk

TOPCON CORPORATION BEIJING OFFICE

Room No. 962 Poly Plaza Building, 14 Dongzhimen Nandajie,
Dongcheng District, Beijing, 100027, China
Phone: 10-6501-4191~2 Fax: 10-6501-4190

TOPCON CORPORATION BEIRUT OFFICE

P. O. BOX 70-1002 Antelias, BEIRUT-LEBANON.
Phone: 961-4-523525/961-4-523526 Fax: 961-4-521119

TOPCON CORPORATION DUBAI OFFICE

Offce No. 102,Khalaf Rashd Al Nayli Bldg., 245 Abu Hail Road, Deira,Dubai,UAE
Phone: 971-4-696511 Fax: 971-4-695272