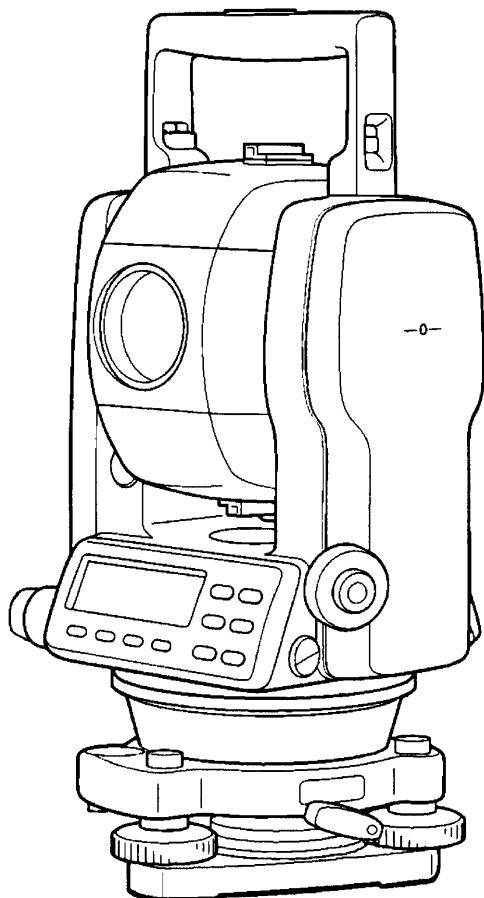




INSTRUCTION MANUAL

ELECTRONIC TOTAL STATION
GTS-210 SERIES
GTS-211D
GTS-212
GTS-213



Foreword

Thank you for purchasing the TOPCON Electronic Total Station, GTS-210 series. For the best performance of the instruments, please carefully read these instructions and keep them in a convenient location for future reference.

GENERAL HANDLING PRECAUTIONS

Do not submerge the instrument into water.

The instrument can not be submerged underwater.

The instrument is designed based on the International Standard (IP Code) IPX 6, therefore it is protected from the normal shower or 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

- Aiming the instrument directly into the sun can result in serious damage to your eye.
Do not aim the instrument directly into the sun.
- GTS-210 series is not explosion proof.
Avoid using in an area that produces explosive gases.

CAUTION

- There is a risk of leakage and electric shock if you take out or insert the power plug or cable with wet hands.
Avoid when hands are wet.
- There is a risk of hurt if the unit come down by less tighten condition of tripod screw.
Tight firmly when you are going to set up the unit to the tripod.
- There is a risk of hurt by overturn the carrying case.
Do not ride on the carrying case.

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 misuse including any direct, indirect, consequential damage, and loss of profits.

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STANDARD SET COMPOSITION

- | | |
|--|--------|
| 1. GTS-210 series (with lens cap) | 1 each |
| 2. Battery BT-32Q..... | 1 each |
| 3. Battery charger BC-19B or BC-19C..... | 1 each |
| 4. Tool kit with case [rod pins, screwdriver , cleaning brush]..... | 1 set |
| 5. Plastic carrying case | 1 each |
| 6. Silicon cloth..... | 1 each |
| 7. Plastic rain cover | 1 each |
| 8. Instruction manual | 1 each |

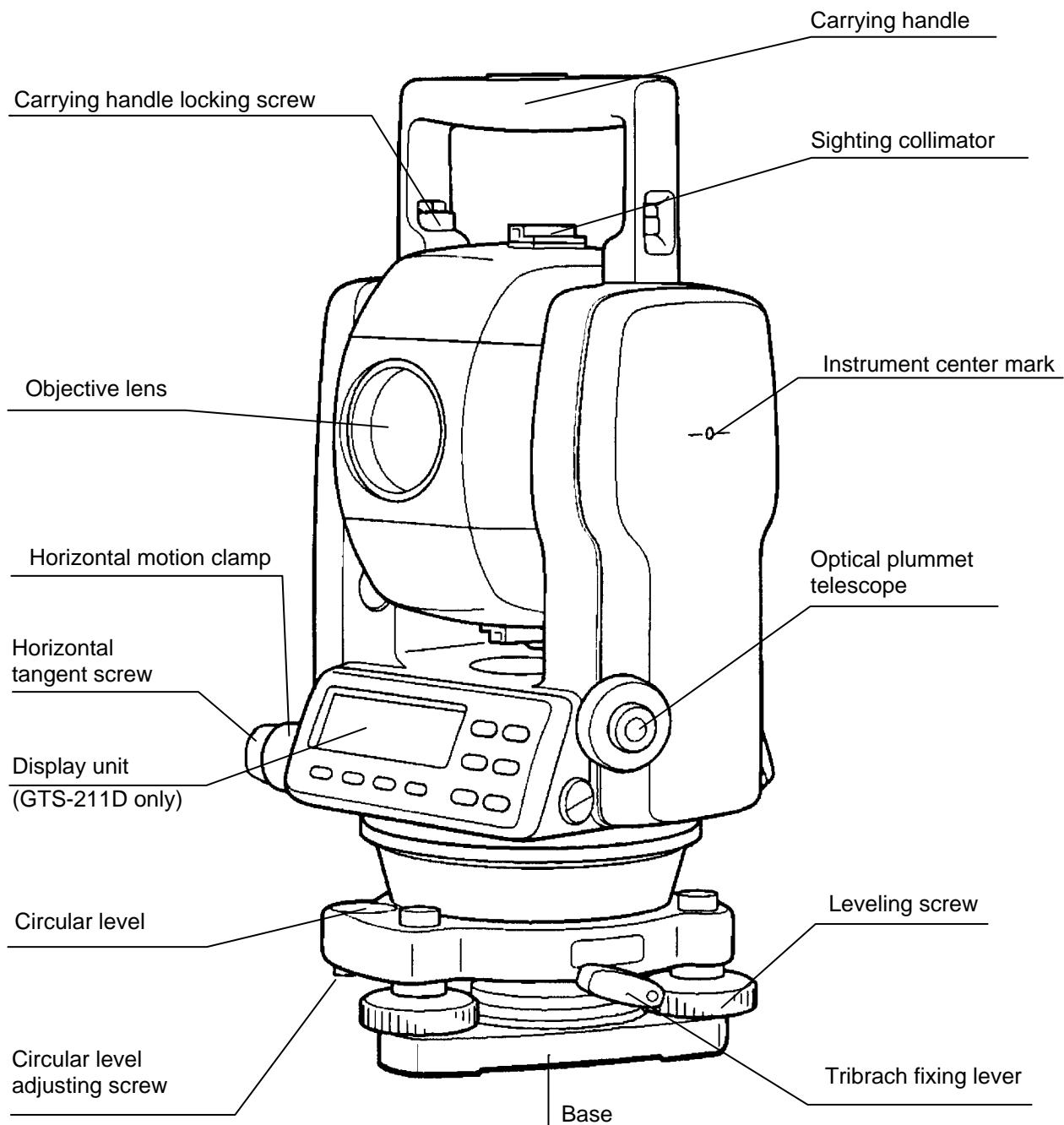
(Make sure that all of the above items are with the instrument when purchased.)

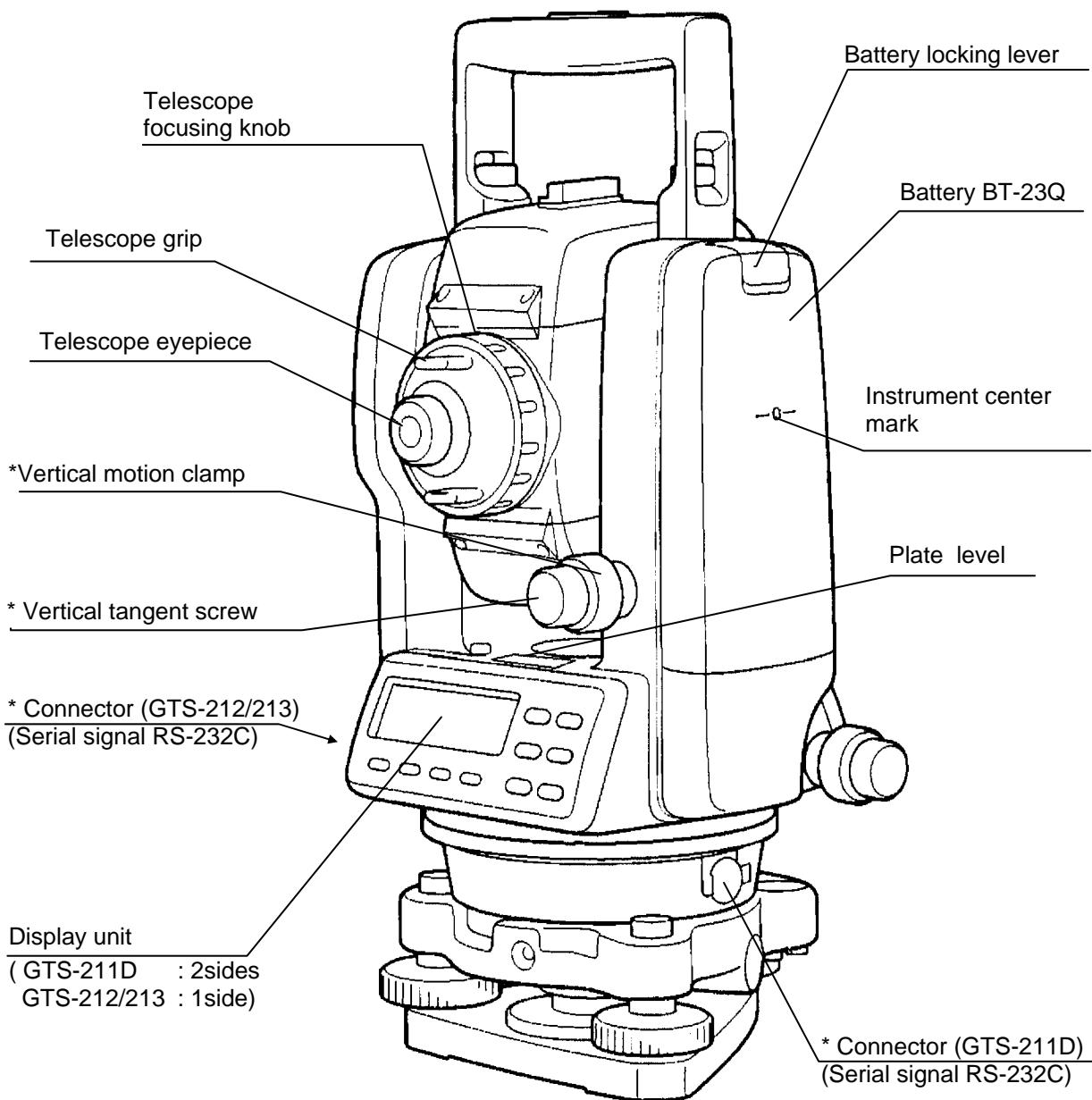


- Remarks:
1. Battery charger BC-19C is for AC 230V use and BC-19B is for AC 120V use.
 2. Plumb bob set and plumb bob hook are supplied for certain markets.
 3. 2 Batteries are supplied for certain markets.

1 NOMENCLATURE AND FUNCTIONS

1.1 Nomenclature





- *1) The position of vertical motion clamp and Vertical tangent screw will differ depending on the market.
- 2) The position of connector(Serial signal RS-232C) for GTS-212/213 will differ depending on the market.

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

HR: 120°30'40"

HD* 65.432m

VD: 12.345m

MEAS MODE S/A P1↓

Distance measurement mode

V-angle : 90°10'20"

H-angle : 120°30'40"

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 S/A 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 S/A P1↓

Horizontal-angle : 120°30'40"

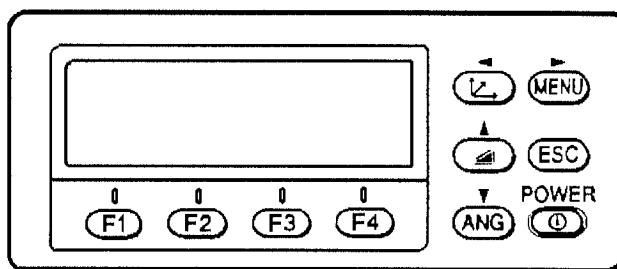
Horizontal distance : 123ft 4in 6/8in

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		
SD	Slope distance		
N	N coordinate		
E	E coordinate		
Z	Z coordinate		

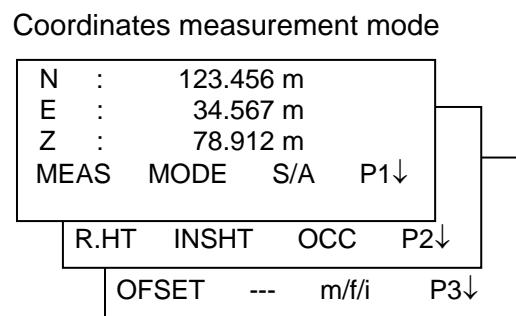
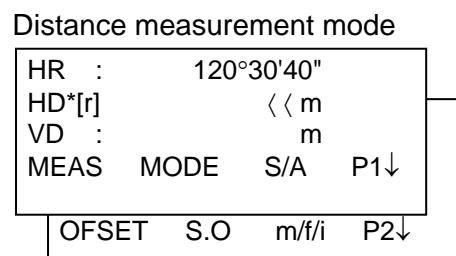
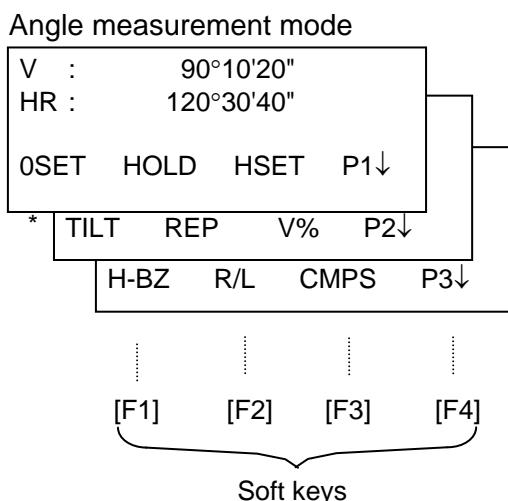
1.3 Operating Key



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	<ul style="list-style-type: none"> 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.



* [F2](REP) key is only for GTS-211D

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 * This function is only for GTS-211D
	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	S/A	Select set audio 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	m/f/i	Switches meter, feet or feet and inch unit.
	F4	P2↓	The function of soft keys is shown on next page (P1).

Coordinate measurement mode

1	F1	MEAS	Start measuring
	F2	MODE	Sets a measuring mode, Fine/Coarse/Tracking
	F3	S/A	Select set audio 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
	F3	m/f/i	Switches meter, feet or feet and inch unit.
	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 GTS-210 series with a computer or TOPCON Data Collector, which enables the computer to receive measured data from the GTS-210 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 GTS-210 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

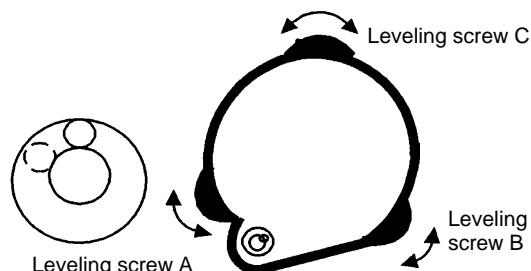
First, extend the extension legs to suitable lengths and tighten the screws on their midsections.

2. Attaching the Instrument on the Tripod Head

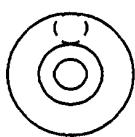
Place the instrument carefully on the tripod head and slide the instrument by loosening the tripod screw. If the plumb bob is positioned right over the center of the point, slightly tighten the tripod screw.

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.

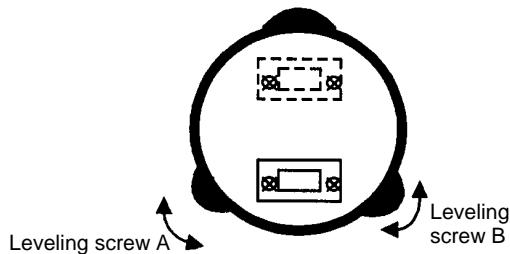


- ② Turn the leveling screw C to bring the bubble to the center of the circular level.

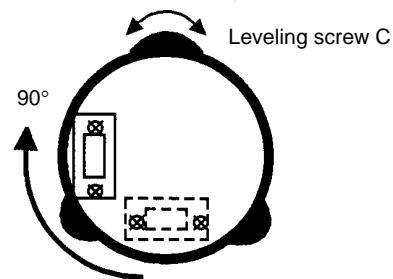


4. Centering by Using the Plate Level

- 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.



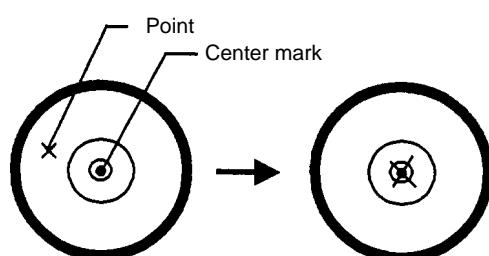
- ② Rotate the instrument 90° (100g) around its vertical axis and turn the remaining leveling screw or C to center the bubble once more.



- 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

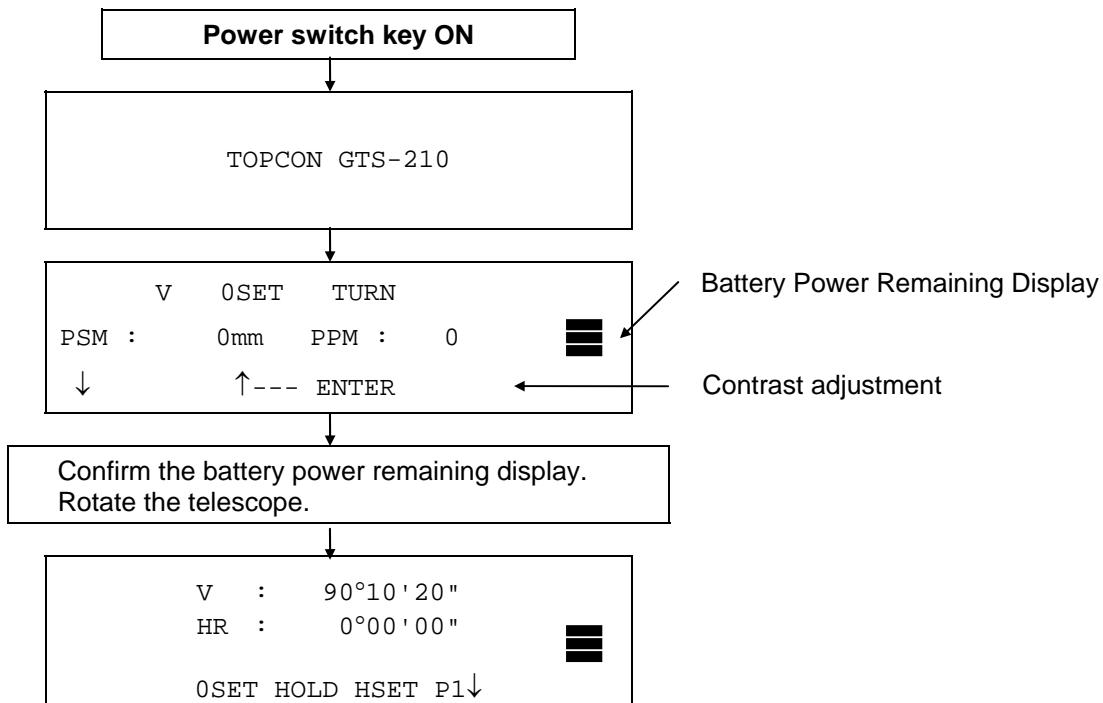
Leveling the instrument precisely in a similar way to 4. Rotate the instrument and check to see that the bubble is in the center of the plate level regardless of telescope direction, then tighten the tripod screw hard.

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) and atmospheric correction value (PPM) . This allows you to confirm the prism constant value to be used.

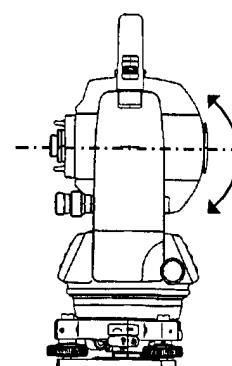
- ② Rotate the telescope to set the instrument at vertical angle reading of 0°



- 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.
- 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.

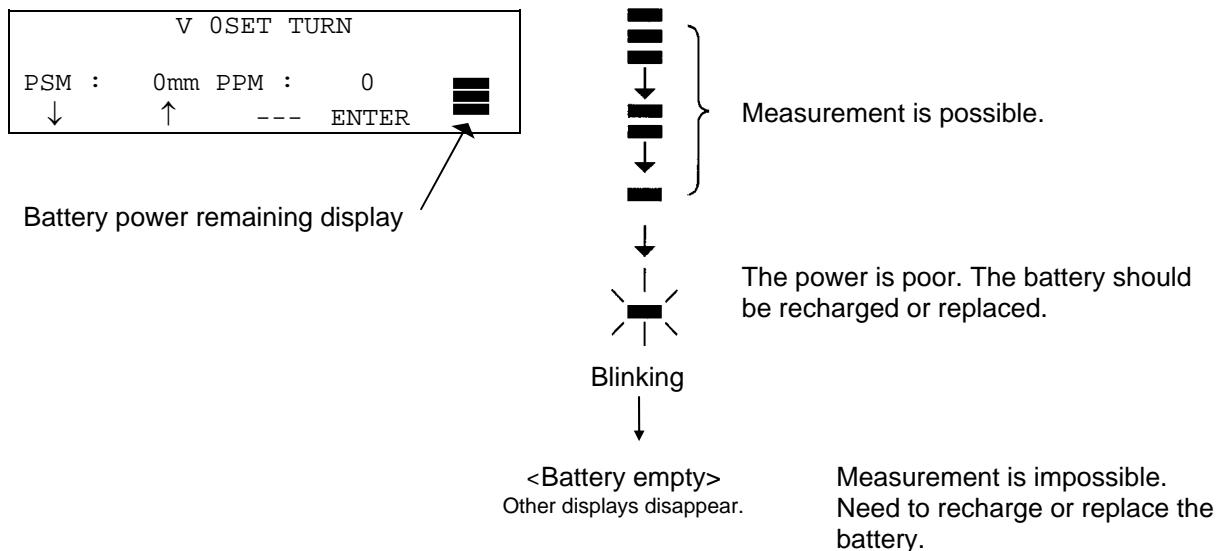
Note : For setting the vertical angle at 0°, an electronic datum 0 is provided on the vertical angle circle. If the telescope is turned and the sensor passes the datum 0, angle measurement begins.

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.



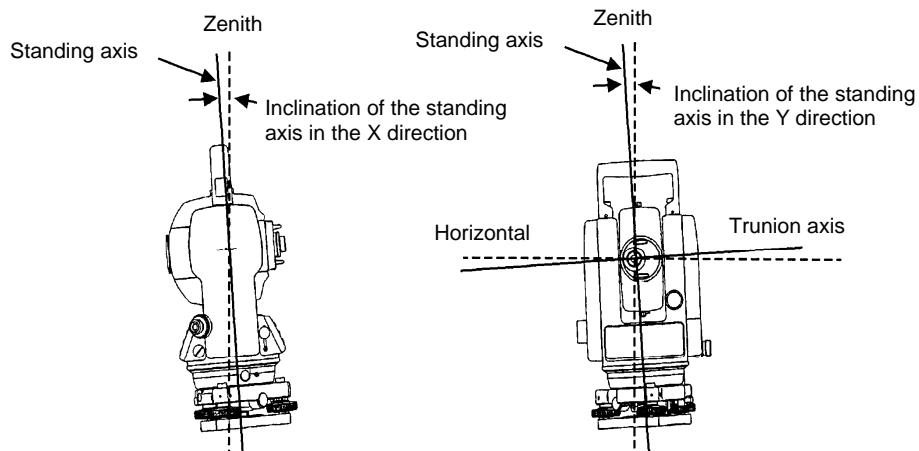
Note : 1) The battery operating time will vary depending on the environmental conditions such as ambient temperature, charging time, the number of times of charging and discharging etc. It is recommended for safety to charge the battery beforehand or to prepare spare full charged batteries.
 2) For general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

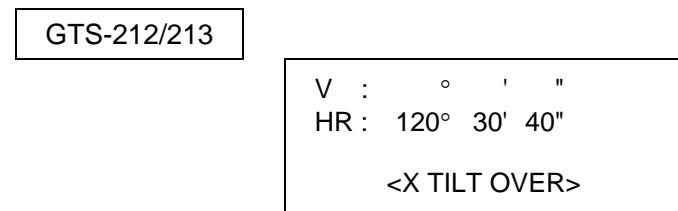
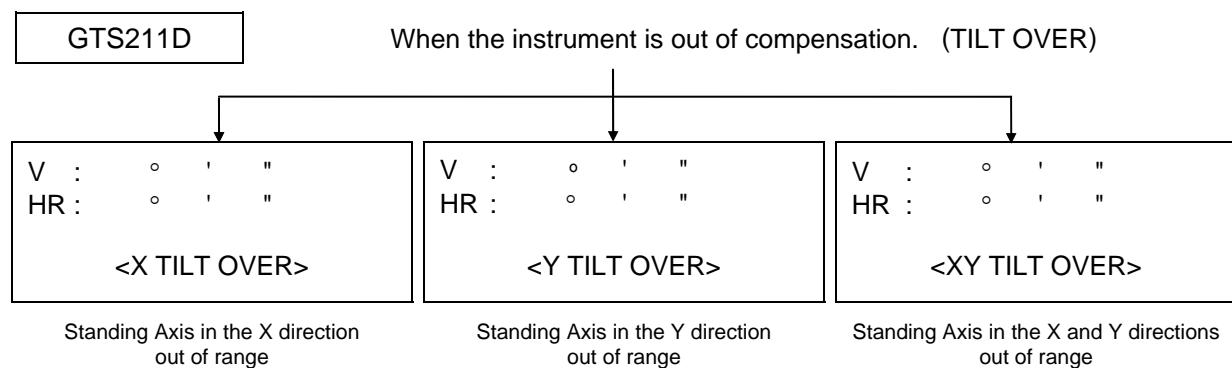
(GTS-212/213 have vertical angle correction only)

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.



- GTS-212 and 213 compensate only the vertical angle reading due to inclination of the standing axis in the X direction.
- GTS-211D 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".



- 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↓ TILT REP V% P2↓
② Press [F1](TILT) key. In case ON is already selected, the display shows tilt correction value.	[F4] [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" TILT REP V% P2↓
● 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..

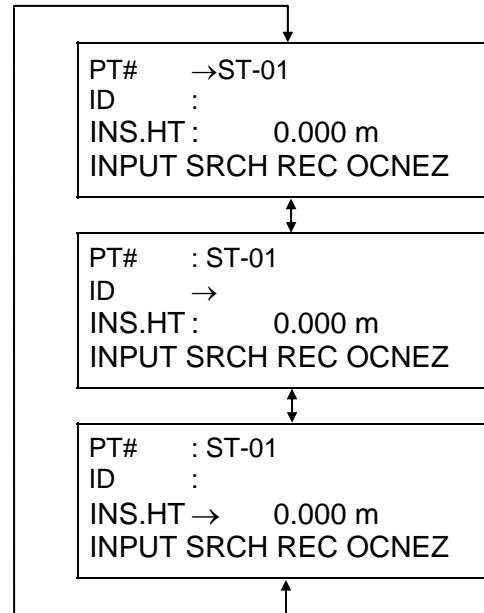
● How to select a item

[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.

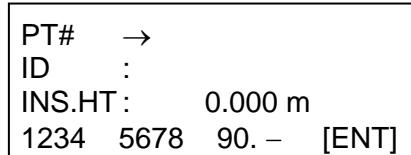
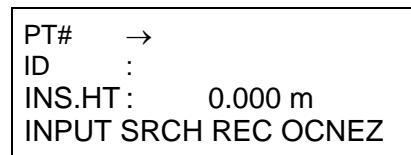
- ② Press the [F1](INPUT) key.
The arrow changes to the equal (=).

The characters are displayed on the bottom line.

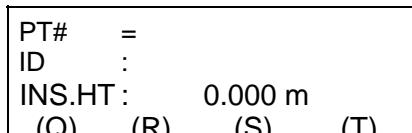
- ③ Press the [▲] or [▼] key to select a page.

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

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



[F1] [F2] [F3] [F4]



[F1] [F2] [F3] [F4]

- 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 [\blacktriangleleft] or [\triangleright] key and enter again.

3 ANGLE MEASUREMENT

3.1 Measuring Horizontal Angle Right and Vertical Angle

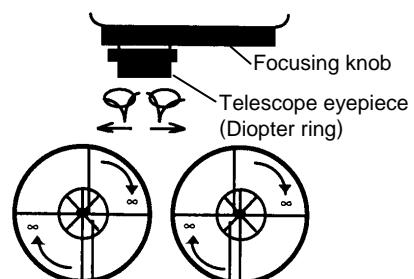
Make sure the mode is in Angle measurement.

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] [F3]	H ANGLE 0 SET >OK? --- --- [YES] [NO] 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.		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.	[F4] twice [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 1234 5678 90.- [ENT]
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]	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.	[F4]	V : 90°10'20" HR : 170°30'20" OSET HOLD HSET P1↓ 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 (Only for GTS-211D)

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↓ TILT REP V% P2↓
② Press [F2](REP)key.	[F4] [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 ⑥ to ⑦ to measure the desired number of repetitions.		REP-ANGLE COUNT [4] Ht : 180°40'00" Hm : 45°10'00" OSET V/H REL HOLD
⑨ To return to the normal angle mode, press the [F2](V/H) key or [ESC] key.	[ESC] or [F2]	[Example] 4 measurement REPETITION ANGLE Exit >OK ? --- --- [YES] [NO]

⑩ Press [F3](YES) key.	[F3]	V : 90°10'20" HR : 170°30'20" OSET HOLD HSET P1↓
<ul style="list-style-type: none"> ● 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".

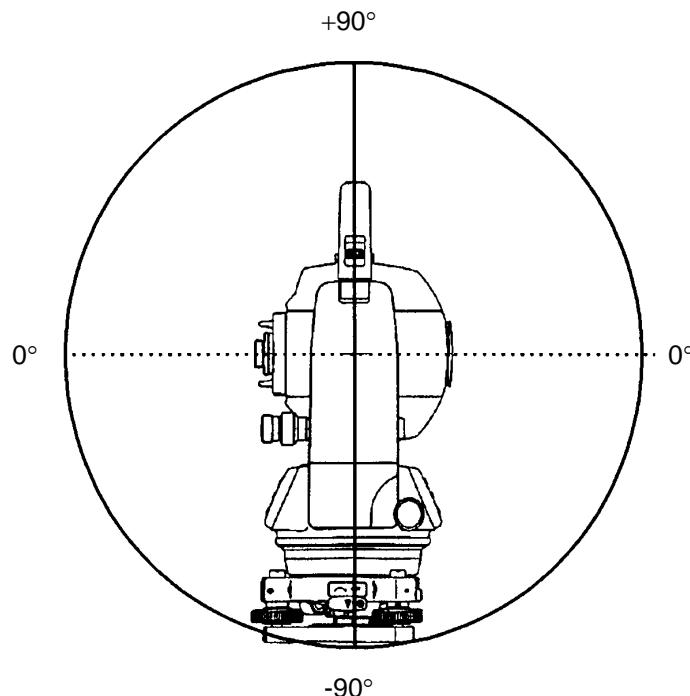
This setting is not memorized after powering off. Refer to Chapter 16 "SELECTING MODE" to set the initial setting (memorized after powering off).

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↓
② Press [F1](H-BZ) key. The data previously set is shown.	[F1]	H-BZ R/L CMPS P3↓ 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

Note : Since the distance more than 2,000m(6,600ft) can not be displayed, measure the distance less than 2,000m(6,600ft) .

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.

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 [Δ] key. Distance measurement starts. *1),*2) The measured distances are shown. *3)~*5)	[Δ]	HR : 120°30'40" HD*[r] < < m VD : m MEAS MODE S/A P1↓ ↓ HR : 120°30'40" HD* 123.456 m VD : 5.678 m MEAS MODE S/A P1↓
● Pressing [Δ] key again, the display changes to horizontal (HR) and vertical (V)angle and slope distance(SD). *6)	[Δ]	V : 90°10'20" HR : 120°30'40" SD* 131.678 m MEAS MODE S/A 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 GTS-210 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.		<p>V : 90°10'20" HR : 120°30'40"</p> <p>OSET HOLD HSET P1↓</p>
② Press [Δ] key. Continuous measuring starts.*1)	[Δ]	<p>HR : 120°30'40" HD*[r] < < m VD : m MEAS MODE S/A P1↓</p>
③ Press [F1](MEAS) key while continuous measuring is exceeding.*2)	[F1]	<p>HR : 120°30'40" HD*[n] < < m VD : m MEAS MODE S/A P1↓</p>
The average value is displayed and "*" mark disappears. ● While EDM is working, press [F1](MEAS) key again, the mode will be changed to continuous measuring mode.		<p>HR : 120°30'40" HD : 123.456 m VD : 5.678 m MEAS MODE S/A P1↓</p>
<p>*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".</p> <p>*2) For setting the number of times (N-times) in the measurement, refer to Chapter 16 "SELECTING MODE".</p>		

○ 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 to get the function on page 2. ② Every time pressing [F3](m/f/i) key, the display unit will be changed. ● Every time pressing [F3](m/f/i) key, the unit mode switches.	[F4] [F3]	<table border="1"> <tr> <td>HR : 120°30'40"</td> </tr> <tr> <td>HD* 2.000 m</td> </tr> <tr> <td>VD : 3.000 m</td> </tr> <tr> <td>MEAS MODE S/A P1↓</td> </tr> </table> <table border="1"> <tr> <td>OFFSET S.O m / f / i P2↓</td> </tr> </table> <table border="1"> <tr> <td>HR : 120°30'40"</td> </tr> <tr> <td>HD* 6.560 ft</td> </tr> <tr> <td>VD : 9.845 ft</td> </tr> <tr> <td>OFFSET S.O m / f / i P2↓</td> </tr> </table>	HR : 120°30'40"	HD* 2.000 m	VD : 3.000 m	MEAS MODE S/A P1↓	OFFSET S.O m / f / i P2↓	HR : 120°30'40"	HD* 6.560 ft	VD : 9.845 ft	OFFSET S.O m / f / i P2↓
HR : 120°30'40"											
HD* 2.000 m											
VD : 3.000 m											
MEAS MODE S/A P1↓											
OFFSET S.O m / f / i P2↓											
HR : 120°30'40"											
HD* 6.560 ft											
VD : 9.845 ft											
OFFSET S.O m / f / i P2↓											

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).

OFine Mode : This is a normal distance measuring mode.

The unit to be displayed : 1mm

Measuring time : approx. 2.5 sec.

OTracking 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.

OCoarse 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]	<table border="1"> <tr> <td>HR : 120°30'40"</td> </tr> <tr> <td>HD* 123.456 m</td> </tr> <tr> <td>VD : 5.678 m</td> </tr> <tr> <td>MEAS MODE S/A P1↓</td> </tr> </table> <table border="1"> <tr> <td>HR : 120°30'40"</td> </tr> <tr> <td>HD* 123.456 m</td> </tr> <tr> <td>VD : 5.678 m</td> </tr> <tr> <td>FINE TRACK COARSE F</td> </tr> </table>	HR : 120°30'40"	HD* 123.456 m	VD : 5.678 m	MEAS MODE S/A P1↓	HR : 120°30'40"	HD* 123.456 m	VD : 5.678 m	FINE TRACK COARSE F
HR : 120°30'40"										
HD* 123.456 m										
VD : 5.678 m										
MEAS MODE S/A P1↓										
HR : 120°30'40"										
HD* 123.456 m										
VD : 5.678 m										
FINE TRACK COARSE F										
② Press [F1](FINE) key, [F2](TRACK) key, or [F3](COARSE) key.	[F1]~[F3]	<table border="1"> <tr> <td>HR : 120°30'40"</td> </tr> <tr> <td>HD* 123.456 m</td> </tr> <tr> <td>VD : 5.678 m</td> </tr> <tr> <td>MEAS MODE S/A P1↓</td> </tr> </table>	HR : 120°30'40"	HD* 123.456 m	VD : 5.678 m	MEAS MODE S/A P1↓				
HR : 120°30'40"										
HD* 123.456 m										
VD : 5.678 m										
MEAS MODE S/A 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

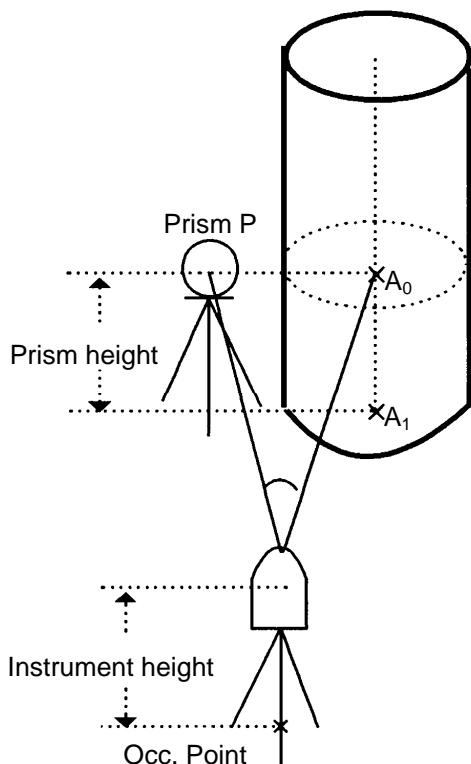
- In stake out operation, you can select either horizontal distance (HD), relative elevation (VD) and slope distance (SD)

Operating procedure	Operation	Display
① Press [F4](↓) key in the distance measuring mode to get the function on page 2.	[F4]	<p>HR : 120°30'40" HD* 123.456 m VD : 5.678 m MEAS MODE S/A P1↓</p> <p>OFFSET S.O m/f/i P2↓</p>
② Press [F2](S.O) key. The data previously set is shown.	[F2]	<p>STAKE OUT HD : 0.000 m</p> <p>HD VD SD ---</p>
③ Select the measuring mode by pressing [F1] to [F3] key. Example : Horizontal distance	[F1]	<p>STAKE OUT HD : 0.000 m</p> <p>INPUT --- --- ENTER</p>
④ Enter the distance for stake out. *1)	[F1] Enter data [F4]	<p>1234 5678 90. - [ENT]</p> <p>STAKE OUT HD : 100.000 m</p> <p>INPUT --- --- ENTER</p>
⑤ Collimate the target (Prism). Measuring starts.	Collimate P	<p>HR : 120°30'40" dHD*[r] < < m VD : m MEAS MODE S/A P1↓</p> <p>↓</p> <p>HR : 120°30'40" dHD* 23.456 m VD : 5.678 m MEAS MODE S/A P1↓</p>
⑥ Move the target until the difference becomes 0m.		
<p>*1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters".</p> <ul style="list-style-type: none"> To return to normal distance measurement mode, stake out distance to "0"m or turn the power off. 		

4.7 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. 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).

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

Operating procedure	Operation	Display
① Press [F4](P1↓) key from 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 S/A P1↓
② Press [F1](OFFSET) key.	[F1]	OFFSET S.O m/f/i P2↓ OFFSET-MEASUREMENT HR : 120°30'40" HD : m MEAS --- --- SET
③ Collimate prism P, and press [F1](MEAS) key.	Collimate P [F1]	OFFSET-MEASUREMENT HR : 110°20'30" HD* < < m MEAS --- --- SET

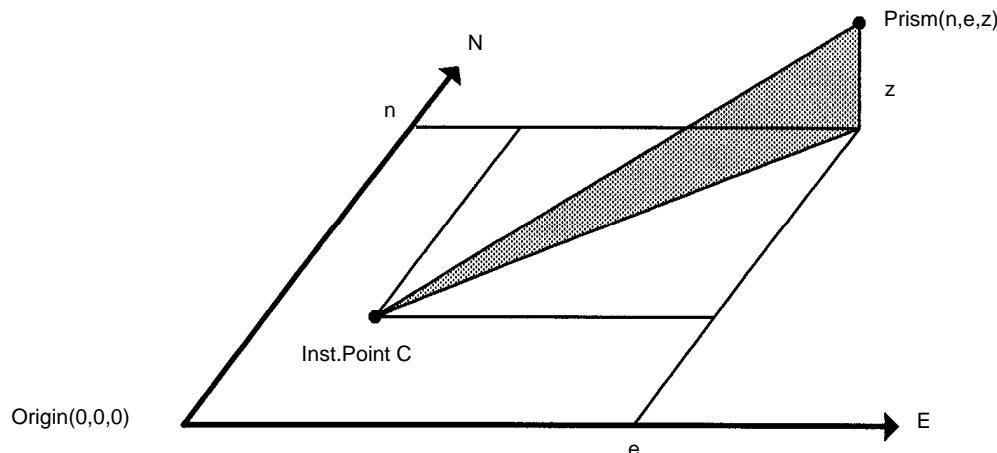
The horizontal distance from the instrument to the prism will be measured.		OFFSET-MEASUREMENT HR : 110°20'30" HD* 56.789 m MEAS --- --- SET
④ Press [F4](SET) key to decide the prism position.	[F4]	OFFSET-MEASUREMENT HR : 110°20'30" HD : 56.789 m NEXT --- --- ---
⑤ Collimate point A ₀ using the horizontal motion clamp and horizontal tangent screw.	Collimate A ₀	OFFSET-MEASUREMENT HR : 150°30'50" HD : 56.789 m NEXT --- --- ---
⑥ Show the relative elevation of point A ₀ .	[4]	OFFSET-MEASUREMENT HR : 110°20'30" VD : 34.567 m NEXT --- --- ---
⑦ Show the slope distance of point A ₀ .	[4]	OFFSET-MEASUREMENT HR : 110°20'30" SD : 45.678 m NEXT --- --- ---
⑧ Show N coordinate of point A ₀ or A ₁ .	[L]	OFFSET-MEASUREMENT HR : 110°20'30" N : -12.345 m NEXT --- --- ---
<ul style="list-style-type: none"> ● Each time pressing [4] key, horizontal distance , relative elevation and slope distance are shown in sequence. ● Each time pressing [L] key, N,E and Z coordinate are shown in sequence. 		
<ul style="list-style-type: none"> ● To return to procedure ③, press [F1](NEXT) key. ● To return to the previous mode, press [ESC] key. 		

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
① Press [F4](↓) key from the coordinate measurement mode to get the function on page 2.	[F4]	<p>N : 123.456 m E : 34.567 m Z : 78.912 m MEAS MODE S/A P1↓</p> <p>P.HT INSHT OCC P2↓</p>
② Press [F3](OCC) key.	[F3]	<p>N→ 0.000 m E : 0.000 m Z : 0.000 m INPUT --- --- ENTER</p>
③ Enter N coordinate value.*1)	[F1] Enter data [F4]	<p>1234 5678 90. – [ENT]</p> <p>N : -72.000 m E→ 0.000 m Z : 0.000 m INPUT --- --- ENTER</p>
④ Enter E and Z coordinate values in the same manner. After entering the values, the display returns coordinate measuring display.		<p>N : 51.456 m E : 34.567 m Z : 78.912 m MEAS MODE S/A P1↓</p>
<p>*1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters".</p> <ul style="list-style-type: none"> • Input range $-999999.999 \leq N,E,Z \leq +999999.999$ m $-999999.999 \leq N,E,Z \leq +999999.999$ ft. $-999999.11.7 \leq N,E,Z \leq +999999.11.7$ 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
① Press [F4](↓) key from the coordinate measurement mode to get the function on page 2.	[F4]	N : 123.456 m E : 34.567 m Z : 78.912 m MEAS MODE S/A P1↓
② Press [F2](INSHT) key. The current value is displayed.	[F2]	P.HT INSHT OCC P2↓
③ Enter the instrument height. *1)	[F1] Enter Inst.HT [F4]	INSTRUMENT HEIGHT INPUT INS.HT: 0.000 m INPUT --- --- ENTER 1234 5678 90. - [ENT]
		N : 123.456 m E : 34.567 m Z : 78.912 m MEAS MODE S/A P1↓

*1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters ".
 • Input range -999.999 ≤Instrument height≤ +999.999 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
① Press [F4](↓) key from the coordinate measurement mode to get the function on page 2.	[F4]	N : 123.456 m E : 34.567 m Z : 78.912 m MEAS MODE S/A P1↓
② Press [F1](R.HT) key. The current value is displayed.	[F1]	P.HT INSHT OCC P2↓
③ Enter the prism height. *1)	[F1] Enter Prism HT [F4]	REFLECTOR HEIGHT INPUT R.HT : 0.000 m INPUT --- --- ENTER 1234 5678 90. - [ENT]
		N : 123.456 m E : 34.567 m Z : 78.912 m MEAS MODE S/A P1↓

*1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters ".
 • Input range -999.999 ≤Prism height≤ +999.999 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)

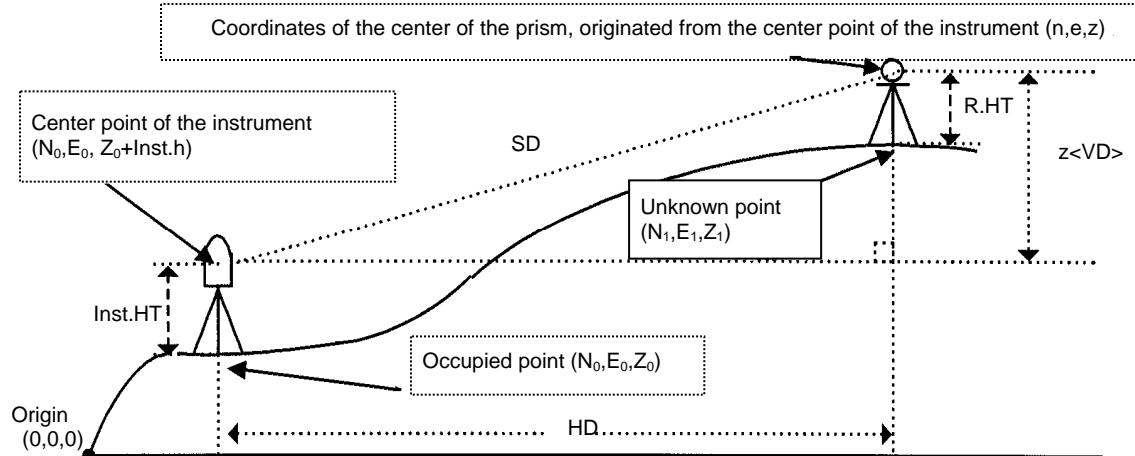
Coordinates of the center of the prism,
originated from the center point of the instrument : (n,e,z)

Coordinates of unknown point : (N_1, E_1, Z_1)

$$N_1 = N_0 + n$$

$$E_1 = E_0 + e$$

$$Z_1 = Z_0 + \text{INS.HT} + z - \text{R.HT}$$



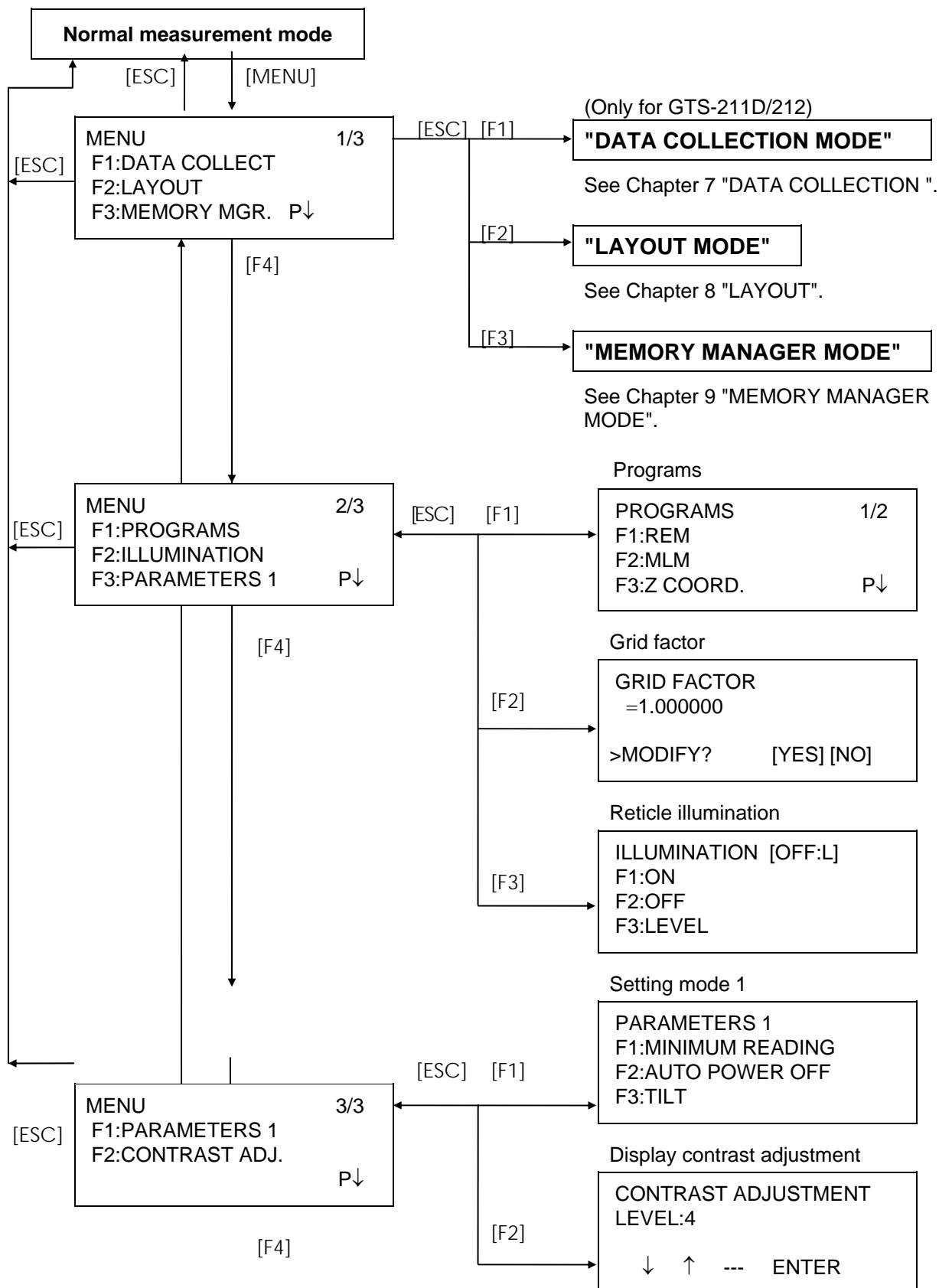
Operating procedure	Operation	Display
① Set the direction angle of known point A. *1)	Set direction angle	V : 90°10'20" HR : 120°30'40"
② Collimate target B.	Collimate prism	OSET HOLD HSET P1↓
③ Press [\downarrow] key. Measuring starts.	[\downarrow]	N*[r] < < m E : m Z : m MEAS MODE S/A P1↓
The result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

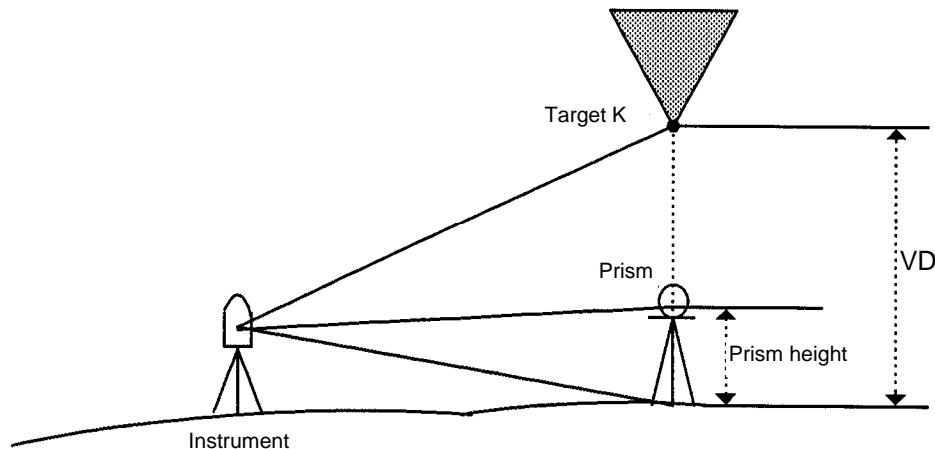


Note : DATA COLLECTION mode is not provided on GTS-213

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)

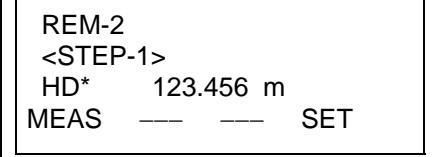
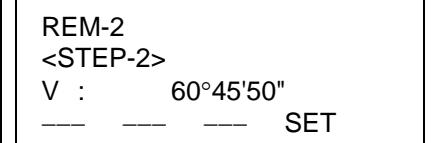
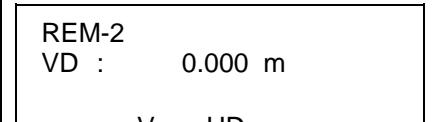
Operating procedure	Operation	Display
① After pressing [MENU] key, press [F4](P↓) key to get the menu on page 2.	[MENU] [F4]	MENU 2/3 F1 : PROGRAMS F2 : GRID FACTOR F3 : ILLUMINATION P↓
② Press [F1] key.	[F1]	PROGRAMS 1/2 F1 : REM F2 : MLM F3 : Z COORD. P↓
③ Press [F1](REM) key.	[F1]	REM F1 : INPUT R.HT 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)	Enter R.HT [F4]	1234 5678 90. - [ENT]
⑥ Collimate prism.	Collimate P	REM-1 <STEP-2> HD : m MEAS --- --- SET
⑦ Press [F1](MEAS) key. Measuring starts.	[F1]	REM-1 <STEP-2> HD* < < m MEAS --- --- SET

Horizontal distance (HD) between the instrument and prism will be shown.		REM-1 <STEP-2> HD* 123.456 m MEAS --- --- SET
⑧ Press [F4](SET). The prism position will be decided. *2)	[F4]	REM-1 VD : 1.500 m --- R.HT HD ---
⑨ 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 --- --- SET
⑤ Collimate prism.	Collimate P	
⑥ Press [F1](MEAS) key. Measuring starts.	[F1]	REM-2 <STEP-1> HD* < < m MEAS --- --- SET

<p>Horizontal distance (HD) between the instrument and prism will be shown.</p>	
<p>⑦ Press [F4](SET). The prism position will be decided.</p>	<p>[F4]</p> 
<p>⑧ Collimate ground point G.</p>	<p>Collimate G</p> 
<p>⑨ Press [F4](SET) key. The position of point G will be decided. *1)</p>	<p>[F4]</p> 
<p>⑩ Collimate target K. Vertical distance (VD) will be shown. *2)</p>	<p>Collimate K</p> 

*1) To return to procedure ⑤, press [F3](HD) key.

To return to procedure ⑧, press [F2](V) key.

*2) To return to PROGRAMS Menu, press [ESC] key.

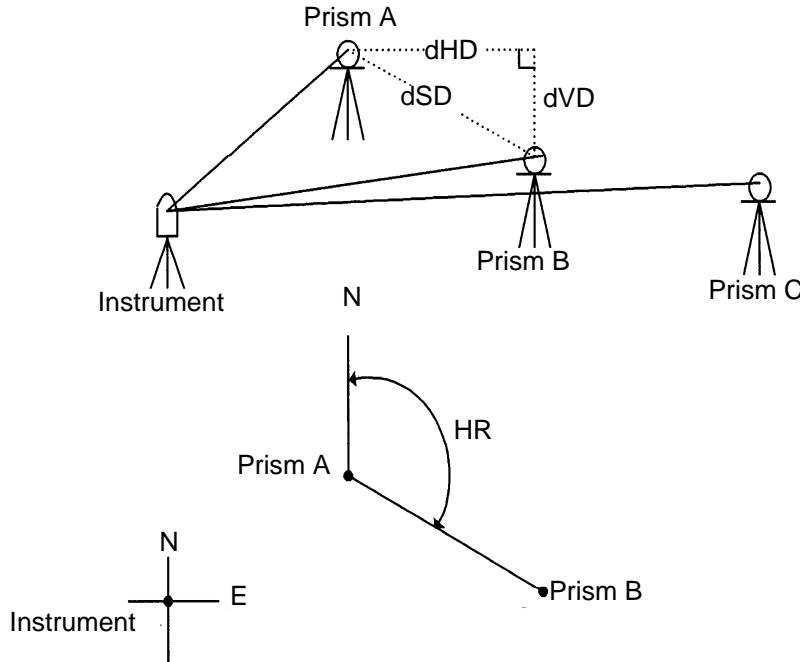
6.1.2 Missing Line Measurement (MLM)

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, 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

<p>④ Press [F1] or [F2] key to select using coordinate file. [Example:F2 : DON'T USE]</p>	[F2]	GLID FACTOR F1 : USE G.F. F2 : DON'T USE
<p>⑤ Press [F1] or [F2] key to select using GRID FACTOR. [Example:F2 : DON'T USE]</p>	[F2]	MLM F1 : MLM-1(A-B, A-C) F2 : MLM-2(A-B, B-C)
<p>⑥ Press [F1] key.</p>	[F1]	MLM-1(A-B, A-C) <STEP-1> HD : m MEAS R.HT NEZ SET
<p>⑦ Collimate prism A, and press [F1](MEAS) key. Horizontal distance (HD) between the instrument and prism A will be shown.</p>	Collimate A [F1]	MLM-1(A-B, A-C) <STEP-1> HD* < < m MEAS R.HT NEZ SET
<p>⑧ Press [F4](SET) key.</p>	[F4]	MLM-1(A-B, A-C) <STEP-2> HD : m MEAS R.HT NEZ SET
<p>⑨ Collimate prism B and press [F1](MEAS) key. Horizontal distance (HD) between the instrument and prism B will be shown.</p>	[F1]	MLM-1(A-B, A-C) <STEP-2> HD* < < m MEAS R.HT NEZ SET
<p>⑩ Press [F4](SET) key. The horizontal distance (dHD) and relative elevation (dVD) between prism A and B.</p>	[F4]	MLM-1(A-B, A-C) dHD : 123.456 m dVD : 12.345 m --- --- HD ---
<p>⑪ To show slope distance (dSD) , press [Δ]key.</p>	[Δ]	MLM-1(A-B, A-C) dSD : 234.567 m HR : 12°34'40" --- --- HD ---

<p>⑫ To measure the distance between points A and C, press [F3](HD). *1)</p>	<p>[F3]</p>
<p>⑬ Collimate point C (Prism C) and press [F1](MEAS) key. Horizontal distance (HD) between the instrument and prism C will be shown.</p>	<p>Collimate prism C [F1]</p>
<p>⑭ Press [F4](SET) key. The horizontal distance (dHD) and relative elevation (dVD) between prism A and C.</p>	<p>[F4]</p>
<p>⑮ To measure the distance between points A and D, repeat procedure ⑫~⑭. *1)</p>	

*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
<p>After procedure ⑥.</p>		
<p>① Press [F3](NEZ) key. Direct key input display will be shown.</p>	<p>[F3]</p>	
<p>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.</p> <p>After selecting coordinate input mode by pressing [F3](NEZ or PT# or HD) key, press [F1](INPUT) key and enter the data.</p>	<p>[F3]</p>	

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]	NOO1# 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* < < m VD : m >Measuring...

⑩ Press [F4](CALC) key. *2) Z : Z coordinate dZ : Standard deviation	[F4]	HR : 120°30'40" HD : 12.345 m VD : 23.456 m NEXT --- --- CALC
⑪ Press [F3](BS) key. *3) Horizontal angle to the last measured point will be shown.	[F3]	Z COORD. SETTING Z : 1.234 m dZ : 0.002 m --- --- BS SET
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]	BACKSIGHT H(B) = 23°20'40" --- --- COORD SET
		PROGRAMS 1/2 F1 :REM F2 :MLM F3 :Z COORD. P↓

*1) Measurement is Fine Single 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.

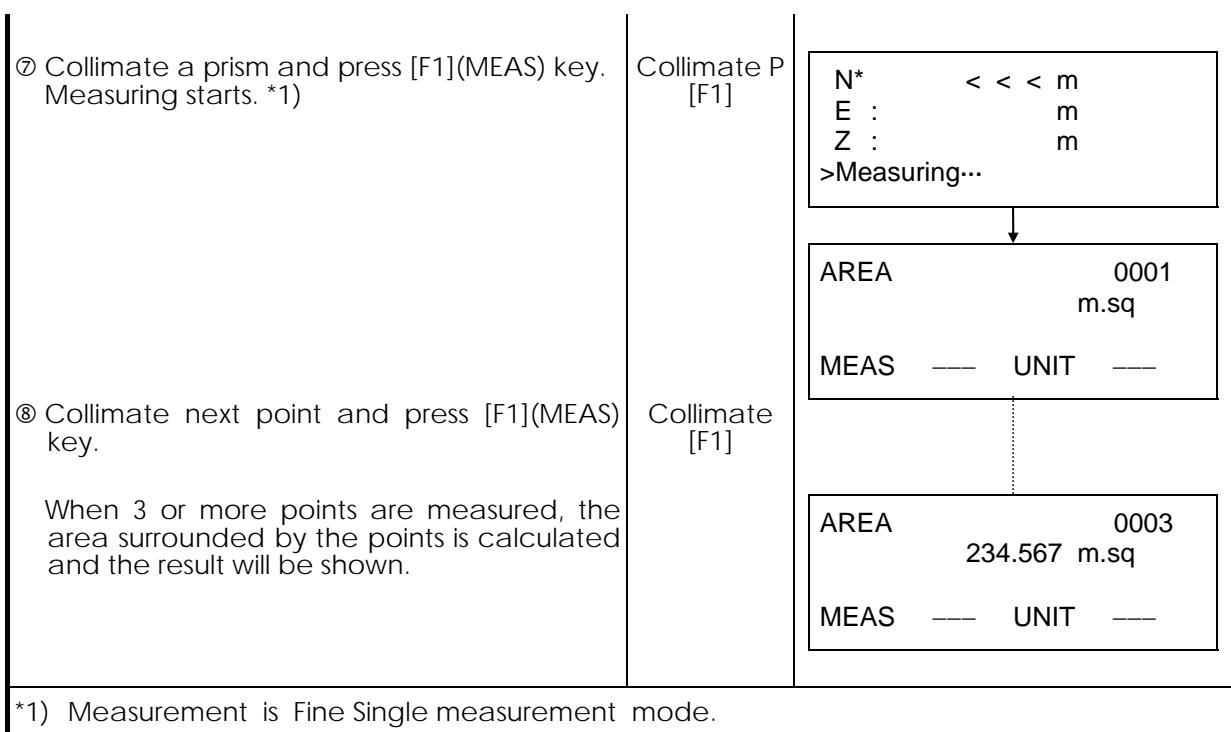
1) Area Calculation from Coordinate Data File

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]	⋮

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

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



*1) Measurement is Fine Single measurement mode.

● To change the display unit

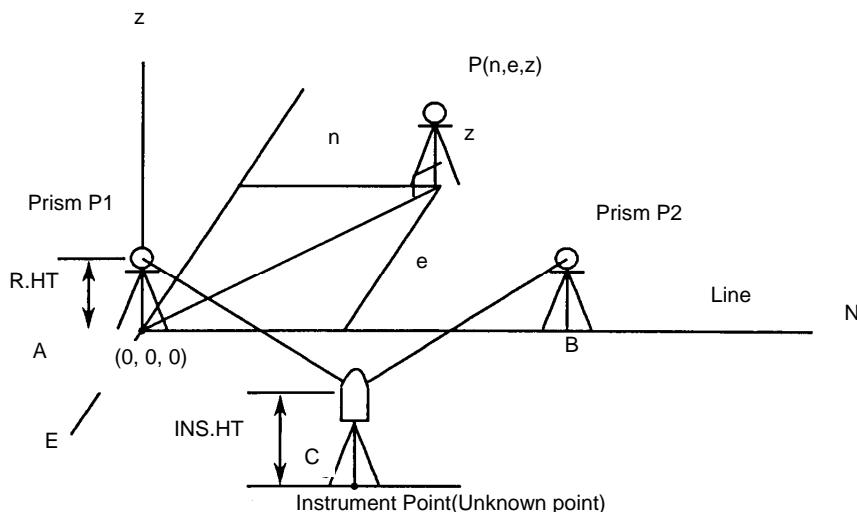
It is possible to change the displayed area unit .

Operating procedure	Operation	Display
① Press [F3](UNIT) key.	[F3]	<p>AREA 0003 100.000 m.sq</p> <p>MEAS --- UNIT ---</p>
② Select a unit by pressing [F1] to [F4] key. Example: [F2](ha) key.	[F2]	<p>AREA 0003 100.000 m.sq</p> <p>m.sq ha ft.sq acre</p> <p>AREA 0003 0.010 ha</p> <p>MEAS --- UNIT ---</p>
● m.sq : meter square ha : hectare ft.sq : feet square 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.



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 >Sight? [YES] [NO]

<p>⑦ Collimate prism A (Origin) and press [F3](YES) key. Measuring starts. *1)</p> <p>Input display of reflector B height will be shown.</p>	<p>Collimate [F3]</p>	<p>POINT TO LINE MEAS. P1 HD : < < m >Measuring...</p>
<p>⑧ Press [F1](INPUT) key and enter reflector B height.</p>	<p>[F1] Enter HT [F4]</p>	<p>REFLECTOR HEIGHT INPUT R.HT : 0.000 m INPUT --- --- ENTER</p>
<p>⑨ Collimate prism B (End) and press [F3](YES) key. Measuring starts. *1)</p>	<p>Collimate [F3]</p>	<p>POINT TO LINE MEAS. P2 HD : m >Sight? [YES] [NO]</p>
<p>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)</p>	<p></p>	<p>POINT TO LINE MEAS. P2 HD : < < m >Measuring...</p> <p>DIST. (P1-P2) 1/2 dHD : 10.000 m dVD : 0.000 m NEZ S.CO --- P↓</p>
<p>⑩ Press [F1](NEZ) key to measure other points.</p>	<p>[F4]</p>	<p>N : 0.000 m E : 0.000 m Z : 0.000 m EXIT --- R.HT MEAS</p> <p>>Measuring...</p>
<p>⑪ Collimate a prism and press [F4](MEAS) key. Coordinate measurement starts. *4) The result will be shown. *5)</p>	<p>Collimate [F4]</p>	<p>N : 0.000 m E : 0.000 m Z : 0.000 m EXIT --- R.HT MEAS</p>

*1) Measurement is Fine Single 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 [F1](EXIT) 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 1234 5678 90. - [ENT]
④ Press [F1] (INPUT) key and enter Elevation. *1) Press [F4](ENT) key.	Enter ELEV. [F4] [F1]	GRID FACTOR ELEV. : 2000 m SCALE → 1.001000 INPUT --- --- ENTER
⑤ Enter Scale Factor in the same way. Grid Factor is displayed for 1 to 2 second and display returns to menu.	Enter Scale [F4]	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 Correction (Tilt ON/OFF).
 3. Vertical and Horizontal Angle Tilt
- This setting is memorized after power off.

6.4.1 Setting Minimum Reading

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

Model	Angle Unit			Coarse mode Distance unit
	Degree	GON	MIL	
GTS-211D	5" / 1"	1mgon/0.2mgon	0.1mil/0.01mil	10mm(0.02ft) / 1mm(0.005ft)
GTS-212	5" / 1"	1mgon/0.2mgon	0.1mil/0.01mil	10mm(0.02ft) / 1mm(0.005ft)
GTS-213	10" / 5"	2mgon / 1mgon	0.1mil/0.01mil	10mm(0.02ft) / 1mm(0.005ft)

[Example GTS-211D] 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 F1 : MINIMUM READING F2 : AUTO POWER OFF F3 : TILT
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 F1 : MINIMUM READING F2 : AUTO POWER OFF F3 : TILT
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)

(GTS-212/213 have vertical angle correction only)

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 F1 : MINIMUM READING F2 : AUTO POWER OFF F3 : TILT
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]	

6.5 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 (Only for GTS-211D/212)

The GTS-211D/212 are able to store the measured data in the internal memory which is maintained by lithium battery.

The internal memory is shared by the measured data files and the coordinate data files.

The total number of generated files is maximum 30.

- **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)

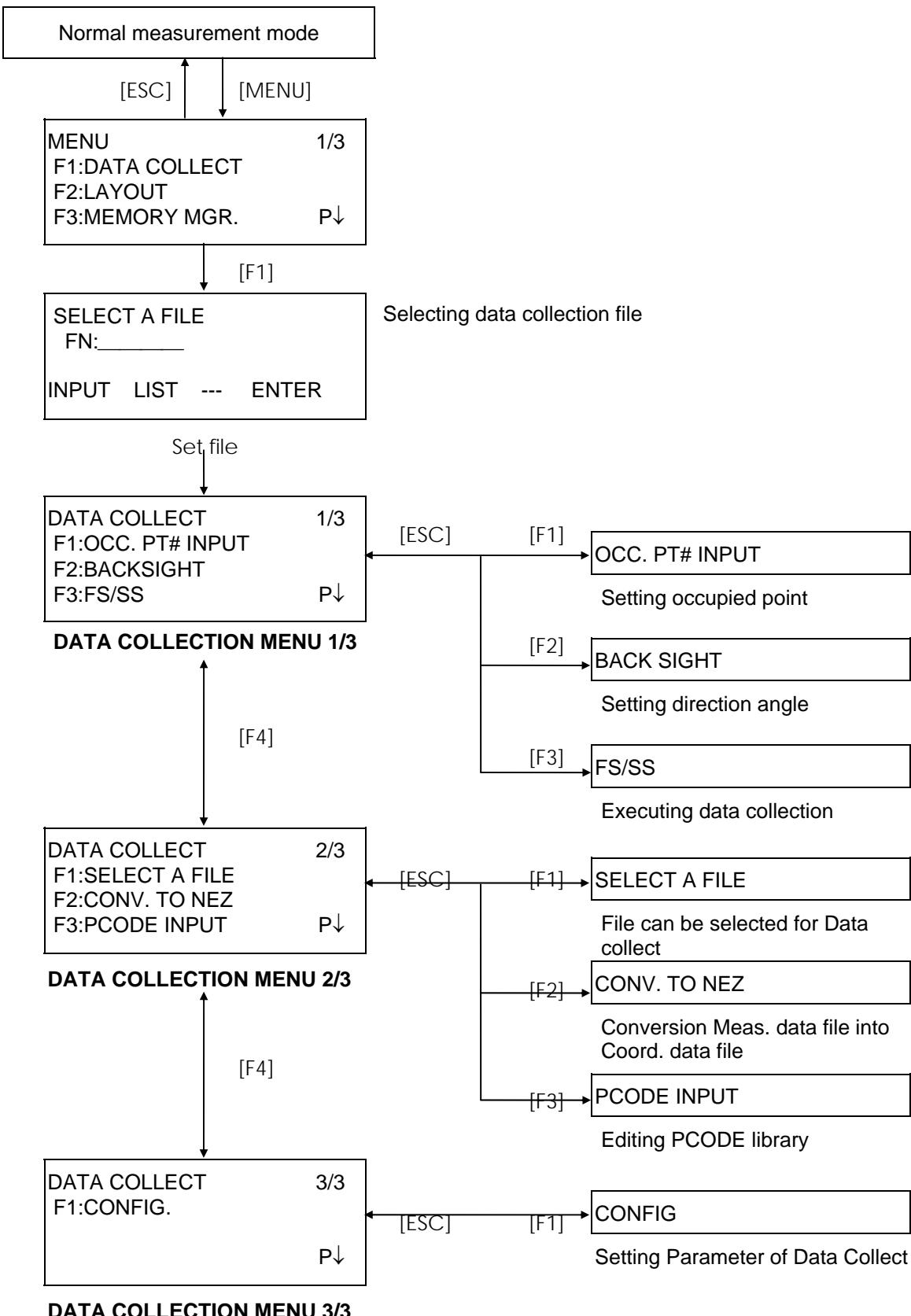
GTS-211D,GTS-212
MAX. 2,000 points

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 "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.
- 3) The expiry date of backup battery is set for 5-year duration at a temperature of 20°C.
The data may be lost when the battery is out.
Have your lithium battery replaced at your dealer before the expiry date.

● 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
		<p>MENU 1/3 F1 : DATA COLLECT F2 : LAYOUT F3 : MEMORY MGR. P↓</p>
① Press [F1](DATA COLLECT) key from menu 1/3.	[F1]	<p>SELECT A FILE FN : _____</p> <p>INPUT LIST --- ENTER</p>
② Press [F2](LIST) key to display the list of file. *1)	[F2]	<p>AMIDATA /M0123 →* HILDATA /M0345 TOPDATA /M0789 --- SRCH --- ENTER</p>
③ Scroll file list by pressing [▲] or [▼] key and select a file to use. *2),3)	[▲] or [▼]	<p>TOPDATA /M0789 → RAPDATA /M0564 SATDATA /M0456 --- SRCH --- ENTER</p>
④ Press [F4](ENTER) key. The file will be set and data collect 1/3 menu will be shown.	[F4]	<p>DATA COLLECT 1/3 F1 : OCC. PT# INPUT F2 : BACKSIGHT F3 : FS/SS P↓</p>
<p>*1) If you want to make a new file or input file name directly, press [F1](INPUT) key and enter a file name.</p> <p>*2) When a file has been selected already, '*' mark is indicated on left of current file name.</p> <p>*3) Data in a file shown with arrow can be searched by pressing [F2](SRCH) key.</p> <ul style="list-style-type: none"> It is possible to select a file from DATA COLLECT 2/3 menu in the same way. 		<p>DATA COLLECT 2/3 F1 : SELECT A FILE F2 : CONV. TO NEZ F3 : PCODE INPUT P↓</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
① Press [F1](SELECT A FILE) key from DATA COLLECT menu 2/3.	[F1]	<p>DATA COLLECT 2/3 F1 : SELECT A FILE F2 : CONV. TO NEZ F3 : PCODE INPUT P↓</p>
② Press [F2] (COORD.DATA) key.	[F2]	<p>SELECT A FILE F1 : MEAS.DATA F2 : COORD.DATA</p>
③ Select a coordinate file in the same manner as Chapter 7.1.1 "Selecting a File for Data Collection".		<p>SELECT A FILE FN: _____</p> <p>INPUT LIST --- ENTER</p>

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]	<p>PT# →PT-01 ID : INS. HT : 0.000 m INPUT SRCH REC OCNEZ</p>
② Press [F4] (OCNEZ) key.	[F4]	<p>OCC. PT PT# : PT-01</p> <p>INPUT LIST NEZ ENTER</p>

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]	<pre>BS# → PCODE : R. HT : 0.000 m INPUT SRCH MEAS BS</pre>
② Press [F4] (BS) key. *1)	[F4]	<pre>BACKSIGHT PT# : INPUT LIST NE/AZ ENT</pre>
③ Press [F1](INPUT) key.	[F1]	<pre>BACKSIGHT PT# = 1234 5678 90. - [ENT]</pre>
④ Enter PT#, press [F4](ENT) key. *2) Enter PCODE,R.HT in the same way. *3),4)	Enter PT# [F4]	<pre>BS# →PT-22 PCODE : R. HT : 0.000 m INPUT SRCH MEAS BS</pre>
⑤ Press [F3](MEAS) key.	[F3]	<pre>BS# →PT-22 PCODE : R. HT : 0.000 m *VH SD NEZ ---</pre>
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]	<pre>V : 90°00'00" HR : 0°00'00" SD*[n] <<< m --- --- --- SET</pre> <p style="text-align: center;">↓</p> <pre>DATA COLLECT 1/3 F1 : OCC. PT# INPUT F2 : BACKSIGHT F3 : FS/SS P↓</pre>
<p>*1) Pressing each time [F3] key, the input method changes as Coordinate value, Angle, Coordinate point name alternatively.</p> <p>*2) Refer to Chapter 2.5 "How to enter alphanumeric characters."</p> <p>*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.</p> <p>*4) Data collect sequence set to [EDIT→MEAS]. Refer to Chapter 7.6 "Setting parameter of data collect".</p> <p>● If point is not found in internal memory " PT# DOES NOT EXIST" is displayed.</p>		

7.2 Operational Procedure of "DATA COLLECT"

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

<p>Continue the measuring in the same way. To finish the mode , press [ESC] key.</p>	<p style="text-align: center;">↓</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">PT# → PT-03</td></tr> <tr> <td style="padding: 2px;">PCODE :</td></tr> <tr> <td style="padding: 2px;">R. HT : 1.200 m</td></tr> <tr> <td style="padding: 2px;">INPUT SRCH MEAS ALL</td></tr> </table>	PT# → PT-03	PCODE :	R. HT : 1.200 m	INPUT SRCH MEAS ALL
PT# → PT-03					
PCODE :					
R. HT : 1.200 m					
INPUT SRCH MEAS ALL					
<p>*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 7.6 "Setting parameter of data collect". *4) The mark "*" indicates the previous measuring mode. *5) You can confirm the measured data as follows. Refer to Chapter 7.6 " Setting Parameter of Data Collect [CONFIG]".</p>					

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								
<p>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.</p> <p>② Select one of 3 search methods by pressing one of [F1] to [F3] key. *2)</p>	<p>[F2]</p> <p>[F1] ~[F3]</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">PT# → PT-02</td> </tr> <tr> <td style="padding: 2px;">PCODE :</td> </tr> <tr> <td style="padding: 2px;">R. HT : 1.200 m</td> </tr> <tr> <td style="padding: 2px;">INPUT SRCH MEAS ALL</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">SEARCH [TOPCON]</td> </tr> <tr> <td style="padding: 2px;">F1 : FIRST DATA</td> </tr> <tr> <td style="padding: 2px;">F2 : LAST DATA</td> </tr> <tr> <td style="padding: 2px;">F3 : PT# DATA</td> </tr> </table>	PT# → PT-02	PCODE :	R. HT : 1.200 m	INPUT SRCH MEAS ALL	SEARCH [TOPCON]	F1 : FIRST DATA	F2 : LAST DATA	F3 : PT# DATA
PT# → PT-02										
PCODE :										
R. HT : 1.200 m										
INPUT SRCH MEAS ALL										
SEARCH [TOPCON]										
F1 : FIRST DATA										
F2 : LAST DATA										
F3 : PT# DATA										
<p>*1) It is possible to see the PCODE list when the arrow is located beside PCODE or ID. *1) The operation is same as the "SEARCH" in the MEMORY MANAGER mode. For more information, refer to Chapter 9.2 "Searching Data".</p>										

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

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

Operating procedure	Operation	Display
① Move the arrow to the PCODE or ID in the DATA COLLECT mode, press [F1](INPUT) key.	[F1]	PT# : PT-02 PCODE > R. HT : 1.200 m INPUT SRCH MEAS ALL
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 = 32 R. HT : 1.200 m 1234 5678 90. - [ENT]

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

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

Operating procedure	Operation	Display
① Move the arrow to the PCODE or ID in the DATA COLLECT mode, press [F2](SRCH) key.	[F2]	PT# : PT-02 PCODE > R. HT : 1.200 m INPUT SRCH MEAS ALL
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)	[▲],[▼],[▶],[◀]	→ 001 : PCODE01 002 : PCODE02 EDIT — CLR ENTER
③ Press [F4](ENTER) key.	[F4]	031 : PCODE31 → 032 : TOPCON 033 : HILTOP EDIT — CLR ENTER

*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.

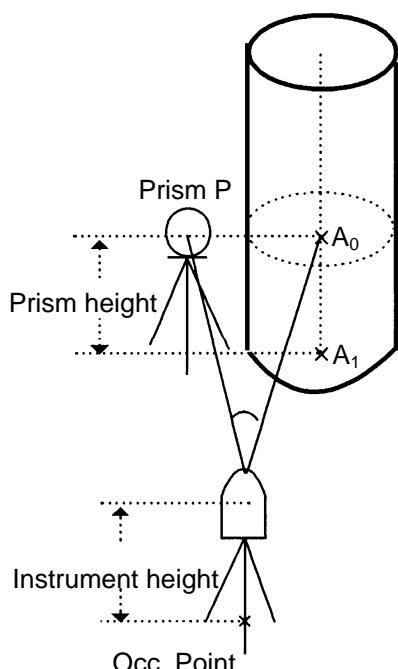
7.3 Data Collect · Offset Measurement mode

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 two measuring methods.

- Angle offset measurement
- Distance offset measurement

7.3.1 Angle Offset Measurement

Place the prism at the same horizontal distance from the instrument as that of point A₀ to measure.



When measuring coordinates of ground point A₁ : Set the instrument height / prism height.

When measuring coordinates of point A₀ : Set the instrument height only. (Set the prism height to 0).

Distance is measured to the prism and then the telescope is turned to the required point. The measured distance is used to calculate position depending on the horizontal and vertical angles turned away from the prism.

Operating procedure	Operation	Display
① Press [F3](MEAS) key.	[F3]	PT# → PT-11 PCODE : TOPCON R. HT : 1.200 m INPUT SRCH MEAS ALL
② Press [F4](OFFSET) key.	[F4]	VH *SD NEZ OFSET OFFSET-MEASUREMENT F1 : ANG. OFFSET F2 : DIST. OFFSET
③ Press [F1] key.	[F1]	OFFSET-MEASUREMENT HR : 120°30'40" SD : m >Sight ? [YES] [NO]
④ Collimate the prism.	Collimate P	

⑤ Press [F3](YES) key.
Continuous measuring starts.

[F3]

OFFSET-MEASUREMENT
HR : 120°30'40"
SD*[n] < m
> measuring...

⑥ Collimate point A₀ using the horizontal motion clamp and horizontal tangent screw.

Collimate A₀

⑦ Show the horizontal distance of point A₀.

[Δ]

OFFSET-MEASUREMENT
HR : 120°30'40"
HD : 6.543 m
> OK ? [YES] [NO]

⑧ Show the relative elevation of point A₀.

- Each time pressing [Δ] key, horizontal distance , relative elevation and slope distance are shown in sequence.

[Δ]

OFFSET-MEASUREMENT
HR : 120°30'40"
VD : 34.567 m
> OK ? [YES] [NO]

⑨ Show N coordinate of point A₀ or A₁.

[\swarrow]

OFFSET-MEASUREMENT
HR : 120°30'40"
N : -12.345 m
> OK ? [YES] [NO]

⑩ Press [F3](YES) key.

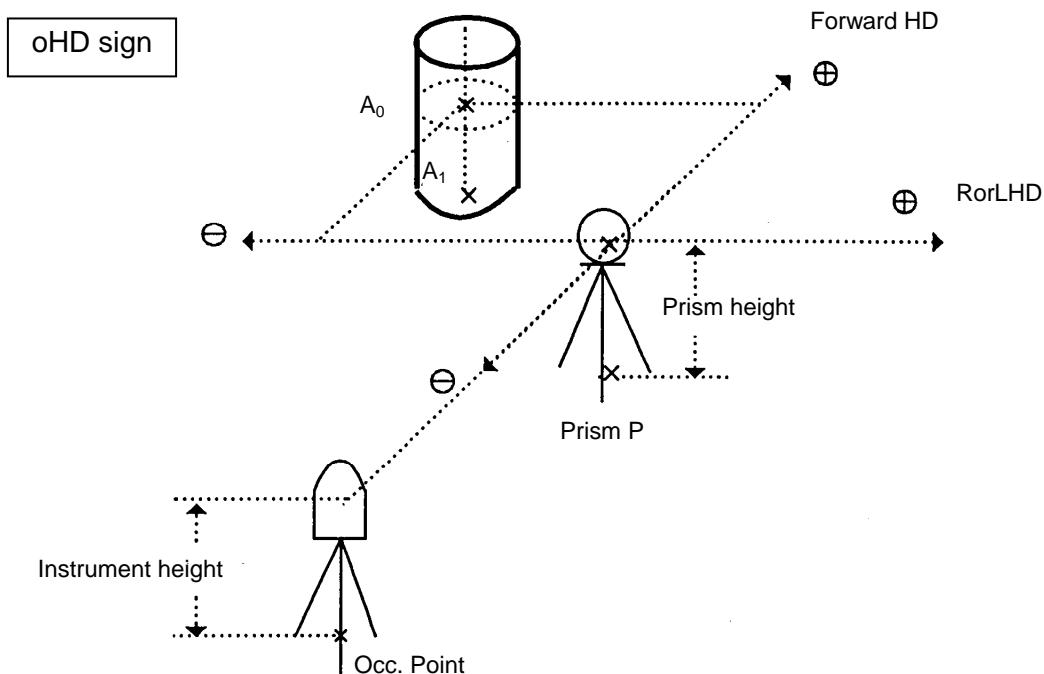
The data is recorded and the next measuring point is displayed.

[F3]

PT# → PT-13
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
① Press [F3](MEAS) key.	[F3]	PT# → PT-11 PCODE : TOPCON R. HT : 1.200 m INPUT SRCH MEAS ALL
② Press [F4](OFFSET) key.	[F4]	VH *HD NEZ OFSET OFFSET-MEASUREMENT F1 : ANG. OFFSET F2 : DIST. OFFSET
③ Press [F2] key.	[F2]	DISTANCE OFFSET INPUT R or L 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
---	*HD NEZ ---

⑤ Collimate the prism.

⑥ Press [F2] or [F3] key.
Example:[F3](NEZ) key
Measuring starts.

Collimate P

[F3]

N* [n]	< < < m
E :	m
Z :	m
> Measuring...	
> Calculating...	

The data is recorded and the next measuring point is displayed.

PT#	→ PT-13
PCODE	:
R. HT	: 1.200 m
INPUT	SRCH MEAS ALL

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

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

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

Operating procedure	Operation	Display
① Press [F2] (CONV. TO NEZ) key from the data collect menu 2/3.	[F2]	<p>DATA COLLECT 2/3 F1 : SELECT A FILE F2 : CONV. TO NEZ F3 : PCODE INPUT P↓</p>
② Press [F2](FILE) key to display the list of file. *1)	[F2]	<p>MEAS. FILE NAME FN :</p> <p>INPUT LIST --- ENTER</p> <p>AMIDATA /M0123 →* HILDATA /M0345 TOPDATA /M0789 --- SRCH --- ENTER</p>
③ Scroll file list by pressing [▲] or [▼] key and select data file to convert. *2),3)	[▲] or [▼]	<p>TOPDATA /M0789 → RAPDATA /M0564 SATDATA /M0456 --- SRCH --- ENTER</p>
④ Press [F4] (ENTER) key.	[F4]	<p>COORD. FILE NAME FN :</p> <p>INPUT --- --- ENTER</p>
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](LIST) 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 number 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 liked 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 = ITABAS → 012 : AMIDAT 013 : HILLTO EDIT —— CLR ——
③ Press [F1](EDIT) key.	[F1]	011 = ITABAS → 012 = <u>AMIDAT</u> 013 : HILLTO 1234 5678 90. - [ENT]
④ Enter PCODE and press [F4](ENT) key. *1)	Enter PCODE [F4]	011 = ITABAS → 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 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
① Press [F1] (CONFIG.) key from the data collect menu 3/3. The CONFIG menu 1/2 is shown.	[F1]	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> DATA COLLECT 3/3 F1 : CONFIG. P↓ </div>
② Press [F4] (P↓) key to display the CONFIG menu 2/2.	[F4]	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> CONFIG. 1/2 F1 : DIST MODE F2 : HD/SD F3 : MEAS. SEQ. P↓ </div>
③ Press [F1] (DATA CONFIRM) key. [] indicates the current setting.	[F1]	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> CONFIG. 2/2 F1 : DATA CONFIRM F2 : COLLECT SEQ. F3 : NEZ AUTO CALC. P↓ </div>
④ Press [F1] (YES) key.	[F1]	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> DATA CONFIRM F1 : YES [F2 : NO] ENTER </div>
⑤ Press [F4] (ENTER) key.	[F4]	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> DATA CONFIRM [F1 : YES] F2 : NO ENTER </div>

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".

For GTS-211D/212

The GTS-211D/212 are able to store the coordinate data in the internal memory which is maintained by lithium battery.

The internal memory is shared by the measured data and the coordinate data for layout.

The total number of generated files is maximum 30.

- The number of coordinate data

(In case not using the internal memory in the data collect mode)

MAX. 4,000 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) The expiry date of backup battery is set for 5-year duration at a temperature range of 20°C. The data may be lost when the battery is out.
Have your lithium battery replaced at your dealer before the expiry date.
- 4) When recording new point data, remember to consider the amount of internal memory available.

For GTS-213

The total number of generated files is maximum 15.

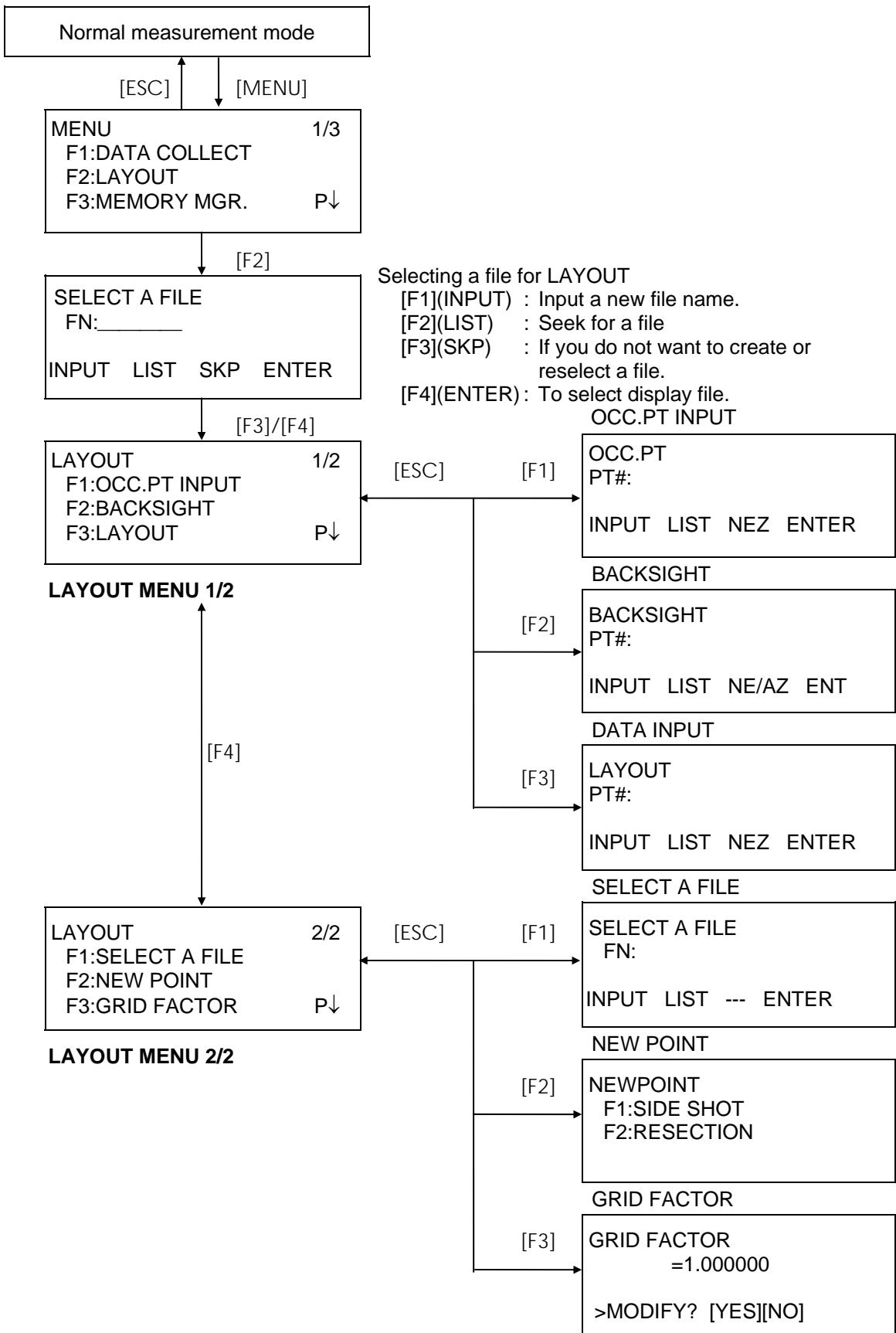
- The number of coordinate data

MAX. 500 points

- 1) The coordinate data stored in the internal memory will be memorized for about 2 hours after taking out the battery (BT-32Q).
- 2) 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.
- 3) It is recommended for safety to charge the battery (BT-32Q) beforehand and prepare fully charged spare batteries.
- 4) It is recommended to initialize the internal memory before using if the battery is discharged completely or the battery was removed for a long period.
Batteries are charged at time of shipping, but they may be discharged by the time of delivery to customers. It is recommended to initialize the memory before using.
- 5) 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

$$\text{Elevation Factor} = \frac{R}{R + \text{ELEV.}} \quad R : \text{The average radius of the earth}$$

$R + \text{ELEV.}$: The elevation above mean sea level

- 2) Scale Factor

Scale Factor : Scale Factor at the surveying station

- 3) Grid Factor

Grid Factor = Elevation Factor × Scale Factor

Distance Calculation

- 1) Grid Distance

$HDg = HD \times \text{Grid Factor}$ HDg : Grid distance

- 2) Ground Distance

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

- How to Set Grid Factor

Operating procedure	Operation	Display
① Press [F3](GRID FACTOR) key from the Layout menu 2/2.	[F3]	<p>LAYOUT 2/2 F1 : SELECT A FILE F2 : NEW POINT F3 : GRID FACTOR P↓</p>
② Press [F3](YES) key.	[F3]	<p>GRID FACTOR $=0.998843$ >MODIFY ? [YES] [NO]</p>
③ Press [F1] (INPUT) key and enter Elevation. <small>*1) Press [F4](ENT) key.</small>	[F1]	<p>GRID FACTOR ELEV. →1000 m SCALE : 0.999000 INPUT —— —— ENTER</p>
④ Enter Scale Factor in the same way.	Enter ELEV. [F4] [F1] Enter Scale [F4]	<p>1234 5678 90. — [ENT]</p> <p>GRID FACTOR ELEV. : 2000 m SCALE → 1.001000 INPUT —— —— ENTER</p>
Grid Factor is displayed for 1 to 2 second and display returns to Layout menu 2/2.		<p>GRID FACTOR $=1.000686$</p>
<p>*1) Refer to Chapter 2.5 "How to enter alphanumeric characters".</p> <ul style="list-style-type: none"> ● 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
		<p>LAYOUT 2/2 F1 : SELECT A FILE F2 : NEW POINT F3 : GRID FACTOR P↓</p>
① Press [F1](SELECT A FILE) key from the Layout menu 2/2.	[F1]	<p>SELECT A FILE FN :</p> <p>INPUT LIST --- ENTER</p>
② Press [F2](FILE) key to display the list of coordinate data file. *1)	[F2]	<p>COORDDATA /C0123 →* TOKBDATA /C0345 TOPCDATA /C0789 --- SRCH --- ENTER</p>
③ Scroll file list by pressing [▲] or [▼] key and select a file to use. *2),3)	[F1]	<p>* TOKBDATA /C0345 → TOPCDATA /C0789 SATIDATA /C0456 --- SRCH --- ENTER</p>
④ Press [F4](ENTER) key. The file will be set .	[F4]	<p>LAYOUT 2/2 F1 : SELECT A FILE F2 : NEW POINT F3 : GRID FACTOR P↓</p>
<p>*1) If you want to input file name directly, press [F1](INPUT) key and enter a file name.</p> <p>*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".</p> <p>*3) Data in a file shown with arrow can be searched by pressing [F2](SRCH) key.</p>		

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. The display returns to layout menu 1/2.	[F1] Enter INS.HT [F4]	1234 5678 90. – [ENT] 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
④ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. *2)	[F1] Enter PT# [F4]	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]	INSTRUMENT HEIGHT INPUT INS. HT : 0.000 m INPUT --- --- ENTER 1234 5678 90. - [ENT]
		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.

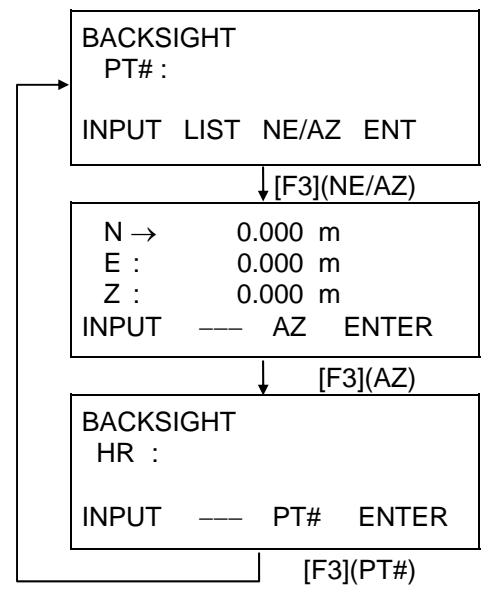
- 1) Setting from the coordinate data file stored in the internal memory.
- 2) Direct key input of coordinate data.
- 3) Direct key input of setting angle.

- 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# : INS. HT : 0.000 m 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								
<p>① Press [F3](LAYOUT) key from the layout menu 1/2.</p> <p>② Press [F1](INPUT) key, and enter PT#. *1 Press [F4](ENT) key.</p> <p>③ Enter reflector height in the same way.</p> <p>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</p> <p>④ Collimate the prism, and press the [F1](ANGLE) key. 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"</p>	[F3] [F1] Enter PT# [F4] [F1] Enter R.HT [F4] Collimate [F1]	<div style="border: 1px solid black; padding: 5px;"> <p>LAYOUT 1/2 F1 : OCC. PT INPUT F2 : BACKSIGHT F3 : LAYOUT P↓</p> </div> <div style="border: 1px solid black; padding: 5px;"> <p>LAYOUT PT# :</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">INPUT</td> <td style="padding: 2px;">LIST</td> <td style="padding: 2px;">NEZ</td> <td style="padding: 2px;">ENTER</td> </tr> <tr> <td style="padding: 2px;">1234</td> <td style="padding: 2px;">5678</td> <td style="padding: 2px;">90. -</td> <td style="padding: 2px;">[ENT]</td> </tr> </table> </div> <div style="border: 1px solid black; padding: 5px;"> <p>REFLECTOR HEIGHT INPUT R. HT : 0.000 m INPUT --- --- ENTER</p> </div> <div style="border: 1px solid black; padding: 5px;"> <p>CALCULATED HR=90°10'20" HD= 123.456 m ANGLE DIST --- ---</p> </div> <div style="border: 1px solid black; padding: 5px;"> <p>HR : 6°20'40" dHR : 23°40'20" DIST --- NEZ ---</p> </div>	INPUT	LIST	NEZ	ENTER	1234	5678	90. -	[ENT]
INPUT	LIST	NEZ	ENTER							
1234	5678	90. -	[ENT]							

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. *2)

[F1]

HD* [t]	< m
dHD :	m
dZ :	m
MODE ANGLE NEZ NEXT	

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

[F1]

HD* [r]	< m
dHD :	m
dZ :	m
MODE ANGLE NEZ NEXT	

⑦ When the display value dHR, dHD and dZ are equal to 0, the layout point is established. *3)

⑧ Press [F3](NEZ) key.
The coordinate data is shown.

[F3]

N * 100.000 m
E : 100.000 m
Z : 1.015 m
MODE ANGLE --- 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) Cut & Fill displaying function is available . Refer to Chapter 16 "SELECTING MODE".

*3) Press [F2](ANGLE) to display dHR.

● **Point Guide Function (Only for Point Guide type)**

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

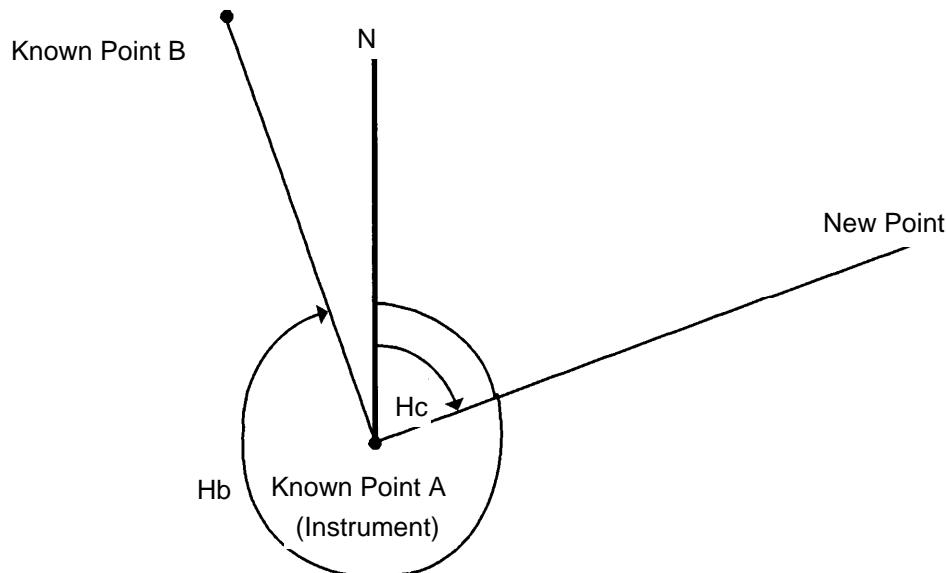
Operating procedure	Operation	Display
① After measuring Angle, Distance or Coordinate, press [MENU] key.	[MENU]	HR : 6°20'40" dHR : 23°40'20" DIST --- NEZ ---
② Press [F3](ON) or [MENU] key.	[F3] or [MENU]	POINTGUIDE [OFF] --- --- [ON] [OFF]
③ Press [ESC] key to return to the previous display.	[ESC]	POINTGUIDE [ON] --- --- [ON] [OFF]
		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
① Press [F4](P↓) key from the layout menu 1/2 to get the layout menu 2/2.	[F4]	LAYOUT 1/2 F1 : OCC. PT INPUT F2 : BACKSIGHT F3 : LAYOUT P↓
② Press [F2](NEW POINT).	[F2]	LAYOUT 2/2 F1 : SELECT A FILE F2 : NEW POINT F3 : GRID FACTOR P↓
③ Press [F1](SIDE SHOT) key.	[F1]	NEW POINT F1 : SIDE SHOT F2 : RESECTION
④ Press [F2](FILE) key to display the list of coordinate data file. *1)	[F2]	SELECT A FILE FN : _____ INPUT LIST --- ENTER COORDDATA /C0123 →* TOKB DATA /C0345 TOPC DATA /C0789 --- SRCH --- ENTER

<p>⑤ Scroll file list by pressing [\blacktriangle] or [\blacktriangledown] key and select a file to use. *2),3)</p>	[F1] * TOKB DATA /C0345 → TOPC DATA /C0789 SATI DATA /C0456 --- SRCH --- ENTER
<p>⑥ Press [F4](ENTER) key. The file will be set.</p>	[F4] SIDE SHOT PT# : INPUT SRCH --- ENTER 1234 5678 90. - [ENT]
<p>⑦ Press [F1](INPUT) key, and enter the new point name. *4) Press [F4](ENT) key.</p>	[F1] Enter PT# [F4] [F1] REFLECTOR HEIGHT INPUT R. HT : 0.000 m INPUT --- --- ENTER 1234 5678 90. - [ENT]
<p>⑧ Enter reflector height in the same way.</p>	[F4] Enter R.HT [F1] REFLECTOR HEIGHT INPUT R. HT : 1.235 m > Sight ? [YES] [NO]
<p>⑨ Collimate the new point, and press [F3](YES) key. Distance measuring starts.</p>	[F3] Collimate [F3] HR : 123°40'20" HD * < m VD : m > Measuring... < complete >
	[F3] N : 1234.567 m E : 123.456 m Z : 1.234 m > REC ? [YES] [NO]
<p>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.</p>	[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".

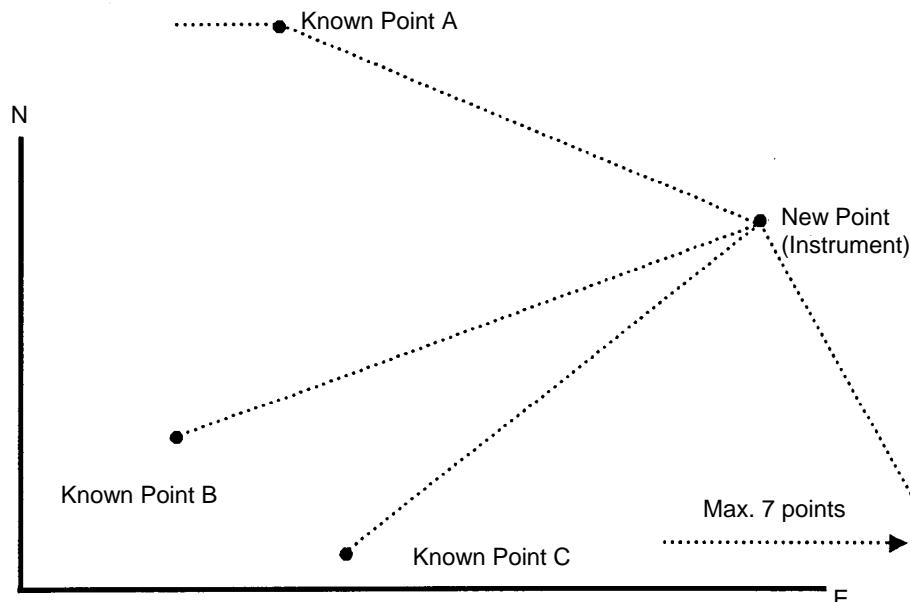
8.3.2 Resection Method

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

⑤ Enter instrument height in the same way.

[F1] INSTRUMENT HEIGHT
INPUT
INS.HT : 0.000 m
INPUT —— —— ENTER

1234 5678 90. – [ENT]

⑥ Enter the known point A number. *3)

[F1] NO01#
PT# :

INPUT LIST NEZ ENTER

1234 5678 90. – [ENT]

⑦ Enter reflector height

[F1] REFLECTOR HEIGHT
INPUT
R.HT : 0.000 m
INPUT —— —— ENTER

1234 5678 90. – [ENT]

⑧ Collimate the known point A, and press [F3](ANG) or [F4](DIST) key.
Example:[F4](DIST)
Distance measuring starts.

[F1] REFLECTOR HEIGHT
INPUT
R. HT : 1.235 m
> Sight ? ANG DIST

1234 5678 90. – [ENT]

Known point B entering display will be shown.

Collimate [F4]

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

< complete >

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 [F4](DIST) key, the RESIDUAL ERROR will be calculated. *4)

⑩ Select GRID FACTOR for calculation of RESIDUAL ERROR by pressing [F1] or [F2] key.
*5)

Example: [F1]

[F1] SELECT GRID FACTOR
F1 : USE LAST DATA
F2 : CALC MEAS. DATA

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.

[F1]

NO03#
PT# :
INPUT LIST NEZ ENTER

- ⑫ Same as procedure ⑥ to ⑩ proceed to the known point C.

HR : 123°40'20"
HD * < m
VD : m
> Measuring...
< complete >

HR : 123°40'20" m
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.

[F3]

NEW POINT
F1 : SIDE SHOT
F2 : RESECTION

The display returns to new point menu.

- *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 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
 $dZ=(Z \text{ coordinate of the new point calculated from known point A}) - (Z \text{ coordinate of the new point calculated from known point B})$
- *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 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
① While executing the LAYOUT mode, press [F2](LIST) key. The arrow(→) indicates selected data.	[F2]	LAYOUT PT# : INPUT LIST NEZ ENTER [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

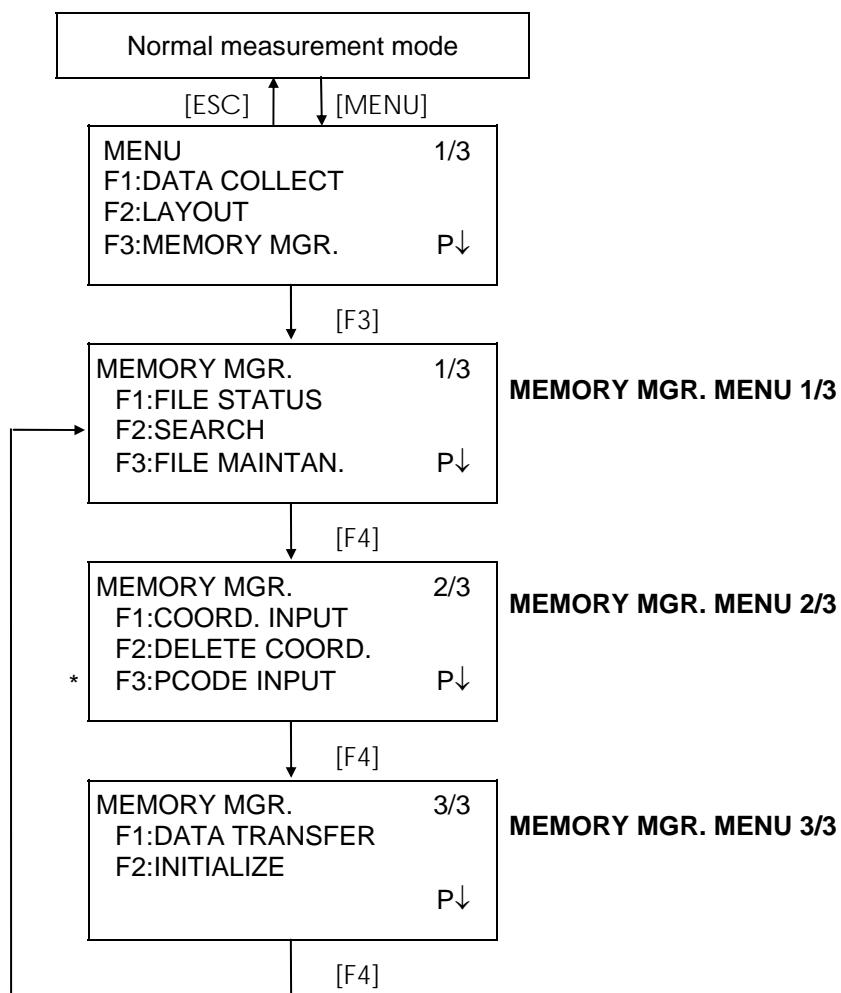
The following items for internal memory are available in this mode.

- 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
This item is only for GTS-211D/212.
- 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.



* 'PCODE INPUT' is only for GTS-211D/212.

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]	<p>MEMORY MGR. 1/3</p> <p>F1 : FILE STATUS</p> <p>F2 : SEARCH</p> <p>F3 : FILE MAINTAN. P↓</p>
② Press [F1](FILE STATUS) key. The total number of stored measured data files and coordinate files are shown.	[F1]	<p>FILE STATUS 1/2</p> <p>MEAS. FILE : 3</p> <p>COORD. FILE : 6</p> <p>[.....] P↓</p>
③ Press [F4](P↓) key. The total number of stored measured data and coordinate data in all files are shown. *1)	[F4]	<p>DATA STATUS 2/2</p> <p>MEAS. DATA : 0100</p> <p>COORD. DATA : 0050</p> <p>[.....] P↓</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.
(Only for GTS-211D / 212)

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.
(Only for GTS-211D / 212)

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

<p>⑥ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. *1)</p> <p>⑦ Press [F4](↓) key to scroll data for selected point.</p>	<p>[F1] Enter PT# [F4]</p> <table border="1" style="margin-top: 10px; border-collapse: collapse; width: 100%;"> <tr><td>PT#</td><td>TOP-104</td><td>1/2</td></tr> <tr><td>V</td><td>98°36'20"</td><td></td></tr> <tr><td>HR</td><td>160°40'20"</td><td></td></tr> <tr><td>TILT</td><td>0°00'00"</td><td>↓</td></tr> </table> <table border="1" style="margin-top: 10px; border-collapse: collapse; width: 100%;"> <tr><td>PT#</td><td>TOP-104</td><td>2/2</td></tr> <tr><td>PCODE</td><td>↓</td><td></td></tr> <tr><td>R.HT</td><td>1.200 m</td><td></td></tr> <tr><td>EDIT</td><td></td><td>↓</td></tr> </table>	PT#	TOP-104	1/2	V	98°36'20"		HR	160°40'20"		TILT	0°00'00"	↓	PT#	TOP-104	2/2	PCODE	↓		R.HT	1.200 m		EDIT		↓
PT#	TOP-104	1/2																							
V	98°36'20"																								
HR	160°40'20"																								
TILT	0°00'00"	↓																							
PT#	TOP-104	2/2																							
PCODE	↓																								
R.HT	1.200 m																								
EDIT		↓																							

- **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																
① Press [F1](EDIT) key from last page of displayed data.	[F1]	<table border="1" style="margin-top: 10px; border-collapse: collapse; width: 100%;"> <tr><td>PT#</td><td>TOP-104</td><td>2/2</td></tr> <tr><td>PCODE</td><td>↓</td><td></td></tr> <tr><td>R.HT</td><td>1.000 m</td><td></td></tr> <tr><td>EDIT</td><td></td><td>↓</td></tr> </table>	PT#	TOP-104	2/2	PCODE	↓		R.HT	1.000 m		EDIT		↓				
PT#	TOP-104	2/2																
PCODE	↓																	
R.HT	1.000 m																	
EDIT		↓																
② Select the item to correct by pressing [▲] or [▼] key.	[▲] or [▼]	<table border="1" style="margin-top: 10px; border-collapse: collapse; width: 100%;"> <tr><td>PT#</td><td>→ TOP-104</td><td></td></tr> <tr><td>PCODE</td><td>:</td><td></td></tr> <tr><td>R.HT</td><td>: 1.000 m</td><td></td></tr> <tr><td>INPUT</td><td>--- ---</td><td>ENTER</td></tr> </table>	PT#	→ TOP-104		PCODE	:		R.HT	: 1.000 m		INPUT	--- ---	ENTER				
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]	<table border="1" style="margin-top: 10px; border-collapse: collapse; width: 100%;"> <tr><td>PT#</td><td>TOP-104</td><td>2/2</td></tr> <tr><td>PCODE</td><td>↓</td><td></td></tr> <tr><td>R.HT</td><td>→ 1.000 m</td><td></td></tr> <tr><td>INPUT</td><td>--- ---</td><td>ENTER</td></tr> </table>	PT#	TOP-104	2/2	PCODE	↓		R.HT	→ 1.000 m		INPUT	--- ---	ENTER				
PT#	TOP-104	2/2																
PCODE	↓																	
R.HT	→ 1.000 m																	
INPUT	--- ---	ENTER																
④ Press [F4](ENT) key.		<table border="1" style="margin-top: 10px; border-collapse: collapse; width: 100%;"> <tr><td>PT#</td><td>TOP-104</td><td>2/2</td></tr> <tr><td>PCODE</td><td>↓</td><td></td></tr> <tr><td>R.HT</td><td>1.200 m</td><td></td></tr> <tr><td>EDIT</td><td></td><td>↓</td></tr> </table> <table border="1" style="margin-top: 10px; border-collapse: collapse; width: 100%;"> <tr><td colspan="2">> SAVE ?</td></tr> <tr><td style="text-align: right;">[YES]</td><td style="text-align: left;">[NO]</td></tr> </table>	PT#	TOP-104	2/2	PCODE	↓		R.HT	1.200 m		EDIT		↓	> SAVE ?		[YES]	[NO]
PT#	TOP-104	2/2																
PCODE	↓																	
R.HT	1.200 m																	
EDIT		↓																
> 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 1234 5678 90. - [ENT]
⑥ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. *1)	Enter PT# [F4]	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 (Only for GTS-211D / 211)

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 [\blacktriangle] or [\blacktriangledown] key to scroll to next or previous PCODE data.

*2) To correct the PCODE data, press [F1](EDIT) key.

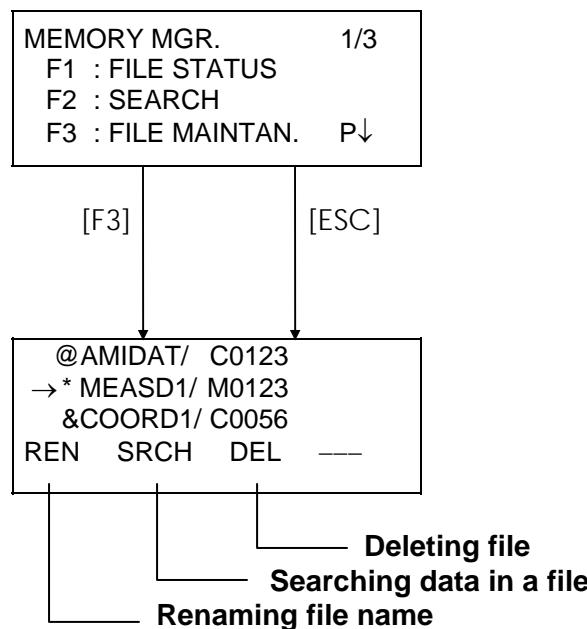
To delete the PCODE data, press [F3](CLR) key.

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.

9.3.4 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]	<pre>→ MEASD1/ M0123 COORD1/ C0056 REN SRCH DEL ---</pre>
② Select a file to delete by pressing [▲] or [▼] key.	[▲] or [▼]	<pre>MEASD1/ M0123 → COORD1/ C0056 COORD2/ C0098 REN SRCH DEL ---</pre>
③ Press [F3](DEL) key.	[F3]	<pre>MEASD1/ M0123 → COORD1/ C0056 COORD2/ C0098 > DELETE ? [NO] [YES]</pre>
④ Confirm the deleting, and press [F4](YES) key.	[F4]	<pre>MEASD1/ M0123 → COORD2/ C0098 COORD3/ C0321 REN SRCH DEL ---</pre>
● 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 1234 5678 90. - [ENT]
④ Press [F1](INPUT) key and enter File Name you want to input. Press [F4](ENT) key. *1)	Enter FN [F4]	COORD. DATA INPUT PT# : INPUT LIST --- ENTER 1234 5678 90. - [ENT]
⑤ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. *1)	Enter PT# [F4]	N → 100.234 m E : 12.345 m Z : 1.678 m INPUT --- --- ENTER 1234 5678 90. - [ENT]
⑥ Enter coordinate data in the same way. Next input display is shown, point# is automatically incremented.	Enter COORD. [F4]	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]
⑤ Press [F1](INPUT) key and enter PT#. Press [F4](ENT) key. *1)	[F1] Enter PT# [F4]	DELETE COORD. PT# : INPUT LIST --- ENTER 1234 5678 90. - [ENT]
⑥ Confirm the data and press [F3](YES) key. Deleting starts. The display returns to the previous display.	[F3]	N : 100.234 m E : 12.345 m Z : 1.678 m > DELETE ? [YES] [NO]

*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]	<p>MEMORY MGR. 1/3</p> <p>F1 : FILE STATUS F2 : SEARCH F3 : FILE MAINTAN. P↓</p>
② Press [F4](P↓) key.	[F4]	<p>MEMORY MGR. 2/3</p> <p>F1 : COORD. INPUT F2 : DELETE COORD. F3 : PCODE INPUT P↓</p>
③ Press [F3](PCODE INPUT) key.	[F3]	<p>→ 001 : TOPCON 002 : TOKYO EDIT --- CLR ---</p>
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.	[▲],[▼],[▶],[◀]	<p>011 : ITABAS → 012 : AMIDAT 013 : HILLTO EDIT --- CLR ---</p>
⑤ Press [F1](EDIT) key.	[F1]	<p>011 : ITABAS → 012 = AMIDAT 013 : HILLTO 1234 5678 90. - [ENT]</p>
⑥ Enter PCODE and press [F4](ENT) key. *1)	Enter PCODE [F4]	<p>011 : ITABAS → 012 = AMISUN 013 : HILLTO EDIT --- CLR ---</p>

*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 receive 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.	[F4]	INITIALIZE DATA < Initializing! > [.....]
The display returns to menu.		MEMORY MGR. 3/3 F1 : DATA TRANSFER F2 : INITIALIZE P↓

For GTS-213

It is recommended to initialize the internal memory before using if the battery is discharged completely or the battery was removed for a long period.

Batteries are charged at time of shipping, but they may be discharged by the time of delivery to customers. It is recommended to initialize the memory before using.

10 SET AUDIO MODE

The light acceptance quantity level for the EDM (SIGNAL), the atmospheric correction value (PPM) and correction value of prism constant (PRISM) 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 1.		<div style="border: 1px solid black; padding: 5px; display: inline-block;"> MEAS MODE S/A P↓ </div>
② Pressing [F3](S/A) key, mode changes to set audio mode. The display indicates correction value of prism constant (PRISM), atmospheric correction (PPM) and reflection light level (SIGNAL).	[F3]	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> SET AUDIO MODE PRISM : 0mm PPM : 0 SIGNAL : [] PRISM PPM T-P —— </div>

● 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 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.

Operating procedure	Operation	Display
① Press [F3](S/A) key from distance measuring or coordinates measuring mode.	[F3]	SET AUDIO MODE PRISM : 0mm PPM : 0 SIGNAL : [] PRISM PPM T-P -----
② Press [F1](PRISM) key.	[F1]	PRISM CONST. SET PRISM : 0mm INPUT ---- ---- ENTER
③ Input the Prism constant correction value. *1) The display returns to set audio mode.	[F4] Enter data [F4]	1234 5678 90. - [ENT] SET AUDIO MODE PRISM : 14mm PPM : 0 SIGNAL : [] PRISM PPM T-P -----
*1) Refer to Chapter 2.5 "How to Enter Alphanumeric characters". ● Input range : -99mm to +99mm,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, and 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

$$Ka = \left\{ 279.66 - \frac{106.033 \times P}{273.15 + t} \right\} \times 10^{-6}$$

<i>Ka</i>	: Atmospheric correction value
<i>P</i>	: Ambient atmospheric pressure(mmHg)
<i>t</i>	: Ambient Atmospheric temperature(°C)

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

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

<i>l</i>	: Measured distance when atmospheric correction is not set.
----------	---

Example : In case Temperature +20°C , Air pressure 635mmHg, *l*=1000 m

$$Ka = \left\{ 279.66 - \frac{106.033 \times 635}{273.15 + 20} \right\} \times 10^{-6}$$

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

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

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]	SET AUDIO MODE PRISM : 0mm PPM : 0 SIGNAL : [] PRISM PPM T-P —
② Press [F3](T-P) key.	[F3]	TEMP. & PRES. SET TEMP. → 15°C PRES. : 1013 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°C PRES. → 1017 hPa INPUT — — ENTER

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

- Range : Temp. -30 to +60 °C (1°C step) or -22 to +140°F (1°F step)
Pres. 420 to 800mmHg(1mmHg step) ,16.5 to 31.5 inHg (0.1 inHg step) or 560 to 1066hPa(1hPa step)
- When the atmospheric correction value which is calculated from the input temperature and pressure values exceeds the range ± 99ppm, 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]	SET AUDIO MODE PRISM : 0mm PPM : 0 SIGNAL : [] PRISM PPM T-P ---
② Press [F2](PPM) key. Current setting value is displayed.	[F2]	PRM SET PPM : 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 : -99ppm to +99ppm, 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.

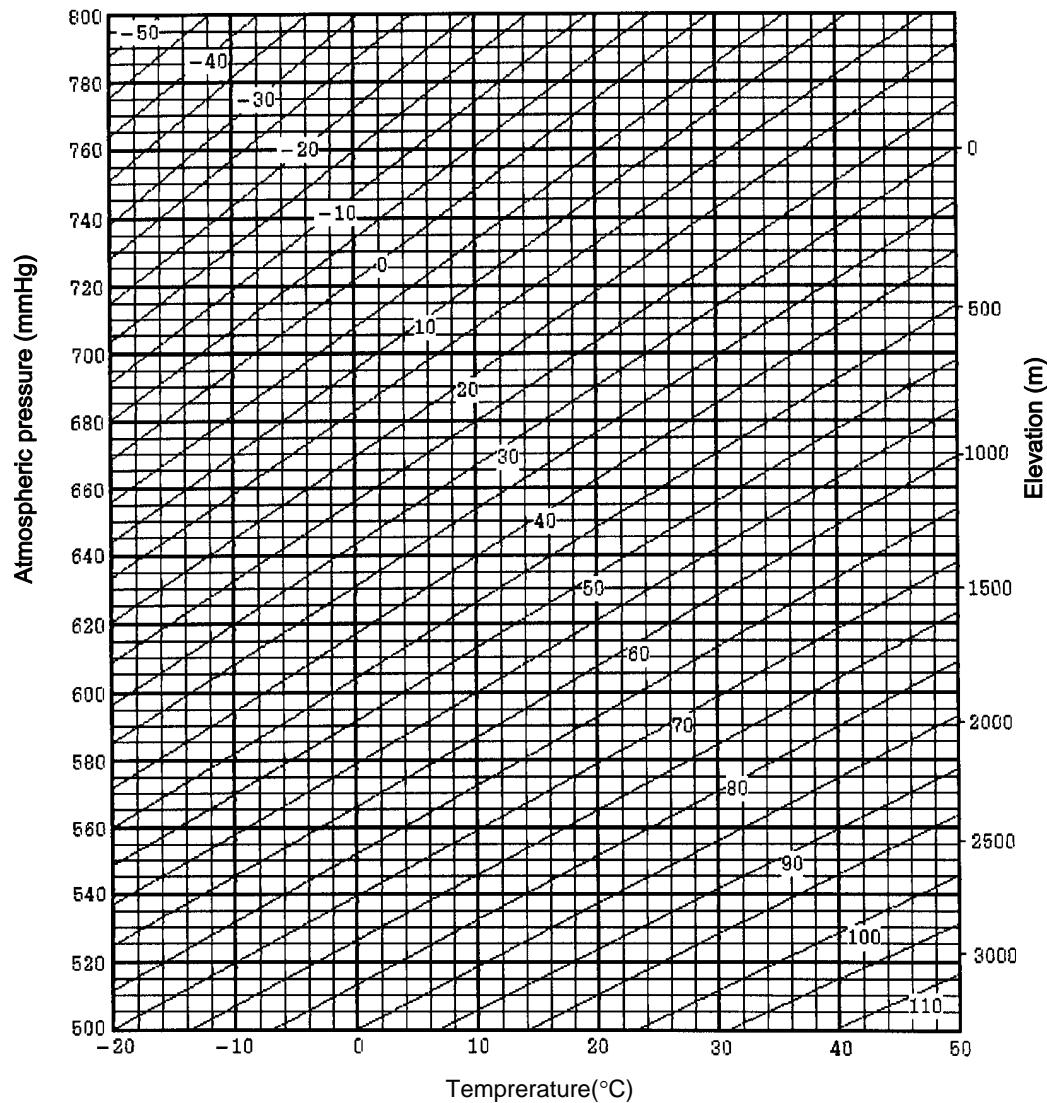
Example:

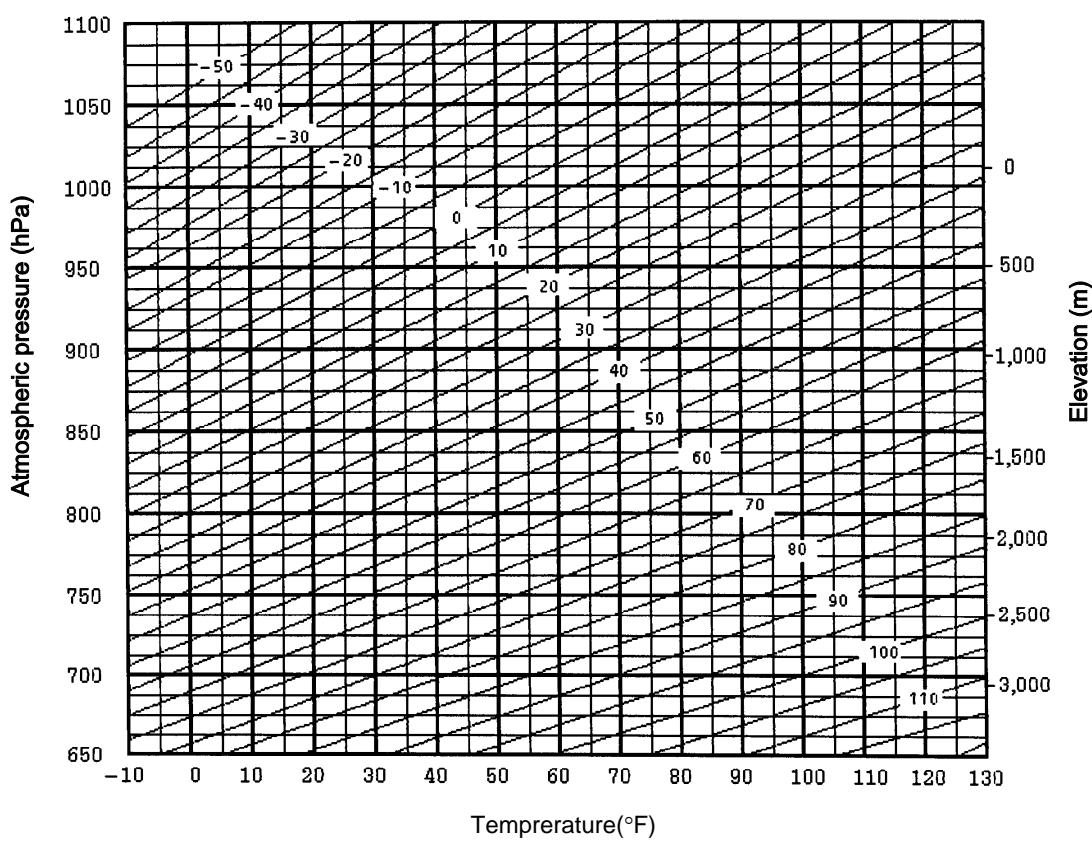
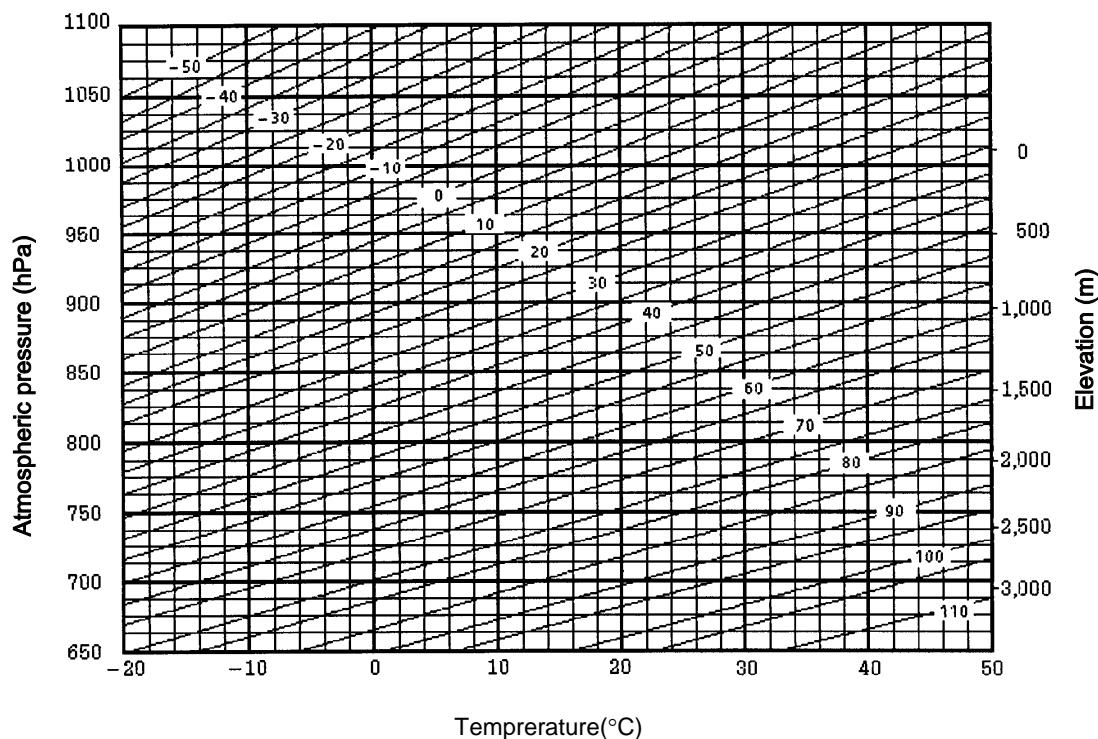
The measured temperature is +26°C

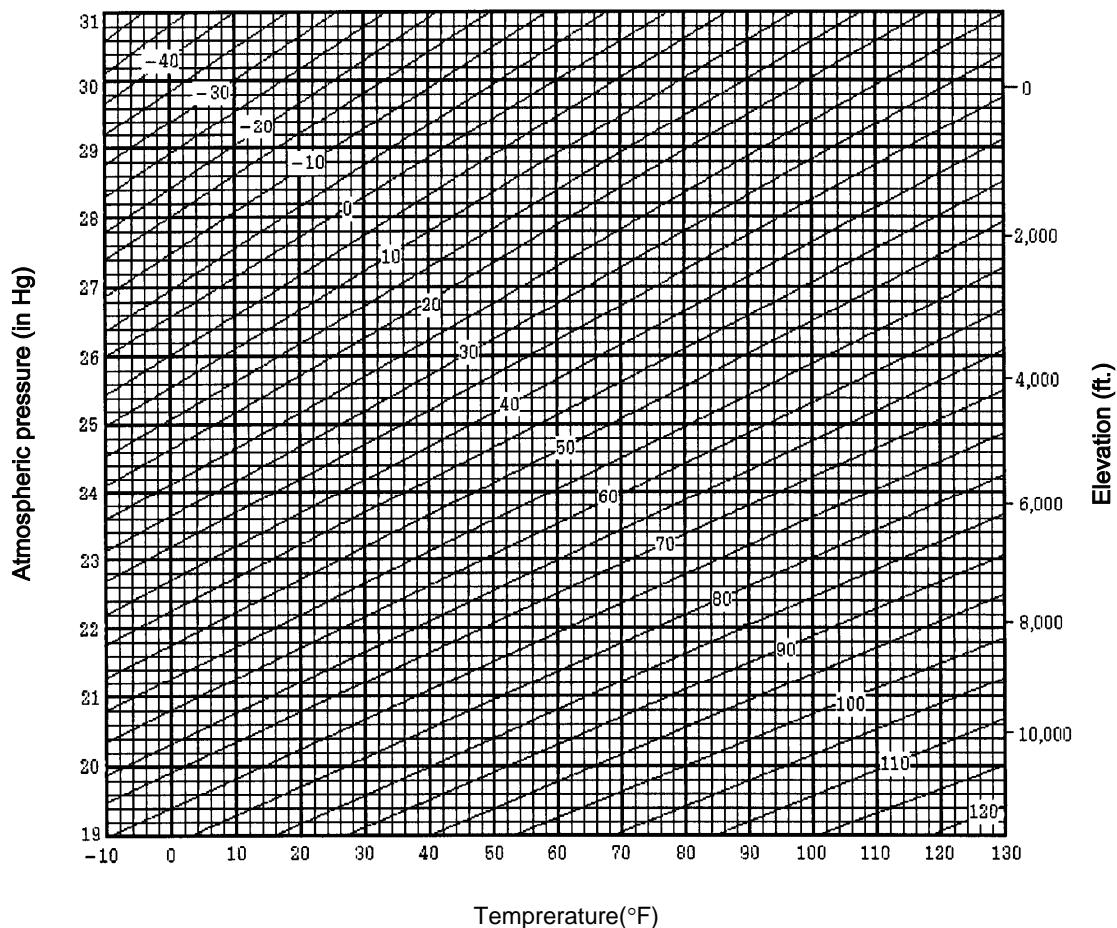
The measured pressure is 760mmHg

There fore,

The correction value is +10ppm







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 $\pm 9^\circ$ 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

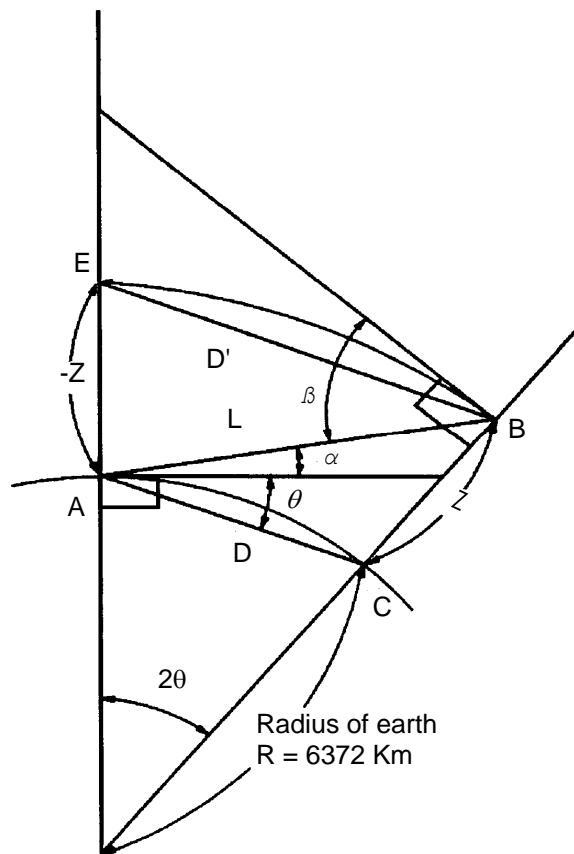
$\gamma=K\cdot L\cos\alpha/2R$ Atmospheric
refraction
correcting item

$K=0.14$ or 0.2 Coefficient of
refraction

$R=6372\text{km}$ Radius of earth

α (or β) Altitude angle

L Slope distance



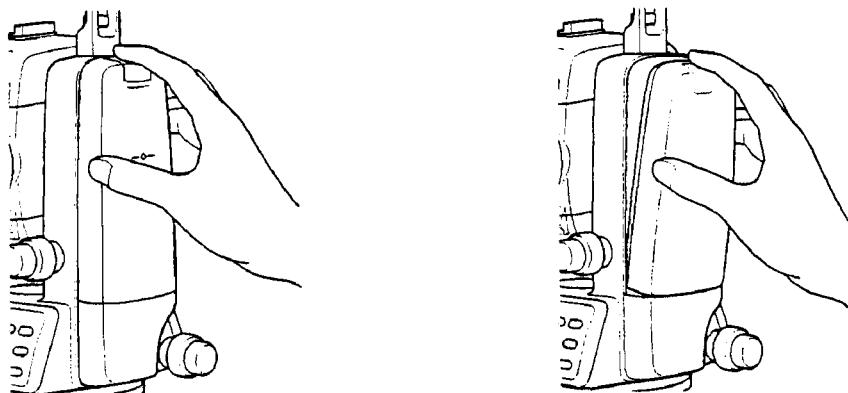
- The conversion formula for horizontal and vertical distances is as follows when correction for refraction and earth curvature is not applied.

$$D=L \cdot \cos\alpha$$

$$Z=L \cdot \sin\alpha$$

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 CHARGING



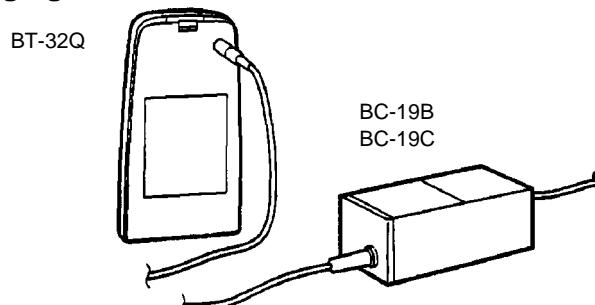
1) For removing

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 Connect the charger connector (BC-19B or BC-19C) to the on-board battery at the connector, the on-board battery should be removed from the instrument when recharging.
- ② Plug the charger into an outlet (BC-19B is for AC 120V use and BC-19C is for AC 230V use.).
- 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.

Note : 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.

15 DETACH/ATTACH OF TRIBRACH

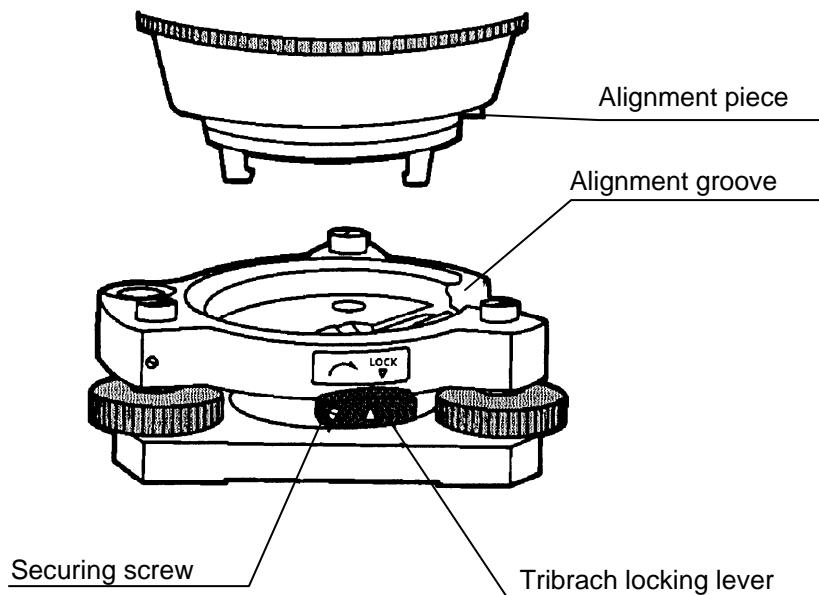
The instrument is easily detached or attached to the tribrach, with a tribrach fixing lever loosened or tightened for this purpose.

- **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 = 3.2808333333333 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 (Only GTS- 211D/212)	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 / OFF	When you press the [ESC] key from the normal measurement mode, it is possible to enter data input mode (in DATA COLLECT) or Layout Menu directly.
	COORD. CHECK	ON / OFF	Select coordinate displaying ON or OFF when setting a point.

3: OTHERS SET	H-ANGLE BUZZER	OFF / ON	Specify whether the buzzer sounds or not for every horizontal angle 90°.
	S/A BUZZER	OFF / ON	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	OFF / ON	It is possible to retain the coordinate of instrument point, the instrument height and prism height after power off.
	RECTYPE	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	OFF / ON	It is possible to output the data with carriage return and line feed.
	NEZ REC FORM	8 DIGITS / 9DIGITS /with RAW	Select to record coordinates in 8 digits, 9 digits or 9digits with raw data.
	LAYOUT NEZ REC	ON/ OFF	In the layout 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 GF. / 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.

* 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

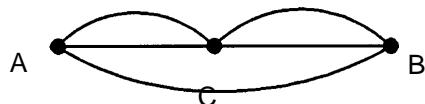
Normally, the instrument constant does not have discrepancy. It is recommended you measure and compare with an accurately measured distance at a location where the precision is specifically monitored on a consistent basis. If such a location is not available, establish your own base line over 20m (when 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.

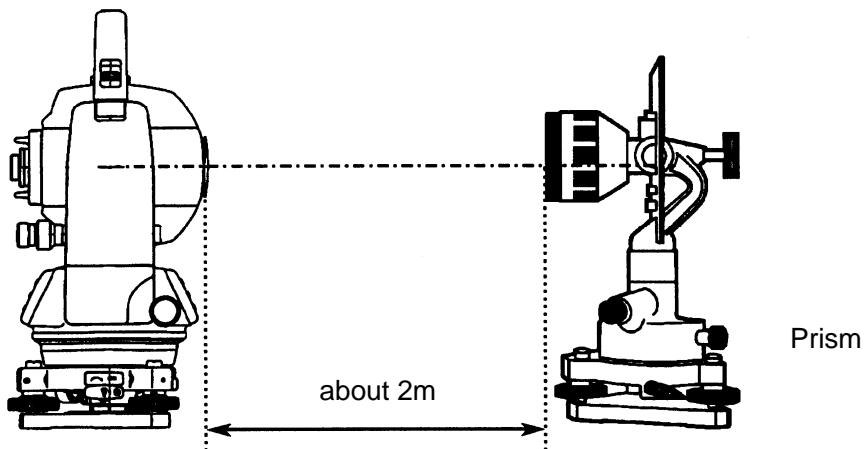


- ② Obtain the instrument constant by repeating ① above several times.
Instrument constant= $AC+BC-AB$
- ③ When there is error between written instrument constant value and calculated value, review the Chapter 17.4 "How to set the instrument constant" procedure.
- ④ Once again, measure at a calibrated 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.

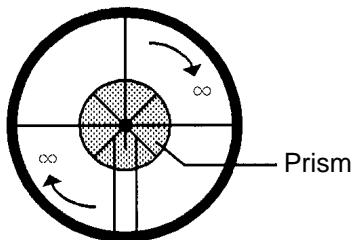
17.2 Checking the Optical Axis

To check if the optical axis of EDM and theodolite are matched, follow the procedure below. It is especially important to check after adjustment of the eyepiece reticle is carried out.

- ① Position the Instrument and prism with about 2m apart and face them at each other. (At this time, the power is ON.)

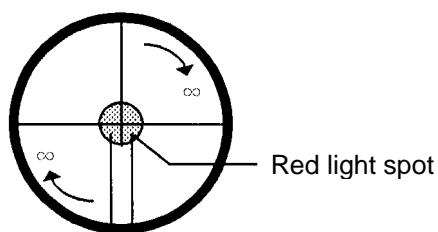


- ② Sight through the eyepiece and focus to the prism. Then center the prism on the cross hairs.



- ③ Set to the measure mode to distance measurement or set audio.
- ④ Sight through the eyepiece and focus the (blinking) red light spot by turning the focusing knob in the direction of infinity (clockwise). If displacement of the reticle cross hairs is within one-fifth of the diameter of the round red light spot both vertically and horizontally, adjustment will not be required.

Note : If displacement is more than one-fifth in the above case, and still remains so after rechecking the original line of sight, the instrument must be adjusted by competent technicians. Please contact TOPCON or your TOPCON dealer to adjust the instrument.



17.3 Checking/Adjusting the Theodolite Functions

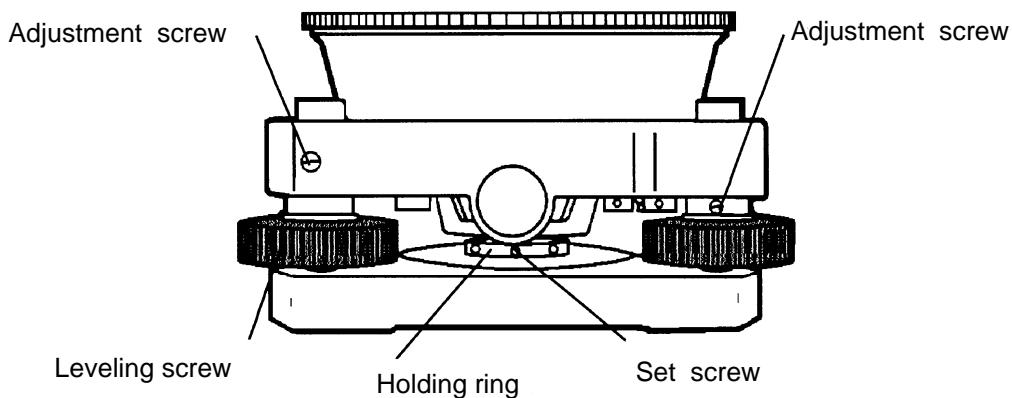
● Pointers on the Adjustment

- 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.

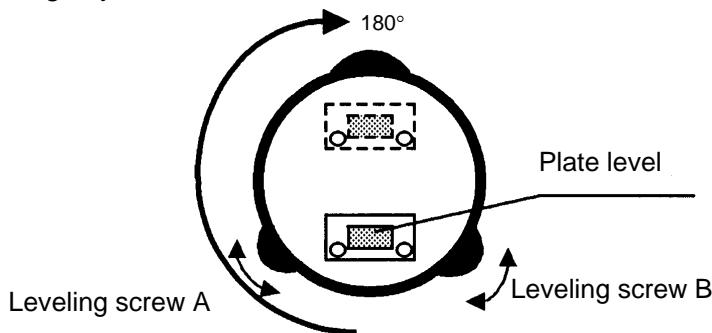


17.3.1 Checking /Adjusting the Plate Level

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

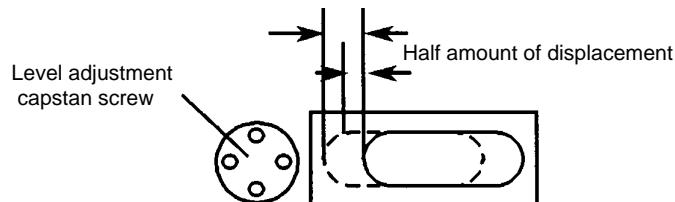
- **Check**

- 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.



17.3.2 Checking /Adjusting the Circular Level

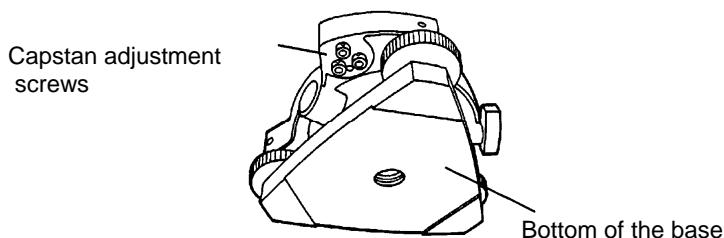
Adjustment is required if the axis of the circular level is also not perpendicular to the vertical axis.

- **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.

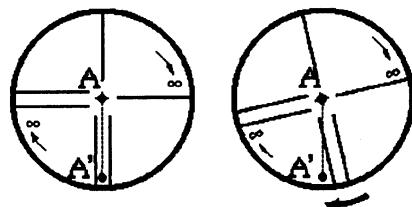


17.3.3 Adjustment of the Vertical Cross-hair

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).

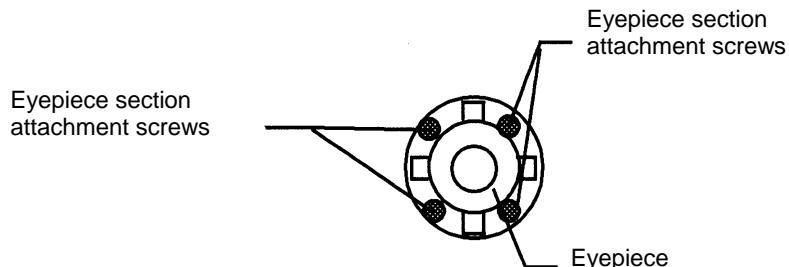
- **Check**

- 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.

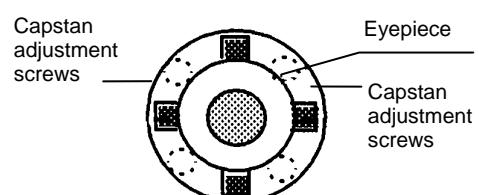
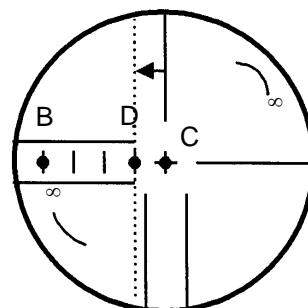
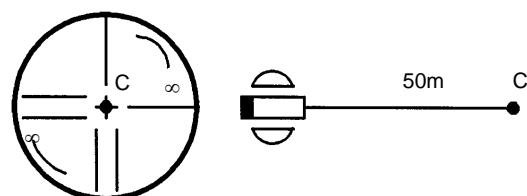
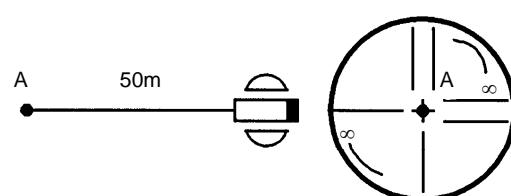
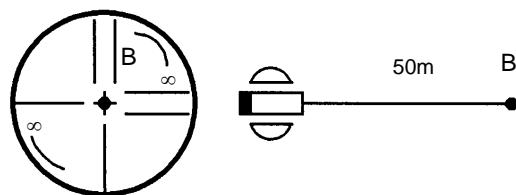
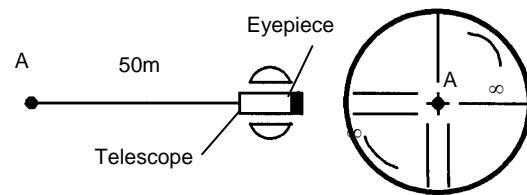
Note : Perform following adjustment after completing the above adjustment .
 Chapter 17.3.4 "Collimation of the Instrument", Chapter 17.3.6 "Adjustment of Vertical Angle Zero Datum" .

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 60 meters (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 $1/4$ th 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 17.3.6 "Adjustment of Vertical Angle 0 Datum", Chapter 17.2 "Checking the Optical Axis".

17.3.5 Checking / Adjusting the Optical Plummet Telescope

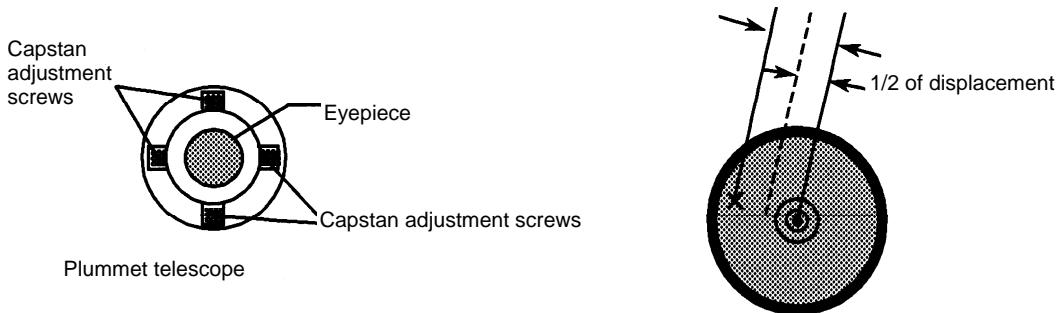
Adjustment is required to make the line of sight of the optical plummet telescope coincide with the vertical axis (otherwise the vertical axis will not be in the true vertical when the instrument is optically plumbed).

- **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.

17.3.6 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 F1 : V ANGLE 0 POINT F2 : INST. CONSTANT
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>	< SET ! >
⑦ Press [F4](ENTER) key. Measured value is set and carry out normal angle measurement.	[F4]	V : 270°00'00" HR : 120°30'40" OSET 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.		

17.4 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.

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
② Press [F2] key.	[F2]	INST. CONSTANT SET INST. CONSTANT : - 0.6 mm INPUT --- --- ENTER
	[F1]	1234 5678 90. - [ENT]
③ Enter the constant value. *1),2)	Enter value [F4]	INST. CONSTANT SET INST. CONSTANT : - 0.7 mm INPUT --- --- ENTER
④ Turn power switch OFF.	Power OFF	

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

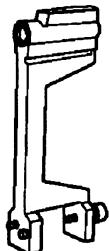
18 PRECAUTIONS

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

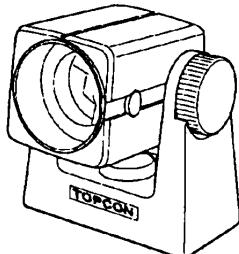
Data collector

Suitable for systemization of measuring instrument. Measuring data will be automatically stored and transferred to a computer system, making measuring operations more efficient and saving time and effort in such operation.



Trough compass, Model 6

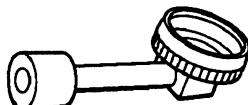
Shock proof construction. No clamp is necessary when carrying the instrument.



Mini prism

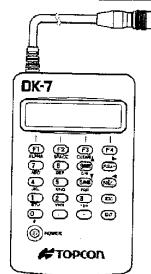
The mini prism (25.4mm) is made from precision ground glass and mounted in high impact plastic housings.

The mini has the unique capability of being positioned either at a "0" or "-30" with the same prism.



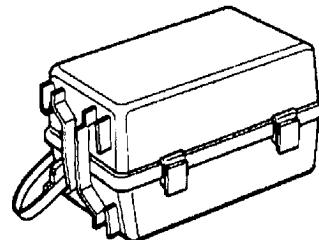
Diagonal eyepiece, Model 11

Observation in an easy posture will be provided up to the zenith position



Data entry keyboard DK-7

Occupied point, coordinate data and other data can be input from DK-7. It is also possible to control GTS-210 series from DK-7.

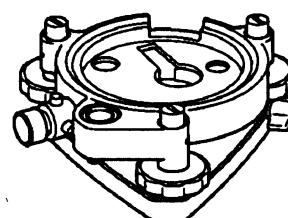


Prism unit case, Model 3

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

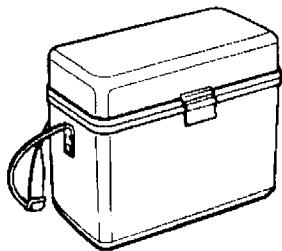
The case covers one of the following prism sets:

- 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



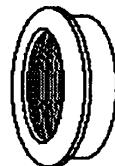
Optical plummet tribrach

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

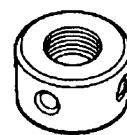
**Gadget case, Model 1**

A case to store and carry accessories.

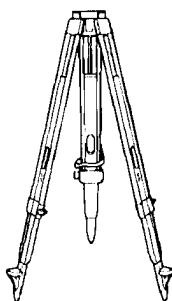
- External dimensions:
300(L)145(W)220(H) mm
- Weight: 1.4kg

**Solar filter, Model 8**

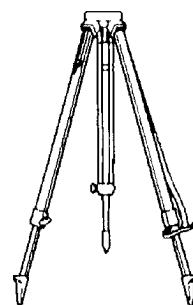
- A filter designed exclusively for direct collimation of the sun.

**Solar reticle, Model 7**

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

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

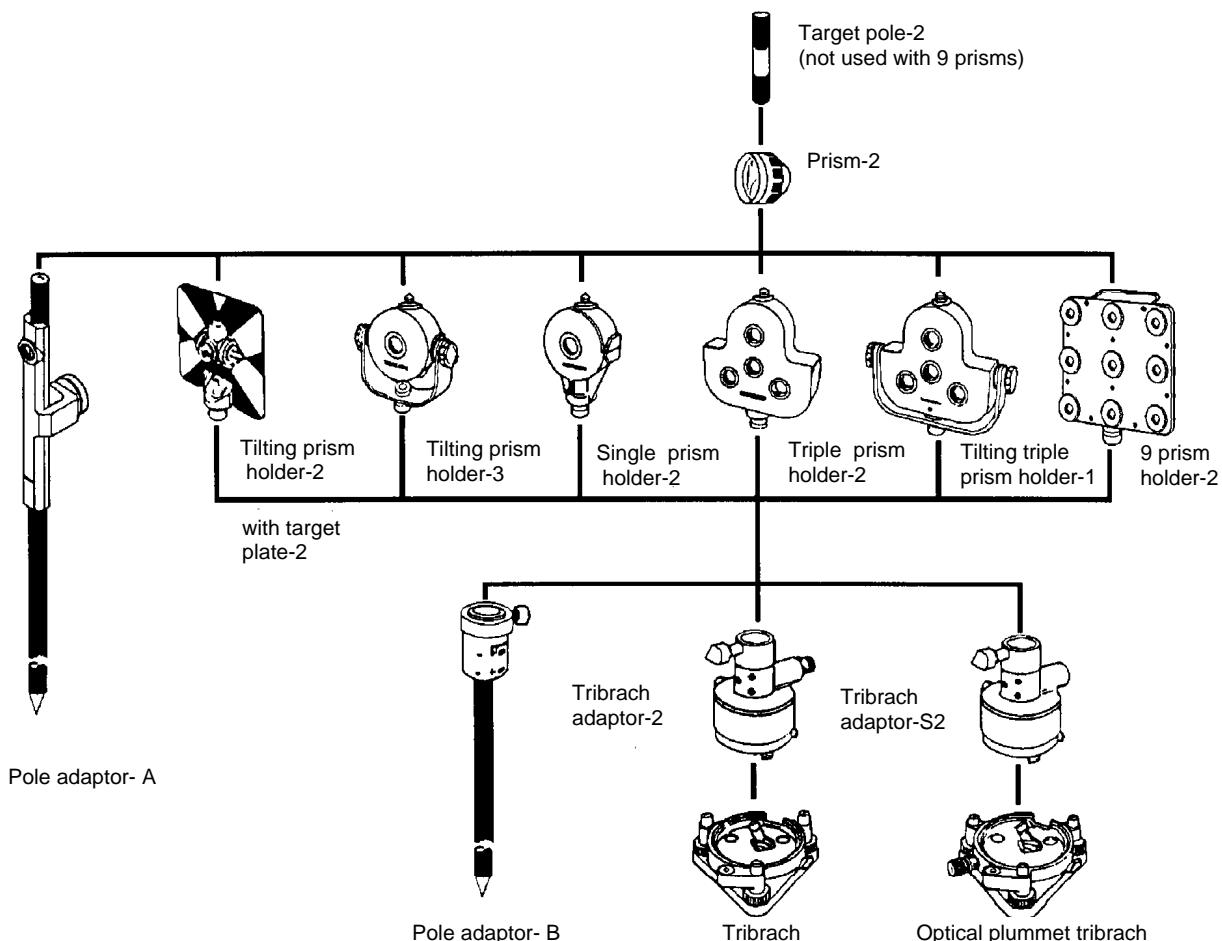
- Flat head 5/8" × 11 threads with adjustable legs.

**Aluminum extension leg tripod,
Type E**

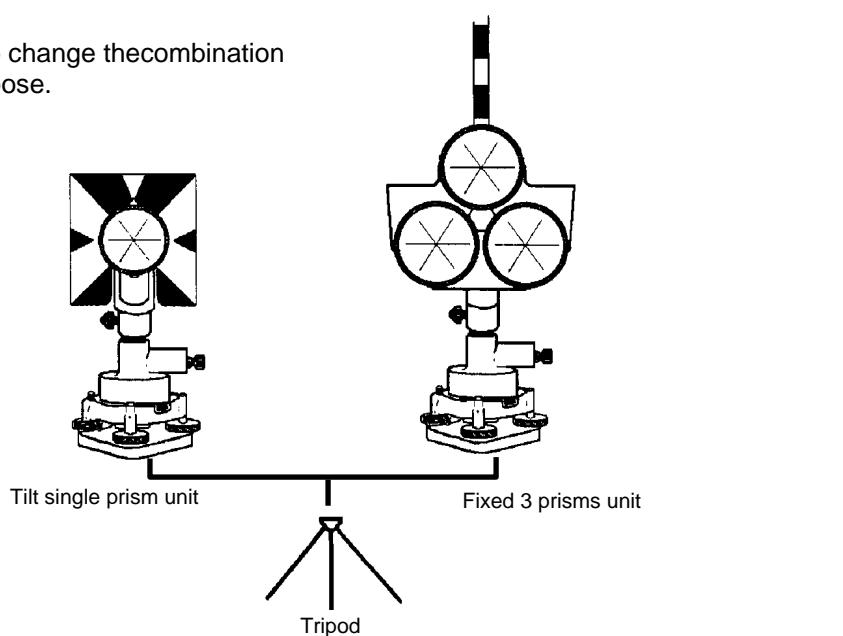
- Flat head 5/8" × 11 threads with adjustable legs.

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 instrument. To adjust the height of prism set, change the position of 4 fixing screws.

21 ERROR DISPLAYS

Error code	Description	Countermeasure
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.
E	Displayed when the Lithium battery power for back up is insufficient. (GTS-211D/212)	Contact your TOPCON dealer.
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 $\pm 6^\circ$.	Operate in the range out of $\pm 6^\circ$ 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 GTS-210 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, 15 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 $\pm 9^\circ$ 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 $\pm 9^\circ$ from the zenith or Nadir.

22 SPECIFICATIONS

Telescope

Length	:	153mm
Objective lens	:	40mm (EDM 40mm)
Magnification	:	26×
Image	:	Erect
Field of view	:	1°30'
Resolving power	:	3"
Minimum focus	:	0.9m
Reticle illumination	:	Provided

Distance measurement

Measurement range

Model	Prism	Atmospheric conditions	
		Condition 1	Condition 2
GTS-211D	Mini prism	550m (1,800ft)	----
	1 prism	1,100m (3,600ft)	1,200m (4,000ft)
	3 prisms	1,600m (5,200ft)	1,800m (5,900ft)
GTS-212	Mini prism	450m (1,500ft)	----
	1 prism	900m (3,000ft)	1,000m (3,300ft)
	3 prisms	1,200m (4,000ft)	1,400m (4,600ft)
GTS-213	Mini prism	300m (1,000ft)	----
	1 prism	600m (2,000 ft)	700m (2,300ft)
	3 prisms	900m (3,000 ft)	1,000m (3,300ft)

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

Condition 2: No haze with visibility about 40km(25 miles), overcast with no heat shimmer.

Measurement accuracy

GTS-211D	:	± (3mm +2ppm) m.s.e.
GTS-212	:	± (3mm +5ppm) m.s.e. (-10°C to +50°C / +14°F to +122°F) ± (5mm +5ppm) m.s.e. (-20°C to -10°C / -4°F to +14°F)
GTS-213	:	± (5mm +5ppm) m.s.e.

Least Count in Measurement

Fine measurement mode	:	1mm (0.005ft.)
Coarse measurement mode	:	10mm (0.02ft.) / 1mm (0.005ft.)
Tracking measurement mode	:	10mm (0.02ft.)

Measurement Display :

9 digits : max. display 999999.999

Measurement Time

Fine measurement mode	:	2.5sec. (Initial 4.5 sec.)
Coarse measurement mode	:	0.5sec. (Initial 3 sec.)
Tracking measurement mode	:	0.3sec. (Initial 2.5 sec.) (Tilt compensation and W-correction : OFF) 0.4 to 0.5 sec. (Tilt compensation and W-correction : ON)

Atmospheric Correction Range	:	-99 ppm to +99 ppm , in 1 ppm increments
Prism Constant Correction Range	:	-99 mm to +99 mm , in 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		
GTS-211D	:	2 sides
GTS-212	:	1 side
GTS-213	:	1 side
Vertical angle		
GTS-211D	:	5" / 1" (1mgon / 0.2mgon) reading
GTS-212	:	5" / 1" (1mgon / 0.2mgon) reading
GTS-213	:	10" / 5"(2mgon / 1mgon) reading
Minimum reading		
Accuracy(Standard deviation based on DIN 18723)		
GTS-211D	:	5"(1.5mgon)
GTS-212	:	6"(1.8mgon)
GTS-213	:	10"(3mgon)
Measuring time	:	Less than 0.3 sec.
Diameter of circle	:	71mm

Tilt Correction (Automatic index)

Tilt sensor	GTS-211D	:	Automatic vertical and horizontal compensator
	GTS-212	:	Automatic vertical compensator
	GTS-213	:	Automatic vertical compensator
Method			Liquid type
Compensating Range		:	±3'
Correction unit		:	1"

Others

Water protection	:	IPX 6	
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	GTS-211D	:	30"/2 mm
	GTS-212	:	40"/2 mm
	GTS-213	:	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)152(L) mm (13.5(H)7.2(W)6.0(L) in)
(without carrying handle)	: 289(H)184(W)152(L) mm (11.4(H)7.2(W)6.0(L) in)

Weight

Instrument	
(with carrying handle and battery)	: 4.9kg (10.8 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	: 3.5hours (2,100 points)
Angle measurement only	: 12hours
Normal use	: 7.5hours
(Calculated in the ratio of 1 (distance measurement) : 3 (angle measurement)	
Weight	: 0.3kg (0.7 lbs)

Battery Charger BC-19B / BC-19C

Input voltage	: AC 120V(BC-19B), AC 230V(BC-19C)
Frequency	: 50/60Hz
Recharging time (at +20°C /+68°F)	
On-board battery BT-32Q	: 1.5 hours
Operating temperature	: +10°C to +40°C (+50°F to 104°F)
Charging signal	: Red lamp illumination
Weight	: 0.3kgs (0.7 lbs)

- Battery using time will vary depending on environmental conditions and operations done with GTS-210 series.