Precaution

1. If the instrument has not been used for a long time, check it regularly(3 months).
2. Avoid shocking or bumping.
3. No using in high dusty, not well ventilated, and easy burning environment.
4. No dismount and mount the instrument by yourselves.
5. Prohibit to see the sun with telescope.
6. Cover with umbrella in burning sun or rainy day.
7. Cover the instrument with rainy cover.
8. Power off before taking off battery, or the data will be lost.
9. Place instrument the case and avoid humidity.
10. Prohibit move the instrument with tripod.
11. It will cause measuring result is not correct if there is leaves and obstacle between the target and the instrument.
12. Place the instrument like the picture below:

13. **Contact me if you got any problem.**

User

1) Only those qualified people who own measuring knowledge can use the instrument.
2) Wear safety uniform such as safety shoe and headgear.

Declaration

We won't afford any responsibility if following conditions occur:

1) Damage caused by drop, extrusion, soaking, wetting and other man-made damage.
2) Cycle inspection, protection, repair or component replacement caused by normal abrasion.
3) Damage caused flood, fire, lighting stroke and other natural disaster.
4) Malfunction of products due to not following protection instruction of product instruction book.
5) The instrument that has been repaired by repair center having no authority won't be accepted by us.

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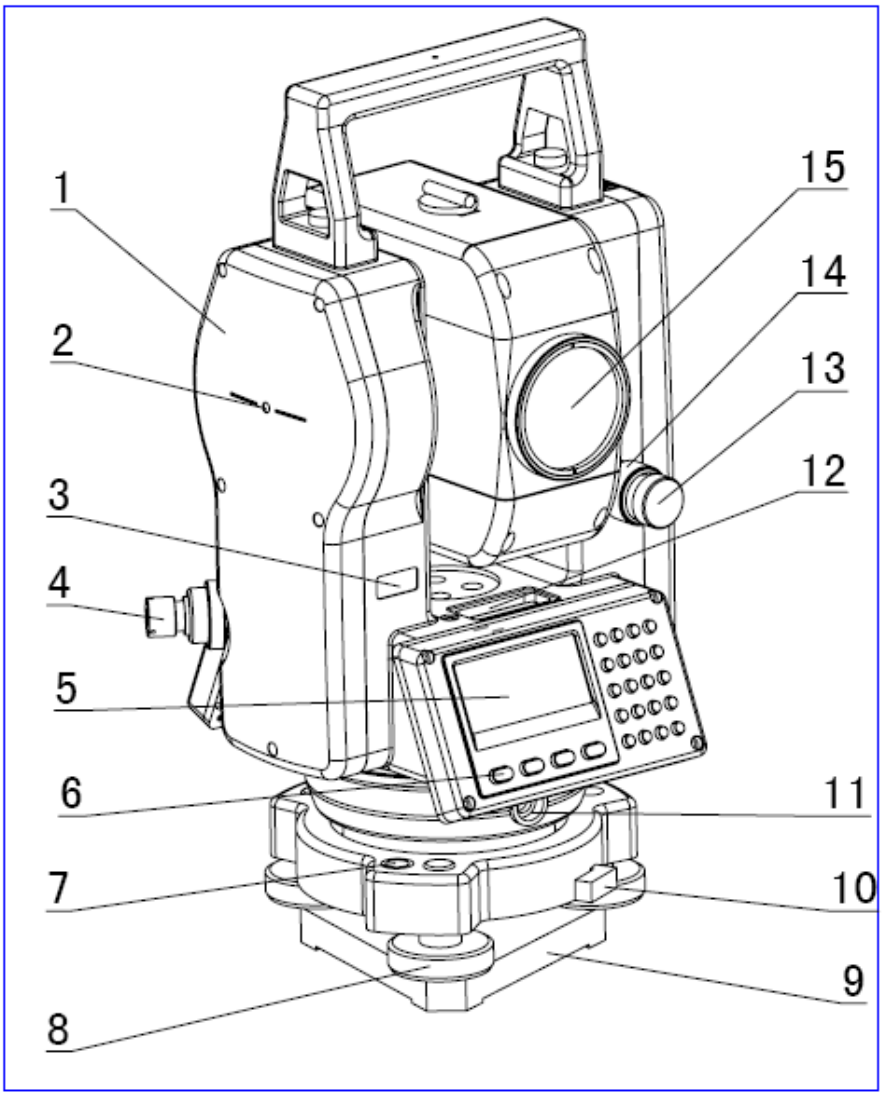
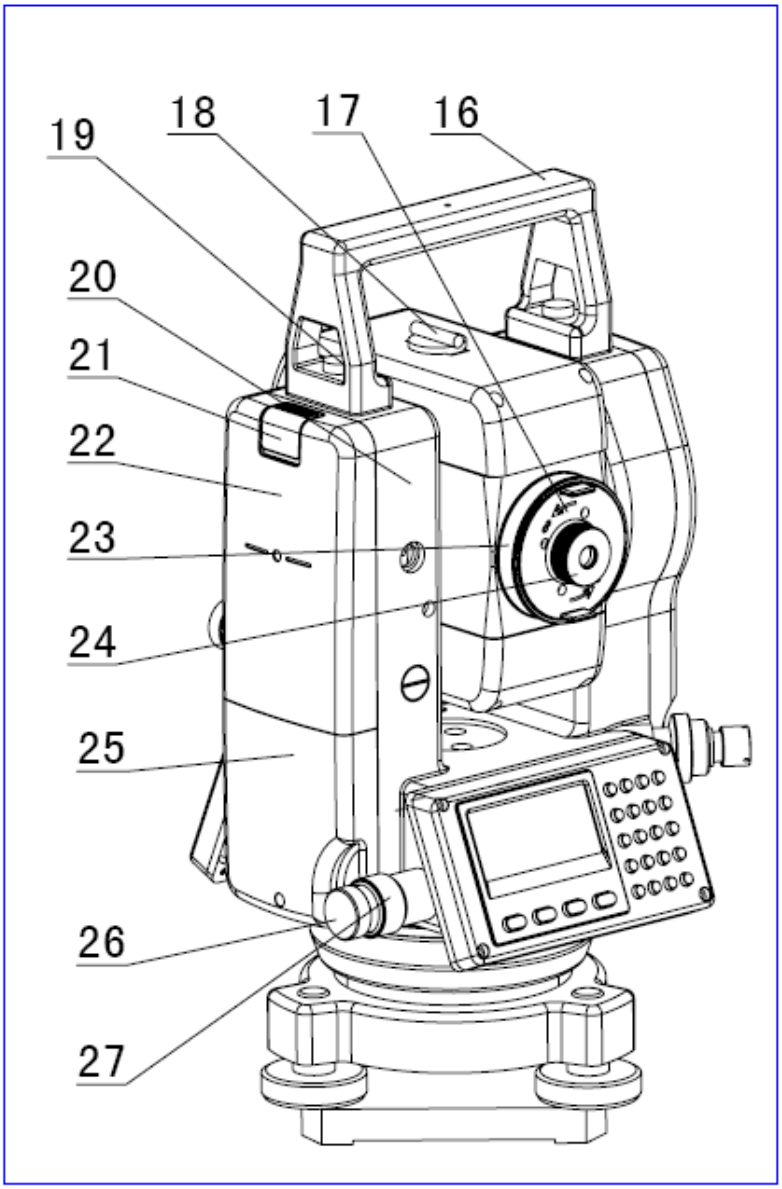
1. Description of All Parts

1.1 Name of Parts



1	Side Cover (Left)	**6**	Function Key	**11**	Data Port
2	Instrument Center Mark	**7**	Circular Vial	**12**	Plate Vial
3	Series No.	**8**	Leveling Screw	**13**	Vertical Tangent Screw
4	Optical Plummet	**9**	Base	**14**	Vertical Clamp Screw
5	Display	**10**	Connection Knob on Base	**15**	Objective Lens



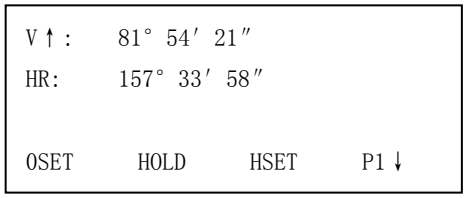
16	Handle	**20**	Frame	**24**	Eyepiece
17	Telescope Grip	**21**	Battery locking Lever	**25**	Side Cover(Right)
18	Collimator	**22**	Battery	**26**	Horizontal Tangent crew
19	Handle Screw	**23**	Telescope Focusing Knob	**27**	Horizontal Clamp Screw

1.2 Display

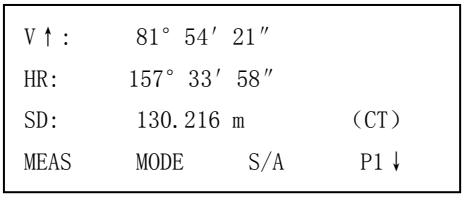
The dot matrix LCD can display 4 lines of characters and numbers. Each Line can display 20 characters. Normally the first 3 lines show measured data while the last line shows the function of the measurement mode.

There are two modes on display: Measurement Mode & Menu Mode.

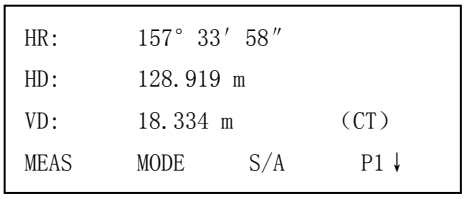
◆ Display(example):



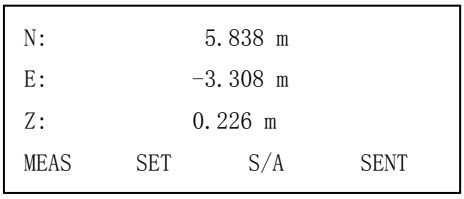
Mode of Angle Measurement
Vertical angle: 81°54′21″
Horizontal angle: 157°33′58″



Mode of Distance Measurement 1
Vertical angle: 81°54′21″
Horizontal angle: 157°33′58″
Slant Distance: 130.216 m

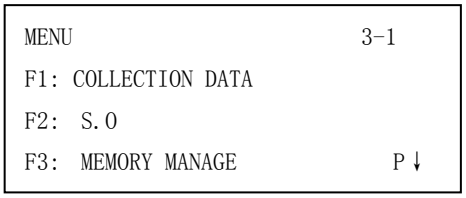


Mode of Distance Measurement 2
Horizontal Angle: 157°33′58″
Horizontal Distance: 128.919 m
Height Distance: 18.334 m

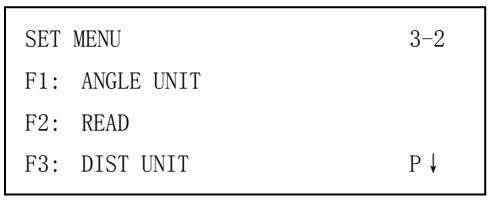


Mode of Coordinate Measurement
Coordinate(north)（N/X）: 5.838 m
Coordinate(east)（E/Y）: -3.308 m
Height Distance （Z/Z）: 0.226 m

◆ Mode of Menu(example):



Main Menu（Page 1）
Press F1 enter into “COLLECTION DATA”
Press F2 enter into “S.O”
Press F3 enter into “MEMORY MANAGE ”



Setup Submenu（Page 2）
Press F1 enter into “ANGLE UNIT”
Press F2 enter into “READ”
Press F3 enter into “DIST UNIT”

◆ Symbol Display

Symbol	Contents
V	Vertical Angle
V↑	Mode in which zenith of vertical angle is 0
V→	Mode in which horizontal of vertical angle is 0
%	Gradient Display
HR	H-angle right
HL	H-angle left
SD	Slope distance
HD	Slope distance
VD	Elevation difference
N	N coordinate
E	E coordinate
Z	Z coordinate
dSD	S.O. difference of slope distance
dHD	S.O. difference of horizontal distance
dVD	S.O. difference of height distance
（CT）	Fine Measurement
（TR）	Track Measurement
（1）	Single Measurement
OUT	Vertical Angle is out of compensator range or slope is over ±100%
°’ “	Set 360°as angle unit
GON（g）	Set 400 gon as angle unit
MIL	Set 6400 mil as angle unit
P1/P2/P3	Page 1/Page 2/Page 3
m	Meter unit
ft	Feet unit
SING：150	Sight intensity:150

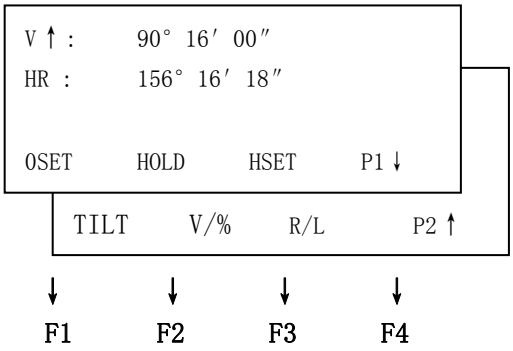
1.3 Operation Key

Key	Function 1	Function 2
F1～F4	Function of fourth line	Refer to picture
0～9	Input number	Input character &special symbol
-	Input minus	
.	Input point	
ESC	Escape	
ENT	Enter	
★	Back sight & Contrast adjusting	
POWER	Power on/off	
MENU	Enter into main menu	Move to right
	Enter into coordinate measurement	Move to left
	Enter into Distance Measurement	HD/SD/HD、move to upside
ANG	Enter into angle measurement	Enter into down

1.4 Function Key

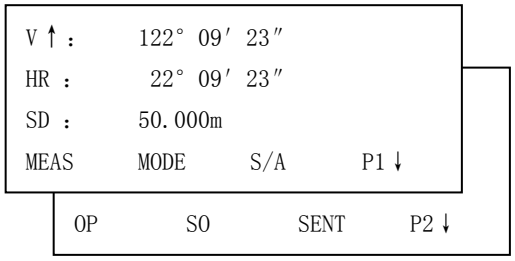
The fourth line on screen is Function Key, which differs from the different measurement mode.

Mode of Angle Measurement



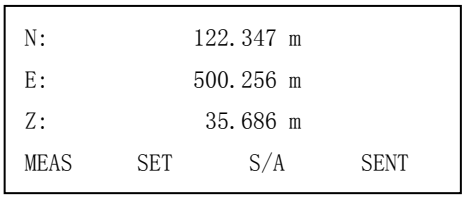
Page	Function Key	Symbol Display	Function
Page 1 （P1）	F1	0SET	Set horizontal angle as 0°00′00″
	F2	HOLD	Hold the horizontal angle
	F3	HSET	Set a required horizontal angle by entering numerals
	F4	P1↓	The function of soft keys is shown on next page(P2)
Page 2 （P2）	F1	TILT	Setting tilt correction If On. The display shows tilt correction value.
	F2	V/%	Vertical angle percent grade(%) mode
	F3	R/L	Switches R/L rotation of horizontal angle
	F4	P2↑	The function of soft keys is shown on next page(P1)

Mode of Distance Measurement



Page	Function Key	Symbol Display	Function
Page 1 （P1）	F1	MEAS	Start measuring
	F2	MODE	Sets a measuring mode, Fine/Tracking/Single
	F3	S/A	Sets temperature, air pressure, prism constant
	F4	P1↓	The function of soft keys is shown on next page (P2)
Page 2 （P2）	F1	OP	Selects Off-set measurement mode
	F2	SO	Selects Staking-out measurement mode
	F3	SENT	Sent data
	F4	P2↓	The function of soft keys is shown on Page 1.

Mode of Coordinate



Page	Function Key	Symbol Display	Function
	F1	MEAS	Start measuring
	F2	SET	Sets mode of station point, backsight point and prism height
	F3	S/A	Sets temperature, air pressure, prism constant
	F4	SENT	Sent data

1.5 RS232

RS232 is used to connect the Total Station with computer or PC to transfer measured data to computer or PC, or to transfer preset data of coordinate to the Total Station.

2. Battery

2.1 Battery replacing

1. Battery Insert

Insert battery correctly. Check and insert battery holder true to side into the housing.

2. Battery Removing

Remove battery and replace.

2.2 Battery Charging

1. Insert recharger into battery's hole.

1. Insert the plug of the recharger into 220V AC power supply.
2. It shows green light after finishing recharging.
3. Cut the power supply of the recharger and drew the battery out from the recharger.

Notes:

1. It's recharging when the red light shows.
2. Normally it takes 7 hours for recharging, but it must be 12-15 hours for the first time.
3. Recharging temperater:0°～ ±45°C.
4. Recharging times: 300-500 times.

3. Measurement Preparation

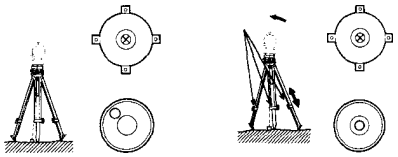
3.1 Instrument Setting Up

1. Setting up the tripod

Pull out to required length and tighten screws.

2. Place the INSTRUMENT onto the tripod head.

Tighten central fixing screw of tripod.



3.2 Instrument leveling

1. Level the instrument with circular vial.

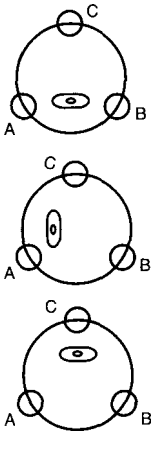
a. Turn the leveling screw A and B to move the bubble in the circular vial.

The bubble is now located on a line perpendicular to a line running through the centers of the two leveling screw being adjusted.

b. Turn the leveling screw C to bring the bubble to the center of the circular vial.

i. Level the instrument with plate vial.

a. Rotate the instrument horizontally by loosening the Horizontal Clamp



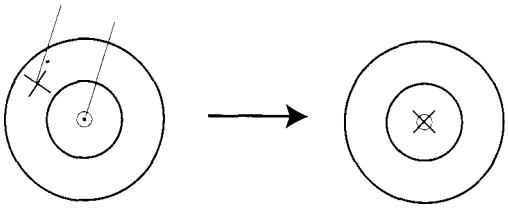
Screw and place the plate vial parallel with the line connecting leveling screw A and B, and then bring the bubble to the center of the plate vial by turning the leveling screws A and B.

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

c. Repeat the procedures ①② for each 90º (100g) rotation of the instrument and check the whether the bubble is correctly centered for all four points.

3.3 Centering by optical plummet

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 of the optical plummet. Sliding the instrument carefully not to rotate that allows you to get the least dislocation of the bubble.



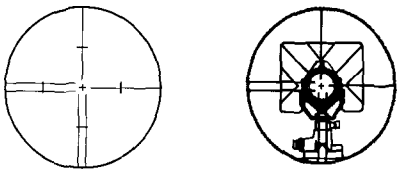
Note: Centering by foot screw first and then leveled-up by tripod.

3.4 Eyepiece Adjustment and Object Sighting

Method of Object Sighting（for reference）

①Sight the Telescope to the sky and rotate the eyepiece tube to make the reticle clear.

②Collimate the target point with top of the triangle mark in the collimator. (Keep a certain distance between eye and the collimator).



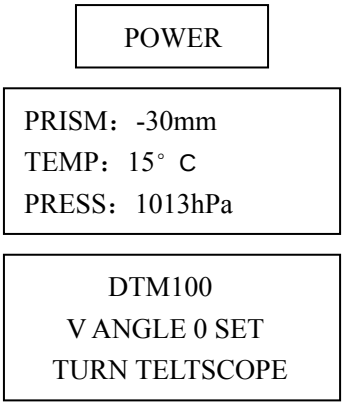
③Make the target image clear with the telescope focusing screw. If there parallax when your eye move up, down or left, right, that show the diopter of eyepiece lens or focus is not adjusted well and accuracy will be influenced, so you should adjust the eyepiece tube carefully to eliminate the parallax.

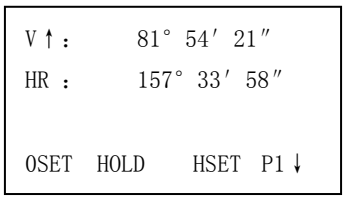
3.5 Power on

① Leveling INSTRUMENT

② Push Key Power (red)

③ Turn telescope to initial the INSTRUMENT.
Confirm the battery is full, if not so,
please replace and recharge the battery.
Check Prism constant, temperature
and atmosphere press.





3.6 Power off

Push key Power (red).

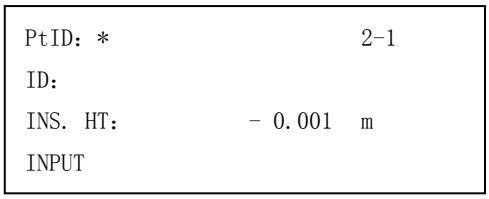
3.7 Turn on/off Back sight

Push Key★、and then press Key F1，turn on LCD back sight, Press Key F1，turn off LCD back sight.

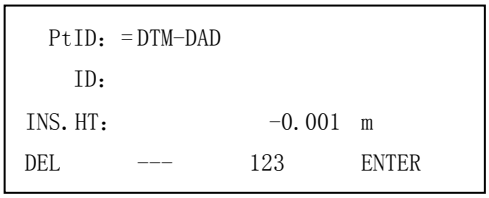
3.8 Input way of Alphanumeric Characters

It's easy and simple to input alphanumeric characters by keyboard.

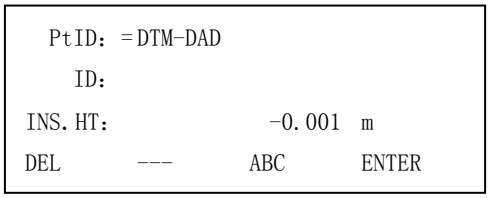
[Example 1]Select items of PtID, ID, INS. HT and * on the mode of data collection.



Press[F1] to enter input menu (input alphanumeric）



Press [F3] to enter into characters menu （123 and ABC changes in turn when pressing[F3]）



Press [F3] to select mode of characters input

Press [8] to input D.（the letters differ from D, E, F, d, e, f in turn, if you press [8] again.

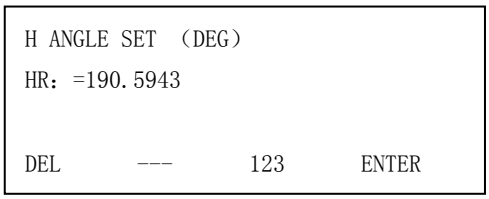
Press [1] twice after the cursor moves to next position. Input T.

Press [5]，input M.

Input -、D、A 、D. The PtID is DTM-DAD.

Note: Input it again if input wrongly (Press [F1]).

[Example 2] Input angle under the mode of angle measurement.



Press [1] to input 1
Press [9] to input 9
Press [0] to input 0
Press [.] to input .
Press [5] to input 5
Press [9] to input 9
Press [4] to input 4
Press [3] to input 3
Press [F4]（ENTER）， HR is "190°59′43″"

Note：①It only can input alphanumeric in this mode. Input it again if input wrongly, press[F1]（DEL）

②Use "." between degree and minute, but not between minute and second. Press ENTER after inputting alphanumeric，it shows degree, minute and second automatically.

3.9 Turn on/off Compensator (Tilt)

When the compensator is activities, automatic correction of vertical angle for mislevelment is displayed. To ensure a precise angle measurement, compensator 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 the automatic compensation range and must be leveled manually.

When the instrument is on an unstable stage or a windy day the display of vertical angle is unstable. You can turn off the auto tilt correction function of vertical angle in this case.

Set tilt correction by software（two ways）。

[Example 1]Setting Tilt Off/On.（It saves after powering off.）

Operation Procedure	Operation	Display
①Press [MENU] to enter into main menu 3-1 in the mode of angle measurement. Press [F4] to enter into main menu 3-2.	[MENU] [F4]	MENU 3-1 F1: COLLECTION DATA F2: S.O F3: MEMORY MANAGE P↓ MENU 3-2 F1: PROGRAMS F2: SET F3: LCD P↓
②Press [F2] to enter into parameter setting, page 3-1	[F2]	SET MENU 3-1 F1: POWER AUTO [ON] F2: CMPS [V↑:] F3: TILT [OFF] P↓

③Press [F3]to set compensator as [OFF] or [ON]	[F3]	SET MENU 3-1 F1: POWER AUTO [ON] F2: CMPS [V↑:] F3: TILT [ON] P↓
④Press [F4] twice to enter into parameter setting. MENU Page 3-3 Press [F3] to save and escape.	[F4] [F4] [F3]	SET MENU 3-3 F1: POWER AUTO[ON] F2: CMPS[V↑:] F3: TILT[ON] P↑ MENU 3-2 F1: PROGRAMS F2: SET F3: LCD P↓

[Example 2]Setting Tilt correction（It doesn't save data after Power off)

①Press [F4] to enter into mode of angle measurement (Page 2) in the mode of angle measurement.	[F4]	V↑: 90° 16′ 00″ HR : 156° 16′ 18″ TILT V/% R/L P2↑
②Press[F1]（TILT）	[F1]	TILT SENSOR [X-OFF] X: X-ON X-OFF ---- ENTER
③Press [F1] or [F2] to select compensator [ON] or [OFF]. It shows tilt value if compensator was ON.	[F3]	TILT SENSOR [X-ON] X: 0° 00′ 30″ X-ON X-OFF ---- ENTER
④Press [F4]（ENTER）to escape.	[F4]	V↑: 90° 16′ 00″ HR : 156° 16′ 18″ TILT V/% R/L P2↑

4. Angle Measurement

4.1 Measuring Horizontal Angle Right and Vertical Angle

Make sure the mode is in Angle measurement.

Operation Procedure	Operation	Display
①Aim at the first target A:	Aim at A	V↑: 82° 09′ 30″ HR : 90° 09′ 30″ 0SET HOLD HSET P1↓
②Set horizontal reading of target A as 0°00′00″; Press[F1]（0SET）and [F3]（YES）	[F1] [F3]	H ANGLE 0 SET > OK? --- --- YES NO V↑: 82° 09′ 30″ HR : 0° 00′ 00″ 0SET HOLD HSET P1↓
③Aim at the second target B. The required V/H angle to target B will be displayed.	Aim at target B	V↑: 82° 09′ 30″ HR : 57° 13′ 48″ 0SET 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 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.

4.2 Switching Horizontal Angle Right/Left

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press [F4]（P1↓)to enter into mode of angle measurement, Page 2, in the mode of angle measurement.	[F4]	V↑：　90° 16′ 00″ HR ：　156° 16′ 18″ TILT　V/%　R/L　P2↑
②Press [F3]（L/R）.The mode Horizontal angle Right (HR) Switches to (HL) mode. ③Measure as HL mode.	[F3]	V↑：　122° 09′ 23″ HL ：　269° 50′ 17″ TILT　V/%　R/L　P2↑
※ Every time pressing the [F2](R/L) key, HR/HL mode switches.		

4.3 Setting of Horizontal Angle

1. Setting by Holding the Angle

Make sure the mode is angle measurement

Operation Procedure	Operation	Display
①Set the required horizontal angle, using Horizontal tangent screw	Angle Display	V↑：　122° 09′ 30″ HR ：　90° 09′ 30″ OSET　HOLD　HSET　P1↓
②Press the [F2](HOLD)key.	[F2]	H ANGLE HOLD HR:　90° 09′ 30″ ＞SET ? ---　---　YES　NO
③Aim at the target（※1）	Aim	
④Press the [F3](YES)key to finish holding the horizontal angle.*1) The display turns back to normal angle measurement mode.	[F3]	V↑：　122° 09′ 30″ HR ：　90° 09′ 30″ OSET　HOLD　HSET　P1↓
（※1）To return to the previous mode, press the [F4](NO)Key		

2. Setting Horizontal Angle from the Keys

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Aim at the target	Aim	V↑: 122° 09′ 30″ HR : 90° 09′ 30″ OSET HOLD HSET P1↓
②Press the [F3](HSET)key	[F3]	H ANGLE SET (DEG) HR: = DEL --- 123 ENTER
③Input the required horizontal angle （※1） by pressing F1(Input). Example：150°10′20″ （Input 150.1020）※2 Press [F4]（Enter）after inputting alphanumeric. It returns to normal monde of angle measurement.	[F1] [F4]	H ANGLE SET (DEG) HR: = DEL --- 123 ENTER V↑: 122° 09′ 30″ HR : 150° 10′ 20″ OSET HOLD HSET P1↓

※1）Press [F1]（Del）if inputting wrongly，or press[ESC]（escape）to input correct value again.
※2）It shows setting failed if wrong value was input. Input it again.

4.4 Vertical Angle Percent Grade (%) Mode

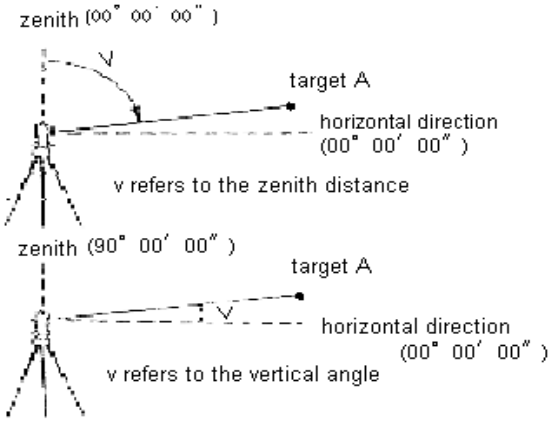
Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press the [F4](P↓)Key to get the function on page 2	F4	V↑: 122° 09′ 30″ HR : 150° 10′ 20″ OSET HOLD HSET P1↓ TILT V/% R/L P2↑

②Press the [F3](V%)（※1）	[F3]	V↑：　0.99% HR：　150° 10′ 20″ TILT　V/%　R/L　P2↑
（※1）Every time pressing the [F3](V%)key, the display mode switches When the measurement is carried out over±45º(±100%)from the horizontal, the display shows<OUT>		

4.5 Compasses (vertical angle)（Refer to 11.3）

Vertical angle is displayed as shown below:



5. DISTANCE MEASUREMENT

Check setting of atmosphere correction & prism constant before measuring distance.

5.1 Setting of the Atmospheric Correction

Preset temperature constant as 15°C. Input temperature manually（Range: -20°C～+50°C）

Preset atmosphere press as 1013hPa. Input temperature manually（Range: 533 hPa～1332 hPa）

1hPa=0.75mmHg

It saves after powering off.

5.2 Setting of the Correction for Prism Constant

Prism Constant value is -30.Set correction for prism at -30.If the prism is of another manufacturer, the appropriate constant shall be set beforehand. Constant range: -999mm～+999mm。The setting value is kept in the memory even after power is off.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press to enter into mode of distance measurement, Page 1 in the mode of angle measurement.		V↑: 81° 54′ 21″ HR : 157° 33′ 58″ SD: (CT) MEAS MODE S/A P1↓
②Press[F3]	[F3]	F1: PRISM= -30mm F2: TEMP= 15° C F3: PRESS=1013 hPa
③Press[F1]to enter into prism constant setting. Refer to 3.8. Press[ENT] after inputting alphanumeric. Press[F2]to enter into temperature constant setting. Refer to 3.8. Press[ENT] after inputting alphanumeric. Press[F3]to enter into atmosphere constant setting. Refer to 3.8. Press[ENT] after inputting alphanumeric. Press [ESC]to return to the mode of distance measurement, Page 1 after correction.	[F1] [F2] [F3]	F1: PRISM=| mm F2: TEMP= 15° C F3: PRESS=1013 hPa DEL --- 123 ENTER F1: PRISM= -30 mm F2: TEMP=| ° C F3: PRESS=1013 hPa DEL --- 123 ENTER F1: PRISM= -30 mm F2: TEMP= 15° C F3: PRESS=| hPa DEL --- 123 ENTER

5.3 Distance Measurement（SD）

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press to enter into mode of distance measurement.		V↑: 122° 09′ 30″ HR : 90° 09′ 30″ (CT) SD : SIGN: 155 OSET HOLD HSET P1↓

②Aim at Prism center. ③Press[F1]（MEAS）.(※1) Press[F1]（MEAS）again to stop distance measurement. It shows measurement result ※2）～※5）	[F1] [F1] ◢	V↑：　122° 09′ 30″ HR：　90° 09′ 30″　(CT) SD：　336.551 m MEAS　MODE　S/A　P1↓ HR:　122° 09′ 23″ HD:　235.343 m　(CT) VD:　36.551 m MEAS　MODE　S/A　P1↓
④Clear value of distance by pressing any key	Any key	V↑：　90° 09′ 20″ HR：　172° 17′ 23″　(CT) VD： MEAS　MODE　S/A　P1↓
※1）It shows “SING：***”on the screen when the instrument check the light intense. ※2）It buzzes when it shows measuring result. ※ 3）Measuring result differs from setting of different mode of measurement. ※ It shows present measuring result when the mode is in Single mode. It shows each measuring result when the mode is in fine mode. ※4）Press ◢ to change horizontal distance and height distance. ※5）It keeps distance measurement if target was covered by something such as branch, but within 5 seconds. Or the memory shows the distance from the instrument to the branch. Hence, to make sure it has no obstacle between the instrument to prism.		

5.4 Distance Measurement（HD, SD）

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press ◢ twice to enter into the mode of HD/SD.	◢ ◢	HR:　122° 09′ 23″ HD:　(CT) VD: MEAS　MODE　S/A　P1↓
②Aim at prism center ③Press[F1]（MEAS）to start measurement ※1） Press[F1]（MEAS）again to stop measurement.	[F1] [F1]	HR:　122° 09′ 23″ HD:　235.343 m　(CT) VD:　36.551 m MEAS　MODE　S/A　P1↓

It shows measuring result ※2）～※4）		
④Clear measuring value by pressing any key.	Any key	HR: 122° 09′ 23″ HD: (CT) VD: MEAS MODE S/A P1↓
※1）It shows "SING：***"on the screen when the instrument check the light intense. ※2）It buzzes when it shows measuring result. ※ 3）Measuring result differs from setting of different mode of measurement. ※ It shows present measuring result when the mode is in Single mode. It shows each measuring result when the mode is in fine mode. ※4）Press ◢ to change into slope distance.		

5.5 Setting of Mode of Distance Measurement

There are three modes of distance measurement: Fine Measurement, Tracking and Single Measurement. The memory doesn't save this setting after powering off. The default setting is Fine Measurement.

Mode of Fine Measurement：Normally it will be used. Higher accuracy, much time.
Measuring time：＜3 second（the first time）
Display unit：0.001m or 0.001ft

Mode of Tracking： Less time, lower accuracy. It only shows like this: 1cm
Measuring time：＜0.8 second
Display unit：0.01m or 0.01ft

Mode of Single Measurement: It is Fine Measurement incontinouslly. Measuring times is only once.
Measuring time：＜3 second
Display unit：0.001m or 0.001ft

Setting the instrument to page 1(mode of distance measurement)

Operation Procedure	Operation	Display
①Press[F2]（MODE）.※1）	[F2]	V↑: 90° 09′ 20″ HR : 172° 17′ 23″ (CT) SD : MEAS MODE S/A P1↓

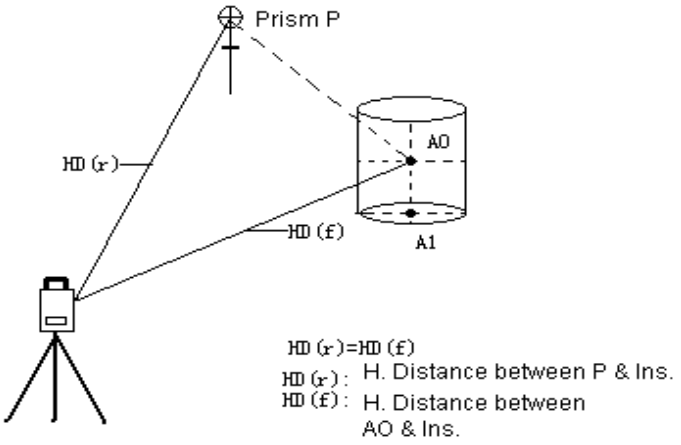
②Press[F1]（CT） to select mode of fine measurement. Press[F2]（TRAC） to select mode of Tracking. Press[F3] （ SINGLE ） to select mode of Single measurement.	[F1] [F2] [F3]	V↑： 90° 09′ 20″ HR ： 172° 17′ 23″ (CT) SD ： FINE TRAC SINGLE --- V↑： 90° 09′ 20″ HR ： 172° 17′ 23″ (CT) SD ： MEAS MODE S/A P1↓
※1） Press [ESC]to cancel the setting.		

5.6 Offset Measurement

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 A0 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 A1: Set the instrument height/Prism height.

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



Confirm the instrument is in the mode of distance measurement.

Operation Procedure	Operation	Display
①Press[F4]to enter into the mode of distance measurement, page 3,in the mode of distance measurement.	[F4]	V↑： 122° 09′ 30″ HR ： 90° 09′ 30″ (CT) SD ： 336.551 m OP SO SENT P2↑

②Press[F1]（OFFSET）	[F1]	OFFSET HR ： 90° 09′ 30″ HD ： MEAS ---- ---- ENTER
③Aim to position P（Put prism in the position P）	Aim at P	
④Press[F1]（MEAS）to measure the distance between instrument and prism.	[F1]	OFFSET HR ： 90° 09′ 30″ HD ： 35.665m MEAS ---- ---- ENTER
⑤Aim at target A（Center point of the column）	Aim at A	
⑥Press[F4]（ENTER).It shows the angle and distance of target A. ※1）※2）	[F4]	OFFSET HR: 122° 09′ 23″ VD: 7.339m NEXT ---- ---- ----
※1）Press[F1]（NEXT）to measure next point and press [ESC] to escape. ※2）Press to display VD、SD、HD in turn.（the third line）; Press to display N、E、Z（the third line）。		

5.7 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

●It can do any kind of S.O. of distance measurement such as HD,VD and SD.

Operation Procedure	Operation	Display
①Press[F4]to enter into mode of distance measurement, Page 2,in the mode of distance measurement.	[F4]	V↑: 122° 09′ 30″ HR ： 90° 09′ 30″ （CT） SD ： 336.551 m OP SO SENT P2↑

②Press[F2]（S.O.）to show the data set last time	[F2]	STAKE OUT HD: 50.000m HD VD SD ---
③Press[F1]～[F3]to select mode of measurement. F1：HD F2：VD F3：SD Example：Horizontal distance	[F1]	STAKE OUT HD: 50.000m INPUT --- --- ENTER
④Input distance of S.O.（※1）50m	[F1] Input 50 [F4]	STAKE OUT HD: 50.000m INPUT --- --- ENTER
⑤Aim at target（Prism）， Press[F1]to start measuring. It shows the difference between distance of measuring and S.O.	Aim at P [F1]	HR: 120° 09′ 23″ dHD: VD: SIGN: 152 MEAS MODE S/A P1↓ HR: 120° 09′ 23″ dHD: -88.652m VD: 0.225m MEAS MODE S/A P1↓
⑥Move target(prism) until distance difference is 0 m.		HR: 120° 09′ 23″ dHD: 0.000 m VD: 0.000 m MEAS MODE S/A P1↓
（※1）Refer to section 3.8(Way of inputting characters and alphanumeric). Press [ESC]to return to normal mode of distance measurement.		

6. COORDINATE MEASUREMENT

6.1 Execution of Coordinate Measurement

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

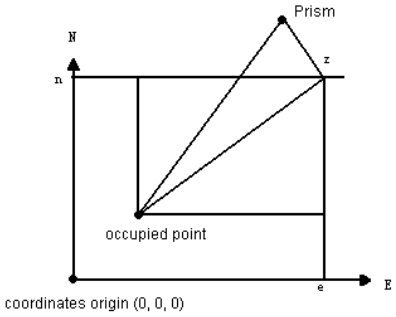
○When setting coordinate values of occupied point, see Section 6.2“Setting Coordinate Values of Occupied Point”.

○When setting the instrument height and prism height, see Section 6.3 “Setting Height of the Instrument” and 6.4 “Setting Height of Target (prism Height)”.

○To set back sight, decide the back sight azimuth, and check the known azimuth, coordinate and distance.

6.2 Setting Coordinate Values of Occupied Point

Set the coordinates of the instrument (occupied point) according to coordinates origin, and the instrument automatically converts and displays the unknown point (prism point) coordinates following the origin.



1）Input coordinate with keyboard.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press [COORDINATE] to enter into the mode of coordinate measurement.	[COORDINATE]	N: 0.000m E: 0.000m Z: 0.000m MEAS SET S/A SENT
②Press[F2]	[F2]	SELECT FILE FILE: ---- LIST SKP ENTER
③Press[F3]（SKP） to enter into setting screen.	[F3]	SET F1: STATION SETUP F2: BACKSIGHT F3: R.HT

④Press[F1] to enter into setting of instrument height.	[F1]	INSTRUMENT HEIGHT INPUT INS.HT: -0.001m INPUT ---- ---- ENTER
⑤Press[F1]. Refer to 3.8,input instrument height. Skip this step if it needn't to input instrument height)	[F1]	INSTRUMENT HEIGHT INPUT INS.HT: | m DEL ---- 123 ENTER INSTRUMENT HEIGHT INPUT INS.HT: 22.000 m INPUT ---- ---- ENTER
⑥Press[F4]（ENTER） **C/0523 means that there are 523 coordinate data in DAD.** **M/0599 means that there are 599 Raw coordinate data in DAD.**	[F4]	COORD.DATA SET USED FILE: DAD C/0523 M/0599 SRCH ---- ---- NEZ
⑦Press[F4]（COORDINATE）	[F4]	N: * 0.000m E: 0.000m Z: 0.000m INPUT ---- ---- ENTER
⑧Press[F1]（INPUT）to enter into mode of inputting coordinate N. Refer to 3.8. Input coordinate N.The cursor moves to E automatically. Input coordinate E and Z. （Press [▲] or [▼]to select coordinate you wanted by cursor）	[F1] [▲] [▼]	N: =| m E: 0.000m Z: 0.000m DEL ---- 123 ENTER N: 5322.332m E: * 0.000m Z: 0.000m INPUT ---- ---- ENTER

⑨Press[F4]（ENTER）to escape.	[F4]	SET F1：STATION SETUP F2：BACKSIGHT F3：R.HT
Range of inputting coordinate:： -999999.999m≤ N、E ≤+999999.999m -9999.999m≤ Z ≤+9999.999m -999999.999ft≤ N、E ≤+999999.999ft -9999.999ft≤ Z ≤+9999.999ft		

2）Setting up stating measurement by using coordinate file in the memory.（It shows angle measurement）

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press [COORDINATE] to enter into mode of coordinate measurement.	[COORDINATE]	N: 0.000m E: 0.000m Z: 0.000m MEAS SET S/A SENT
②Press [F2]	[F2]	SELECT FILE FILE: ---- LIST SKP ENTER
③Press [F2]（LIST）several times to select file name of coordinate. Press [F4]（ENTER）to enter into the mode of setting screen.	[F3] [F4]	SELECT FILE FILE: DAD[USED] ---- LIST SKP ENTER SET F1：STATION SETUP F2：BACKSIGHT F3：R.HT

④Press [F1] to enter into the screen of inputting instrument height.	[F1]	INSTRUMENT HEIGHT INPUT INS.HT: -0.001m INPUT ---- ---- ENTER
⑤Press [F1]. Refer to 3. Input instrument height. （Skip this step, if it needn't to input the instrument height）	[F1]	INSTRUMENT HEIGHT INPUT INS.HT: | m DEL ---- 123 ENTER INSTRUMENT HEIGHT INPUT INS.HT: 22.000 m INPUT ---- ---- ENTER
⑥Press [F4]（ENTER） **C/0523 means that there are 523 coordinate data in DAD.** **M/0599 means that there is 599 Raw coordinate data in DAD.**	[F4]	COORD.DATA SET USED FILE: DAD C/0523 M/0599 SRCH ---- ---- NEZ
⑦Press [F1]（SEARCH）to enter into the screen of SEARCH COORD.DATA.	[F1]	SEARCH COORD.DATA F1: FIRST PtID F2: LAST PtID F3: INPUT SEACH
⑧Press[F3]to enter into INPUT PtID SEARCH Press [F1]to input PtID	[F3] [F1]	INPUT PtID SEARCH PtID: INPUT ---- ---- SET INPUT PtID SEARCH PtID: D1 INPUT ---- ---- ENTER
⑨Press [F4](ENTER）	[F4]	N: 10.000m E: 80.000m Z: 0.000m PtID: D1 F4: SET

⑩Press [F4]（SET）to escape.	[F4]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT

6.3 Setting up Height of Prism

It saves the prism height after powering off.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press [COORDINATE] to enter into the mode of measurement.	[COORDINATE]	N: 0.000m E: 0.000m Z: 0.000m MEAS SET S/A SENT
②Press [F2]（SET）	[F2]	SELECT FILE FILE: ---- LIST SKP ENTER
③Press [F3]（SKP）to enter into the mode of setting screen.	[F3]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT
④Press [F3]to enter into the screen of inputting prism height.	[F3]	REFLECTOR HEIGHT INPUT R.HT: 0.000m INPUT ---- ---- ENTER
⑤Press [F1] to input prism height and press enter.	[F1] [F4]	REFLECTOR HEIGHT INPUT R.HT =10.000| m DEL ---- 123 ENTER REFLECTOR HIGHT INPUT R.HT: 10.000m INPUT ---- ---- ENTER

⑥Press [F4]（ENTER）to escape.	[F4]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT

6.4 Setting up Back Sight

The back sight setting is similar between data collection and S.O. and Coordinate. There are 3 ways to set backsight.

1. Input coordinate data (NE）
2. Use coordinate data in the memory.
3. Input azimuth angle.

The instrument should be turned left(that means you and the plate vail must be face to face.)before setting up the backsight point.And then the function of coordinate measurement will be the same either the instrument is turned left or right.

1） Set back sight by inputting coordinate data

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press （COORDINATE）to enter into the mode of coordinate measurement.		N: 0.000m E: 0.000m Z: 0.000m MEAS SET S/A SENT
②Press [F2]（SET）	[F2]	SELECT FILE FILE: ---- LIST SKP ENTER
③Press [F3]（SKP）to enter into screen of setting.	[F3]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT
④Press [F2]to enter into setting of backsight.	[F2]	BACKSIGHT SET USED FILE：DAD C/0523 M/0599 SRCH ---- HSET NEZ

⑤Press [F4]	[F4]	N: * 0.000m E: 0.000m INPUT ---- ---- ENTER
⑥Press [F1]	[F1]	N: =| m E: 0.000m DEL ---- 123 ENTER
⑦Refer to 3.8.Input coordinate N:、E：in turn.		N: 55.236m E: * 10.000m DEL ---- 123 ENTER
⑧Press [F4]（ENTER） HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 157° 33′ 48″ SET ---- ---- EXIT
⑨Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 57° 13′ 48″ SET ---- ---- ENTER
⑩Press [F4]（ENTER）to escape.	[F4]	SET F1: STATION SETUP F2: BACKSIHGT F3: R.HT

2）Set back sight by using coordinate data in the memory.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press  （COORDINATE）to enter into the mode of coordinate measurement.		N: 0.000m E: 0.000m Z: 0.000m MEAS SET S/A SENT

②Press [F2]（SET）	[F2]	SELECT FILE FILE: ---- LIST SKP ENTER
③Press [F3]（SKP）to enter into setting screen.	[F3]	SET F1: STATION SETUP F2: BACKSIHGT F3: R.HT
④Press [F2]to enter into backsight setting.	[F2]	BACKSIGHT SET USED FILE: DAD C/0523 M/0599 SRCH ---- HSET NEZ
⑤Press [F1]to enter into screen of searching coordinate data.	[F1]	SEARCH COORD.DATA F1: FIRST PtID F2: LAST PtID F3: INPUT SEACH
⑥Press [F3]to enter into INPUT PtID SEARCH. Press [F1] to input PtID.	[F3] [F1]	INPUT PtID SEARCH PtID: INPUT ---- ---- SET INPUT PtID SEARCH PtID: D1 INPUT ---- ---- SET
⑦Press [F4]（ENTER）	[F4]	N: 10.000m E: 80.000m Z: 0.000m PtID: D1 F4: SET
⑧Press [F4]（SET）to enter into the screen of azimuth angle setting. HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 157° 33′ 48″ SET ---- ---- EXIT

⑨Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 57° 13′ 48″ SET ---- ---- ENTER
⑩Press [F4]（ENTER）to escape.	[F4]	SET F1: STATION SETUP F2: BACKSIHGT F3: R.HT

3）Set backsight by inputting azimuth angle.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press （COORDINATE）to enter into the mode of coordinate measurement.		N: 0.000m E: 0.000m Z: 0.000m MEAS SET S/A SENT
②Press [F2]（SET）	[F2]	SELECT FILE FILE: ---- LIST SKP ENTER
③Press [F3]（SKP）to enter into setting screen.	[F3]	SET F1: STATION SETUP F2: BACKSIHGT F3: R.HT
④Press [F2]to enter into backsight setting.	[F2]	BACKSIGHT SET USED FILE: DAD C/0523 M/0599 SRCH ---- HSET NEZ
⑤Press [F3]to enter into horizontal angle setting. Input azimuth angle you wanted.	[F3]	H ANGLE SET (DEG) HR: =| DEL --- 123 ENTER H ANGLE SET (DEG) HR: =123.5540| DEL --- 123 ENTER

⑥Press [F4]（ENTER）to enter into the screen of azimuth angle setting. HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 157° 33′ 48″ SET ---- ---- EXIT
⑦Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 57° 13′ 48″ SET ---- ---- ENTER
⑧Press [F4]（ENTER）to escape.	[F4]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT
●It shows E-29when in the mode of calculating of azimuth： 1. It can't get azimuth angle if inputting wrong coordinate of station point and back sight point. 2.It can't get azimuth angle if the distance of station point and back sight point is within 2mm.		

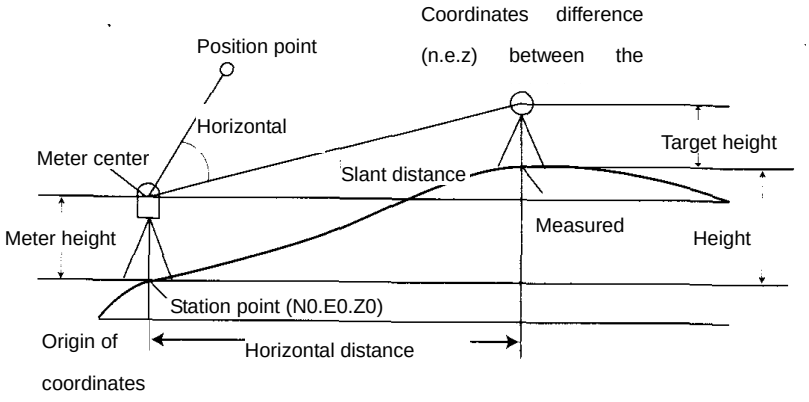
6.5 Coordinate Measurement

Coordinate Measurement:

Note：Set station coordinate, station height, prism height and azimuth angle of backsight.

Coordinate of unknown point was calculated and shows by the formula below:

Station coordinate：（N0，E0，Z0）
Coordinate of prism center which compared to instrument center：（n，e，z）
Instrument Height：IH
Coordinate of unknown point：（N1，E1，Z1）
Prism height：PH
VD：Z（VD）
N1=N0+n
E1=E0+e
Z1=Z0+IH+Z-PH
Coordinate of instrument center（（N0，E0，Z0+IH）



Operation Procedure	Operation	Display
①Press [ESC]after setting station point, backsight and prism height. Enter into screen of coordinate measurement, page 1. （ Or press to enter into it in the mode of angle measurement.）	[ESC]	SET F1：STATION SETUP F2：BACKSIHGT F3：R.HT N: 0.000m E: 0.000m Z: 0.000m MEAS SET S/A SENT
②Aim at prism center. Press [F1]（MEAS）to start measuring and show the result.	[F1]	N: 10.000m E: 5.000m Z: 123.000m MEAS SET S/A SENT
●Mode of coordinate measurement is decided by the mode of distance measurement. ●Setting way of temperature, pressure and prism constant is as same as way of mode of distance measurement. ●It shows coordinate value caculated last time when you enter into the mode of coordinate measurement again. ●Press [F4]（SEND）to transfer present measuring value to computer orPC by RS232.		

7. Data Collection

7.1 Preparation

DTM Series can save measuring data in the memory.

It includes file of measuring data and coordinate data in the memory.

Measuring data：Collected data（station, backsight, etc）to save it in the file of measuring data.

Coordinate data：It only saves collected points to file of measuring data.

Number of station point：（In the precondition of the mode of S.O. Unused）It can reach 15000points maximum. The memory includes mode of data collection and S.O., so that number of station stored decreases when you use the mode of S.O.

1）	Check the instrument was in the mode of angle measurement or main menu screen, which can assure stored data, was not lost.
2)	It suggests that recharge the battery and prepare the spare battery with full battery.

DTM Series includes file of measuring data and coordinate data. Hence, select one saving way before data collection.

Example：Saving way: File of Coordinate data and Measuring data（two files are saved at the same time)

Make sure the mode is Angle measurement

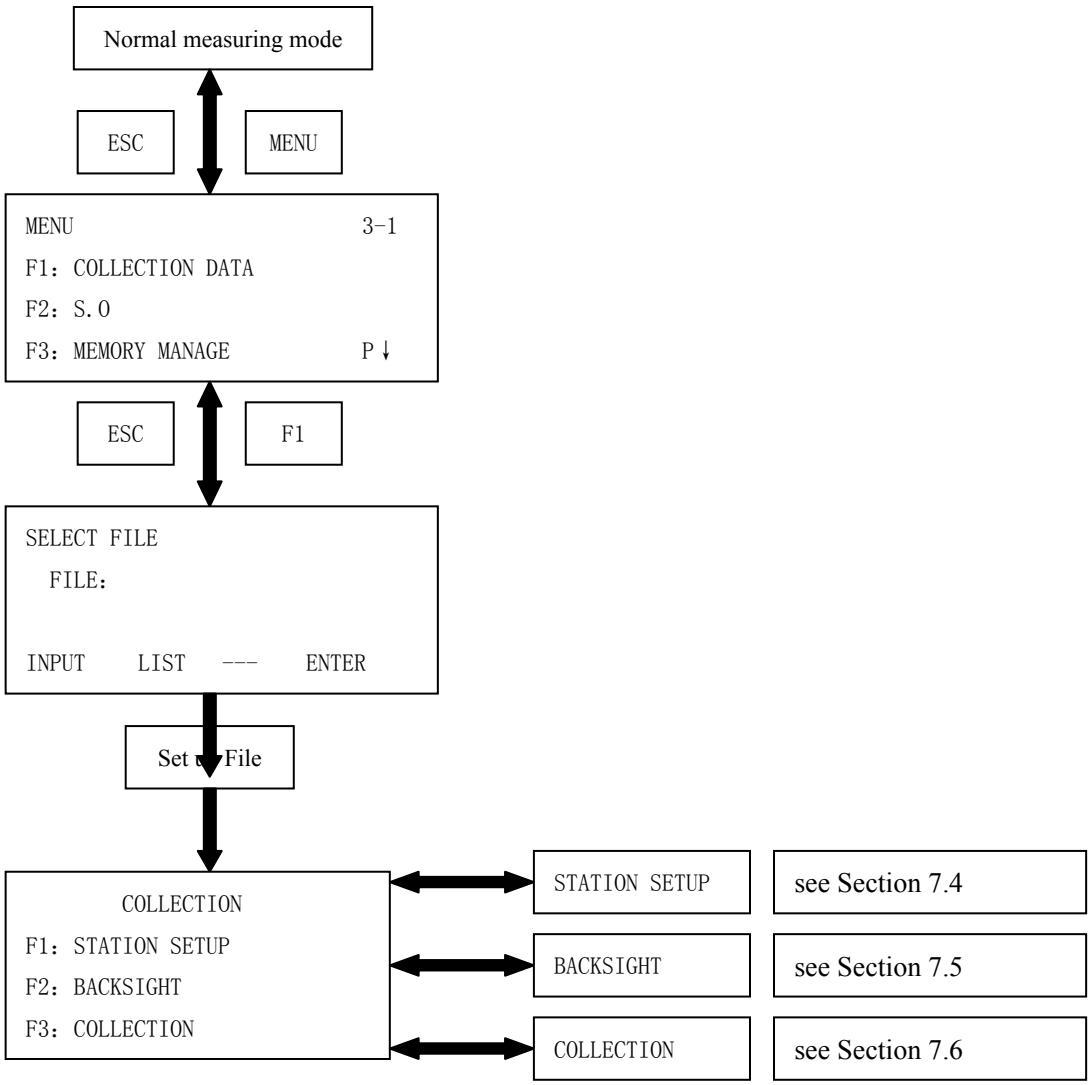
Operation Procedure	Operation	Display
①Press [MENU]to enter into the screen of main menu 3-1	[MENU]	MENU 3-1 F1：COLLECTION DATA F2：S.O F3：MEMORY MANAGE P↓
②Press [F4]（P）to enter into menu 3-2	[F4]	MENU 3-2 F1：PROGRAMS F2：SET F3：LCD P↓
③Press [F2]（Parameter setting）to enter into menu of parameter setting 3-1	[F2]	SET MENU 3-1 F1：POWER AUTO[OFF] F2：CMPS[V↑] F3：TILT[OFF] P↓
④Press [F4]（P）twice to enter into menu of parameter setting 3-3	[F4]	SET MENU 3-3 F1：DATA STORAGE SET [COORD.DATA] F3：SAVE AND EXIT P↓
⑤Select data saving mode is as coordinate and measuring data by pressing [F1]continuously. **Coordinate data：Only saves coordinate data** **Measuring data：Only saves measuring data** **Coordinate and measuring data：Saves both coordinate and measuring data**	[F1]	SET MENU 3-3 F1：DATA STORAGE SET [C.AND M.DATA] F3：SAVE AND EXIT P↓

⑥Press [F3]to save and escape.	[F3]	MENU 3-2 F1：PROGRAMS F2：SET F3：LCD P↓

7.2 Operation Steps

1. Select file of data collection and save the data collected to the file.
2. Select file of coordinate data. You can use coordinate data of station and backsight.（Skip this step if it needn't to use coordinate data of known point)
3. Set up station point, which includes instrument height and ID of station.
4. Set up backsight. Confirm azimuth angle after measuring back sight point.
5. Set up prism height of point. Start to collect and save the data.

Operation of data collection：



7.3 Select File of Data Collection

Select a file of data collection. It can save measuring data to data file you selected.

Make sure the mode is Angle measurement

Operation Procedure	Operation	Display
①Press [MENU]to enter into menu 3-1.	[MENU]	MENU 3-1 F1：COLLECTION DATA F2：S.O F3：MEMORY MANAGE P↓
②Press [F1] （ COLLECTION DATA）	[F1]	SELECT FILE FILE： INPUT LIST ---- ENTET
③Press [F2] continuously(LIST). Select file name of coordinate. ※1）	[F3]	SELECT FILE USED FILE： DAD[USED] INPUT LIST ---- ENTET
Press [F4]（ENTER）to select a file Enter into the screen of data collection.※2）	[F4]	COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION
※1）Press [F1]（INPUT）and then input file name if you want to input file name. ※2）It shows “[WORK]”on the right of the file name if the file was selected.		

7.4 Setting up Station Point

1）Setting up station by using coordinate file in the memory.
Select file of data collection.(Refer to 7.3 to select file of data collection)

Operation Procedure	Operation	Display
①Mode of data collection		COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION

②Press [F1]（set coordinate of station point） to enter into the screen of inputting instrument height.	[F1]	INSTRUMENT HEIGHT INPUT INS.HT: -0.001m INPUT ---- ---- ENTER
③Press [F1]. Refer to 3.8. Input instrument height.（Skip this step if it needn't to input instrument height.）	[F1]	INSTRUMENT HEIGHT INPUT INS.HT: | m DEL ---- 123 ENTER INSTRUMENT HEIGHT INPUT INS.HT: 22.000 m INPUT ---- ---- ENTER
④Press [F4]（ENTER） **C/0523 means there are coordinate data(523) in DAD** **M/0599 means there are Raw coordinate data(599) in DAD**	[F4]	COORD.DATA SET USED FILE: DAD C/0523 M/0599 SRCH ---- ---- NEZ
⑤Press [F1]（SEARCH）to enter into the screen of SEARCH COORD.DATA	[F1]	SEARCH COORD.DATA F1: FIRST PtID F2: LAST PtID F3: INPUT SEARCH
⑥Press [F3] to the screen of INPUT PtID SEARCH Press [F1] to input PtID.	[F3] [F1]	INPUT PtID SEARCH PtID: INPUT ---- ---- ENTER INPUT PtID SEARCH PtID: D1 INPUT ---- ---- ENTER
⑦Press [F4]（ENTER）	[F4]	N: 10.000m E: 80.000m Z: 0.000m PtID: D1 F4: SET

⑧Press [F4]（SET）to escape.	[F4]	COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION

2）Input station coordinate.

Select file of data collection.（Refer to 7.3 to select file of data collection）

Operation Procedure	Operation	Display
①Go to the mode of data collection		COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION
②Press [F1]（ set coordinate of station point） to enter into the screen of inputting instrument height.	[F1]	INSTRUMENT HEIGHT INPUT INS.HT：　-0.001m INPUT　----　----　ENTER
③Press [F1]. Refer to 3.8. Input instrument height. （Skip this step if it needn't to input instrument height.）	[F1]	INSTRUMENT HEIGHT INPUT INS.HT：|　m DEL　----　123　ENTER INSTRUMENT HEIGHT INPUT INS.HT：22.000　m INPUT　----　----　ENTER
④Press [F4]（ENTER） **C/0523 means there are coordinate data(523) in DAD** **M/0599 means there are Raw coordinate data(599) in DAD**	[F4]	COORD.DATA SET USED FILE：DAD C/0523　M/0599 SRCH　----　----　NEZ
⑤Press [F4]（COORDINATE）	[F4]	N：*　0.000m E：　0.000m Z：　0.000m INPUT　----　----　ENTER

⑥Press [F1]（INPUT）to enter into mode of inputting coordinate N. Refer to 3.8to input coordinate N. The cursor moves to E automatically and input coordinate E and Z in turn.（Press[▲] or [▼]to move cursor to select coordinate you wanted.	[F1] [▲] [▼]	N: =| m E: 0.000m Z: 0.000m DEL ---- 123 ENTER N: 5322.332m E: * 0.000m Z: 0.000m INPUT ---- ---- ENTER
⑦Press [F4]（ENTER）to escape.	[F4]	COLLECTION F1: STATION SETUP F2: BACKSIGHT F3: COLLECTION

7.5 Setting up Back Sight

1）Set up backsight by inputting coordinate data.
Select the file of coordinate data(Refer to 7.3to select file of coordinate data）

Operation Procedure	Operation	Display
①Go to the mode of data collection		COLLECTION F1: STATION SETUP F2: BACKSIGHT F3: COLLECTION
②Press[F2] to enter into the screen of backsight.	[F2]	BACKSIGHT SET USED FILE: DAD C/0523 M/0599 SRCH ---- HSET NEZ
③Press[F4]	[F4]	N: * 0.000m E: 0.000m INPUT ---- ---- ENTER
④Press[F1]	[F1]	N: =| m E: 0.000m DEL ---- 123 ENTER

⑤Refer to 3.8to input coordinate N：, E：		N: 55.236m E: * 10.000m DEL ---- 123 ENTER
⑥Press [F4]（ENTER） HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 157° 33′ 48″ SET ---- ---- EXIT
⑦Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 57° 13′ 48″ SET ---- ---- ENTER
⑧Press [F4]（ENTER）to escape.	[F4]	COLLECTION F1: STATION SETUP F2: BACKSIGHT F3: COLLECTION

2）Set backsight by using coordinate data in the memory.

Select file of data collection.（Refer to 7.3 to select file of data collection）

Operation Procedure	Operation	Display
①Go to the mode of data collection.		COLLECTION F1: STATION SETUP F2: BACKSIGHT F3: COLLECTION
②Press [F2]to enter into setting backsight.	[F2]	BACKSIGHT SET USED FILE: DAD C/0523 M/0599 SRCH ---- HSET NEZ
③Press [F1]to enter into SEARCH COORD.DATA	[F1]	SEARCH COORD.DATA F1: FIRST PtID F2: LAST PtID F3: INPUT SEARCH

④Press [F3]to enter into INPUT PtID SEARCH Press [F1] and input PtID.	[F3] [F1]	INPUT PtID SEARCH PtID: INPUT ---- ---- ENTER INPUT PtID SEARCH PtID: D1 INPUT ---- ---- ENTER
⑤Press [F4]（ENTER）	[F4]	N: 10.000m E: 80.000m Z: 0.000m PtID: D1 F4: SET
⑥Press [F4]（SET）to AZIMUTH ANGLE SET HR :azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 157° 33′ 48″ SET ---- ---- EXIT
⑦Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 57° 13′ 48″ SET ---- ---- ENTER
⑧Press [F4]（ENTER）to escape.	[F4]	COLLECTION F1: STATION SETUP F2: BACKSIGHT F3: COLLECTION

3）Setting up back sight by inputting azimuth angle.

Select file of data collection（Refer to 7.3 to select file of data collection）

Operation Procedure	Operation	Display
①Go to the mode of data collection		COLLECTION F1: STATION SETUP F2: BACKSIGHT F3: COLLECTION
②Press [F2]to enter into the screen of setting back sight.	[F2]	BACKSIGHT SET USED FILE: DAD C/0523 M/0599 SRCH ---- HSET NEZ

③Press [F3] to enter into the mode of horizontal angle setting. Input azimuth angle you want to input.	[F3]	H ANGLE SET （DEG） HR： =| DEL --- 123 ENTER H ANGLE SET （DEG） HR： =123.5540| DEL --- 123 ENTER
④Press [F4]（ENTER）to enter into the screen of azimuth angle setting. HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR ： 57° 13′ 48″ >hr ： 157° 33′ 48″ SET ---- ---- EXIT
⑤Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR ： 57° 13′ 48″ >hr ： 57° 13′ 48″ SET ---- ---- ENTER
⑥Press [F4]（ENTER）to escape.	[F4]	COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION
●It shows E-29when in the mode of calculating of azimuth： 1. It can't get azimuth angle if inputting wrong coordinate of station point and back sight point. 2. It can't get azimuth angle if the distance of station point and back sight point is within 2mm.		

7.6 Data Collection

Set instrument in the mode of data collection.

Operation Procedure	Operation	Display
①Set instrument in the mode of data collection.		COLLECTION F1：STATION SETUP F2：BACKSIGHT F3：COLLECTION

②Press [F3]（COLLECTION）	[F3]	PtID：* ID： R.HT：　　-0.001m INPUT　SRCH　MEAS　MR
③Press [F1]（INPUT）to input PtID D1、ID and prism height in turn.	[F1]	PtID：* ID： R.HT：　　-0.001m INPUT　SRCH　MEAS　MR
④Press [F3]（MEAS）.※1）	[F3]	N：　　10.000m E：　　80.000m Z：　　0.000m REPMEAAS　----　----　RECORD
⑤Press [F4]（RECORD）. The instrument record data. Return to screen of next point. PtID will add 1 automatically. ※2）	[F4]	PtID：*D2 ID： R.HT：　　-0.001m INPUT　SRCH　MEAS　MR
※1）Press[F4]（RECORD. The instrument collects data and records it. Return to measuring screen of next point. PtID will add 1 automatically. ID and prism height remains the same. ※2）PtID will add 1 automatically if only the last position of PtID you put is alphanumeric characters, or it remains the same.		

8. S.O.

There are two functions of S.O.: measured point of S.O .and set new point by using known coordinate data in the memory. Input coordinates with keyboard if coordinate data was not saved to the memory. Coordinate data can be input to the memory of the instrument by PC.

Numbers of coordinate data can reach15000 points (We don't use the memory for the mode of data collection).

The memory includes mode of data collection and S.O. so that the memory for coordinate data saved will decrease when you use the mode of data collection.

1) Check the instrument was in the mode of angle measurement or in main menu screen when you power off which can assure that input or out is finishing, in case it would lost the data you saved.
2) In precondition of save, it suggests that recharge the battery and prepare a spare battery with full battery.
3) Considering the memory space you can used when you record new data.

8.1 S.O. Steps

1. Select the file of coordinate data. We can use coordinate data of station, backsight and S.O. point.
2. Set up station point.
3. Set up backsight and get azimuth angle.
4. Input and use coordinate of S.O. point. Start S.O.

8.2 Select File of Coordinate Data

First select a file of coordinate data. Or you may save new measuring data to the file of coordinate data.

You can select present file of coordinate data, create new file in this mode.

Make sure the mode is Angle measurement

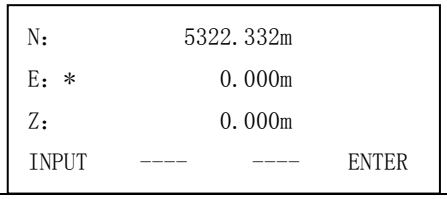
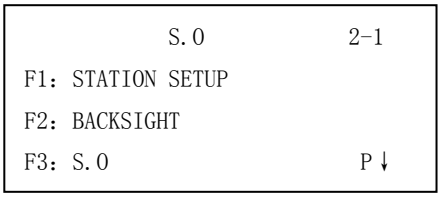
Operation Procedure	Operation	Display
①Press [MENU] to enter into menu 3-1	[MENU]	MENU 3-1 F1: COLLECTION DATA F2: S.O F3: MEMORY MANAGE P↓
②Press [F2]（S.O.）to select file menu.	[F2]	SELECT FILE FILE: INPUT LIST ---- ENTER
③Press [F2]（LIST）to select a file as present work file.	[F2]	SELECT FILE FILE: DAD INPUT LIST ---- ENTER
④Press [F4]（ENTER）to enter into S.O. 2-1	[F4]	S.O 2-1 F1: STATION SETUP F2: BACKSIGHT F3: S.O P↓

8.3 Setting up Station Point

1）Input coordinate with keyboard.

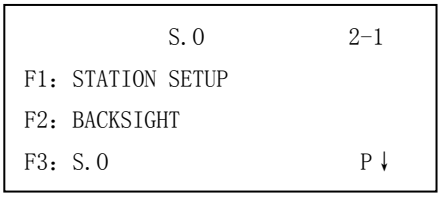
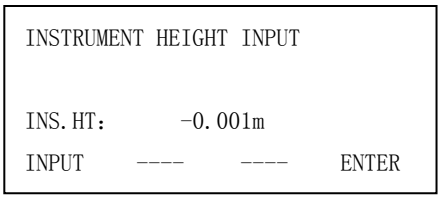
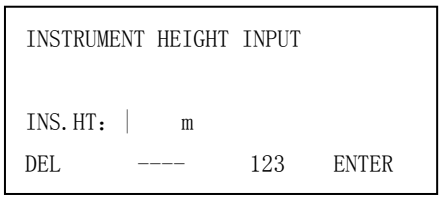
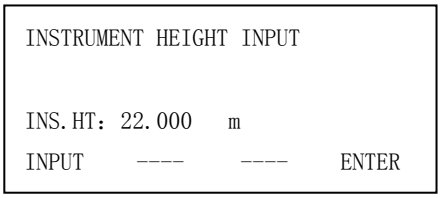
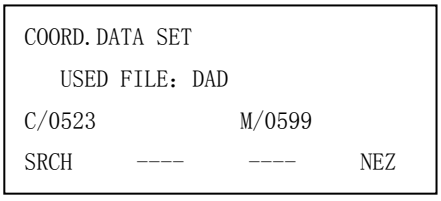
Select the file of coordinate data.（Refer to 8.2 to select the file of coordinate data）

Operation Procedure	Operation	Display
①Go to the mode of S.O. 2-1		S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓
②Press [F1]to input instrument height	[F1]	INSTRUMENT HEIGHT INPUT INS.HT： -0.001m INPUT ---- ---- ENTER
③Press [F1]. Refer to3.8 to input instrument height. （Skip this step if you needn't to input the instrument height.）	[F1]	INSTRUMENT HEIGHT INPUT INS.HT：| m DEL ---- 123 ENTER INSTRUMENT HEIGHT INPUT INS.HT：22.000 m INPUT ---- ---- ENTER
④Press [F4]（ENTER） **C/0523 means there are coordinate data(523) in DAD** **M/0599 means there are Raw coordinate data(599) in DAD**	[F4]	COORD.DATA SET USED FILE：DAD C/0523 M/0599 SRCH ---- ---- NEZ
⑤Press [F4]（COORDINATE）	[F4]	N：* 0.000m E： 0.000m Z： 0.000m INPUT ---- ---- ENTER
⑥Press [F1]（INPUT）to enter into mode of inputting coordinate N. Refer to 3.8 to input coordinate N. The cursor moves to E	[F1] [▲] [▼]	N：=| m E： 0.000m Z： 0.000m DEL ---- 123 ENTER

automatically and input coordinate E and Z in turn. （Press[▲] or [▼]to move cursor to select coordinate you wanted.		
⑦Press [F4]（ENTER）to escape.	[F4]	

2）Use coordinate setting in the memory.

Select the file of coordinate data.（Refer to 8.2 to select the file of coordinate data）

Operation Procedure	Operation	Display
①Go to the mode of S.O. 2-1		
②Press [F1]to enter into the screen of instrument height setting.	[F1]	
③Press [F1]. Refer to 3.8to input instrument height. （Skip this step if you needn't input instrument height.）	[F1]	 
④Press [F4]（ENTER） **C/0523 means there are coordinate data(523) in DAD** **M/0599 means there are Raw coordinate data(599) in DAD**	[F4]	

⑤Press [F1]（SEARCH） to enter into the screen of SEARCH COORD.DATA	[F1]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
⑥Press [F3]to enter into the screen of INPUT PtID SEARCH Press [F1] to input PtID.	[F3] [F1]	INPUT PtID SEARCH PtID： INPUT ---- ---- ENTER INPUT PtID SEARCH PtID：D1 INPUT ---- ---- ENTER
⑦Press [F4]（ENTER）	[F4]	N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET
⑧Press [F4]（SET）to escape.	[F4]	S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓

8.4 Setting up Backsight Point

1）Set backsight point by inputting coordinate data.

Select file of coordinate data（Refer to 8.2 to select file of coordinate data）

Operation Procedure	Operation	Display
①Go to the mode of S.O. 2-1		S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓
②Press [F2]to set back sight point.	[F2]	BACKSIGHT SET USED FILE：DAD C/0523 M/0599 SRCH ---- HSET NEZ

③Press [F4]	[F4]	N: * 0.000m E: 0.000m INPUT ---- ---- ENTER
④Press [F1]	[F1]	N: =| m E: 0.000m DEL ---- 123 ENTER
⑤Refer to 3.8. Input coordinate N:、E: in turn.		N: 55.236m E: * 10.000m DEL ---- 123 ENTER
⑥Press [F4]（ENTER） HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 157° 33′ 48″ SET ---- ---- EXIT
⑦Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 57° 13′ 48″ SET ---- ---- ENTER
⑧Press [F4]（ENTER） to escape.	[F4]	S.O 2-1 F1: STATION SETUP F2: BACKSIGHT F3: S.O P↓

2）Set back sight point by using coordinate data in the memory.

Select the file of coordinate data.（Refer to 8.2 to select the file of coordinate data）

Operation Procedure	Operation	Display
①Go to the mode of S.O. 2-1		S.O 2-1 F1: STATION SETUP F2: BACKSIGHT F3: S.O P↓

②Press [F2] to the screen of backsight point setting.	[F2]	BACKSIGHT SET USED FILE: DAD C/0523 M/0599 SRCH ---- HSET NEZ
③Press [F1]to enter into the screen of SEARCH COORD.DATA	[F1]	SEARCH COORD.DATA F1: FIRST PtID F2: LAST PtID F3: INPUT SEARCH
④Press [F3] to enter into the screen of INPUT PtID SEARCH Press [F1] to input PtID.	[F3] [F1]	INPUT PtID SEARCH PtID: INPUT ---- ---- ENTER INPUT PtID SEARCH PtID: D1 INPUT ---- ---- ENTER
⑤Press [F4]（ENTER）	[F4]	N: 10.000m E: 80.000m Z: 0.000m PtID: D1 F4: SET
⑥Press [F4]（SET） to enter into the screen of AZIMUTH ANGLE SET HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 157° 33′ 48″ SET ---- ---- EXIT
⑦Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 57° 13′ 48″ SET ---- ---- ENTER
⑧Press[F4]（ENTER）to escape.	[F4]	S.O 2-1 F1: STATION SETUP F2: BACKSIGHT F3: S.O P↓

2） Set back sight point by inputting azimuth angle.

Select the file of coordinate data（Refer to 8.2 to select the file of coordinate data）

Operation Procedure	Operation	Display
①Go to the mode of S.O. 2-1		S.O 2-1 F1: STATION SETUP F2: BACKSIGHT F3: S.O P↓
②Press [F2] to the screen of backsight point setting	[F2]	BACKSIGHT SET USED FILE: DAD C/0523 M/0599 SRCH ---- HSET NEZ
③Press [F3] to enter into the screen of horizontal angle. Input azimuth angle you wanted.	[F3]	H ANGLE SET (DEG) HR: =| DEL ---- 123 ENTER H ANGLE SET (DEG) HR: =123.5540| DEL ---- 123 ENTER
④Press [F4]（SET） to enter into the screen of AZIMUTH ANGLE SET HR: azimuth angle by calculated hr: true azimuth angle	[F4]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 157° 33′ 48″ SET ---- ---- EXIT
⑤Press [F1]（SET）to make HR is as same as hr.	[F1]	AZIMUTH ANGLE SET HR : 57° 13′ 48″ >hr : 57° 13′ 48″ SET ---- ---- ENTER
⑥Press [F4]（ENTER）to escape.	[F4]	S.O 2-1 F1: STATION SETUP F2: BACKSIGHT F3: S.O P↓

●It shows E-29when in the mode of calculating of azimuth：

1. It can't get azimuth angle if inputting wrong coordinate of station point and back sight point.
2. It can't get azimuth angle if the distance of station point and back sight point is within 2mm.

8.5 S.O.

There are two ways of S.O.

1. Use the coordinate in the memory by using the PtID.
2. Input coordinates directly.

Example：Use the coordinate in the memory.

Select the file of coordinate data.（Refer to 8.2 to select the file of coordinate data.）

Operation Procedure	Operation	Display
①Go to the mode of S.O. 2-1		S.O 2-1 F1：STATION SETUP F2：BACKSIGHT F3：S.O P↓
②Press [F3] to enter into the screen of S.O COORD SET	[F3]	S.O COORD SET USED FILE：DAD C/0523 M/0556 SRCH ---- ---- NEZ
③Press [F1] to enter into the screen of SEARCH COORD.DATA	[F1]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
④Press [F3] to the screen of INPUT PtID SEARCH	[F3]	INPUT PtID SEARCH PtID: INPUT ---- ---- ENTER
Press [F1]to input PtID.	[F1]	INPUT PtID SEARCH PtID：D1 INPUT ---- ---- ENTER
⑤Press [F4]（ENTER）	[F4]	N: 10.000m E: 80.000m Z: 0.000m PtID：D1 F4：SET

⑥Press [F4]（SET）to input the screen of prism height. Press [F1]. Refer to 3.8 to input prism height. （Skip this step if you needn't to input prism height）	[F4] [F1]	REFLECTOR HEIGH INPUT R.HT: -0.001m INPUT ---- ---- ENTER REFLECTOR HEIGHT INPUT R.HT: | m DEL ---- 123 ENTER REFLECTOR HEIGHT INPUT R.HT: 22.000 m INPUT ---- ---- ENTER
⑦Press [F4]（ENTER） to enter into the screen of S.O. count **HR: Azimuth angle by calculating** **HD: Horizontal distance from S.O. point to instrument**	[F4]	S.O COUNT HR : 57° 13′ 48″ HD: 12.003m ANGLE DIST ---- ----
⑧ Press [F1]（ANGLE） **HR ： true horizontal angle** **dHR：Horizontal angle of rotating the instrument(aim at the S.O.point) = Measured horizontal angle-calculated horizontal angle;** Rotate the instrument, stop rotating when you see **dHR=0°00′00″**,which means that the direction is correct. Press [F1]（DIST）to show the value of dHD、dZ and dHRwithin the accepted difference, which means S.O finishing **HD ：Measured horizontal distance** **dHD ： Horizontal distance(you move prism to S.O. point)=measured horizontal distance** **dZ ： VD(from the prism to S.O. point=measured VD-calculated VD**	[F1] [F1]	S.O PtID: D1 HR : 57° 13′ 48″ dHR: 157° 13′ 48″ DIST ---- NEZ ---- HD: 12.003m dHD: 2.003m dZ: 1.003m MEAS ANGLE NEZ NEXT

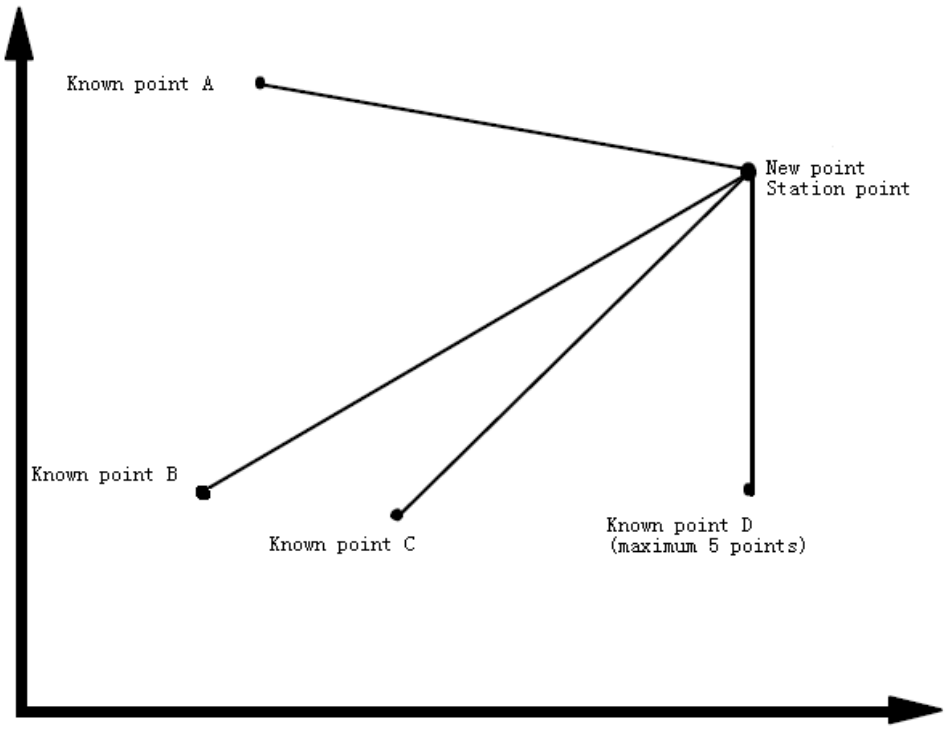
⑨Press [F2]（ANGLE）to return to step ⑦	[F2]	S.O COUNT HR : 57° 13′ 48″ HD: 12.003m ANGLE DIST ---- ----
Press [F3]（NEZ）to display coordinate.	[F3]	N: 12.003m E: 2.003m Z: 1.003m MEAS ANGLE NEZ NEXT
Press [F4]（NEXT）to enter into setting of next .O. Point.（Repeat these steps）.	[F4]	S.O COORD SET USED FILE: DAD C/0523 M/0556 SRCH ---- ---- NEZ

8.6 Resection

Set up the instrument at a new point, and calculate the coordinate of the new point using the coordinate data for maximum five known points and the measurement made to these points. By following observation, resection is possible.

Resection by distance measurement: 2 or more points must be measured.

An occupied point coordinate value will be calculated by the method of least squares.



Select file of coordinate data（Refer to 8.2 to select the file of coordinate data）

Operation Procedure	Operation	Display
①Go to the mode of S.O. 2-1 Press [F4] to enter into the screen of S.O. 2-2 Press [F1] to enter into the screen of new point setting.	 [F4] [F1]	S.O 2-1 F1: STATION SETUP F2: BACKSIGHT F3: S.O P↓ S.O 2-2 F1: RESECTION P↓ NEW POINT PtID: INPUT SRCH SKP ENTER
②Press [F1]（INPUT）to input new PtID. Press [F4]（ENTER）.※1）	[F1] Input PtID [F4]	INSTRUMENT HEIGHT INPUT INS.HT: -0.001m INPUT ---- ---- ENTER
③Press [F1]（INPUT）to input instrument height. Press[F4]（ENTER）.※2）	[F1] Input instrumen t height [F4]	N01# PtID: D1 INPUT SRCH NEZ ENTER
④Press [F1]（INPUT）to input the PtID of Known point A. Press[F4]（ENTER）. Press [F4]（SET） Press [F1]（INPUT）to input prism height . Press [F4]（ENTER）	[F1] Input PtID [F4] [F4] [F1] Input prism height [F4]	N: 10.000m E: 80.000m Z: 0.000m PtID: D1 F4: SET REFLECTOR HEIGHT INPUT R.HT: -0.001m INPUT ---- ---- ENTER REFLECTOR HEIGHT INPUT R.HT: 10.001m ＞Sight? DIST

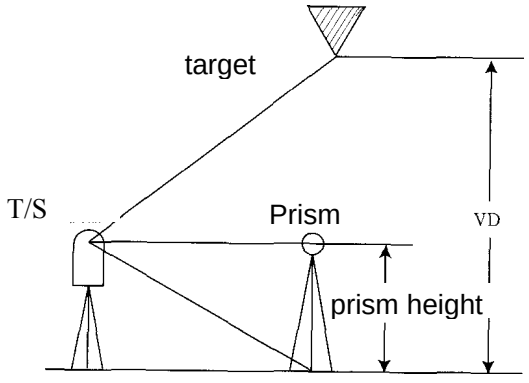
⑤Aim at known point A. Press [F4]（DIST)	Aim [F4]	HR ： 57° 13′ 48″ HD： m VD： SIGN：000 Measuring……
⑥Go to input Known point B.		NO2# PtID：D2 INPUT SRCH NEZ ENTER
⑦Follow step to measure known point B. Get value of Residuals error after measuring 2 known points by pressing [F4] ※3） Press [F1]（NEXT）to measure other known points, maximum 5 points. Fellow steps ④、⑤ to measure known point C Show measuring value.	Aim [F4] [F1]	Residval error dHD= 0.002m dZ = 0.000m NEXT ---- ---- CALC NO3# PtID：D3 INPUT SRCH NEZ ENTER HR ： 57° 13′ 48″ HD： m VD： SIGN：000 Measuring…… HR ： 57° 13′ 48″ HD： m VD： m NEXT ---- ---- CALC
⑧Press [F4]（CALC）to show standard deviation Press [F2]（↓）to standard deviation Press [F2]（↓） or（↑）can show standard deviation above mentioned in turn	[F4] [F2]	Standard Deviation =0.000sec ---- ↓ ---- NEZ SD（n）=0.362m SD（e）=0.001m SD（z）=0.000m ---- ↑ ---- NEZ

⑨Press [F4]（COORDINATE）to show the coordinate of new point.	[F4]	N: 1.000m E: 0.000m Z: 0.000m RECORD? YES NO
⑩Press [F3]（YES）to save the coordinate of new point to file of coordinate data. Set the coordinate of new point as the coordinate of station point. Escapee. ※4）	[F3]	S.O 2-2 F1: RESECTION P↓
※1）Press [F3]（SKP）if you don't want to save data of new point. ※2）Press [F3]（COORDINATE）if you want to input known coordinate. ※3）Residuals error **dHD（horizontal distance between two known points） =measuring value-calculated value；** **dZ=（Get coordinate Z of new point on the base of known point A）-（Get coordinate Z of new point on the base of known point B）** ※4）The value of new point can't be saved to the file of coordinate data if you press [F3]（SKP）on the step 2. It only set coordinate of station point instead of the value of new point.		

9. Application Program

9.1 REM

In order to measure the height of the target where the prism could not be placed, you can put the prism at any position on the vertical line on which the target is located, the remote height can then be measured.



● Input way if you get（h）（Example：h=1.6m）

Operation Procedure	Operation	Display
①Press [MENU] and press [F4]（P↓） to turn to page 2.	[F4]	MENU 3-2 F1：PROGRAMS F2：SET F3：LCD P↓
②Press [F1]to go to program.	[F1]	PROGRAMS F1：REM F2：MLM F3：AREA
③Press [F1]（REM）	[F1]	REM F1：INPUT R.HT F2：NO R.HT
④press [F1]	[F1]	REFLECTOR HEIGHT INPUT R.HT： 0.000 m INPUT --- --- ENTER
⑤Input prism height（※1）	[F1] Input prism height [F4]	REM HAVE R.HT HD： MEAS --- --- SET
⑥Aim at prism and press [F1] （MEAS） It shows horizontal distance from the	Aim at P [F1]	REM HAVE R.HT HD： SIGN：112 MEAS --- --- SET REM HAVE R.HT HD* 123.342 m MEAS --- --- SET

instrument to prism（HD）		
⑦Press [F4]（SET）after finishing measurement. Get the position of prism（※2）	[F4]	REM HAVE R.HT VD: 1.600 m --- R.HT --- HD
⑧Aim at target K. It shows vertical distance（VD）（※3）	Aim at K	REM HAVE R.HT VD: 24.287 m --- R.HT --- HD
(※1)Refer to 3.8“Input way of alphanumeric characters” (※2)Press[F2]（Prism height）to return to step ⑤.Press[F3]（HD）to return to step ⑥. (※3)Press[ESC]to return to menu.		

- The input way for no prism height.

Operation Procedure	Operation	Display
①Press [MENU] and press [F4]（P↓）to turn to page 2.	[F4]	MENU 3-2 F1: PROGRAMS F2: SET F3: LCD P↓
②Press [F1]to enter to program.	[F1]	PROGRAMS F1: REM F2: MLM F3: AREA
③Press [F1]（REM）	[F1]	REM F1: INPUT R.HT F2: NO R.HT

<table>
<tr><td>④ Press [F2]</td><td>[F2]</td><td>REM NO R.HT

HD:
MEAS --- --- SET</td></tr>
<tr><td>⑤Aim at prism and press [F1]（MEAS）

It shows horizontal distance from the instrument to prism（HD）</td><td>Aim at P
[F1]</td><td>REM NO R.HT

HD: SIGN: 112
MEAS --- --- SET

REM NO R.HT

HD* 123.342 m
MEAS --- --- SET</td></tr>
<tr><td>⑥Press [F4]（SET）after finishing measurement. It shows present vertical angle.

Aim at ground and press [F4]（SET）
（Get accurate remote elevation if only you aim at the ground）</td><td>[F4]

Aim at ground
[F4]</td><td>REM NO R.HT
V↑: 90° 16′ 00″

--- --- --- SET

REM NO R.HT

VD: 0.000 m
--- V: HD ---</td></tr>
<tr><td>⑦Aim at target K. It shows vertical distance（VD）（※2、※3）</td><td>Aim at K</td><td>REM NO R.HT

VD: 24.287 m
--- V: HD ---</td></tr>
<tr><td colspan="3">(※1) Refer to 3.8“Input way of alphanumeric characters”
(※2) Press [F3]（Horizontal distance）to return to step ⑤.Press [F2]（V:）to return to step ⑥.
(※3) Press [ESC]to return to menu.</td></tr>
</table>

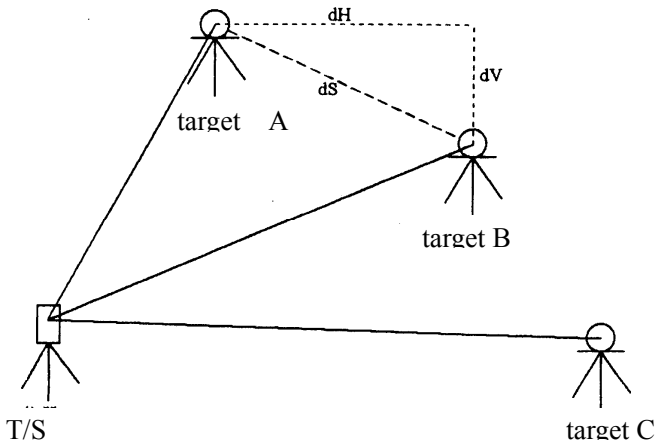
9.2 MLM

Measurement for horizontal distance（dHD）, slope distance(dVD),elevation (dVR) and horizontal bearing (HR)between two target prisms.

There are two functions:

★ MLM-1（A-B、A-C）：measure A-B，A-C，A-D……

★ MLM-2（A-B，B-C）：measure A-B，B-C，C-D……



[Example]：1. MLM -1（A-B，A-C）

2. The measuring steps of MLM -2（A-B，B-C）is as same as mode of MLM-1.

Operation Procedure	Operation	Display
①Go to menu of application program.		PROGRAMS F1：REM F2：MLM F3：AREA
②Press [F2] to enter into MLM.	[F2]	MLM F1：MLM -1 (A-B, A-C) F2：MLM -2 (A-B, B-C)
③Press [F1] to enter into MLM-1.	[F1]	MLM -1 (A-B, A-C) STEP-1 HD: MEAS ---- ---- SET
④Aim at prism A. Press [F1]（MEAS）to show HD from instrument to Point A	Aim at A [F1]	MLM -1 (A-B, A-C) STEP-1 HD: 102.365m MEAS ---- ---- SET

⑤Press [F4]（SET）	[F2]	MLM -1（A-B, A-C） STEP-2 HD: MEAS ---- ---- SET
⑥Aim at prism B. Press [F1](MEAS ） to show HD from instrument to Point B.	Aim at B [F1]	MLM-1（A-B, A-C） STEP-2 HD: 108.665m MEAS ---- ---- SET
⑦Press [F4]（SET）to show dSD between A and B. It also shows HR from A、B and the instrument.	[F4]	MLM -1（A-B, A-C） HR: 122° 09′ 30″ dSD: 42.586 m ---- ---- HD ----
⑧Press to show dHD and dVD between A and B Press one time to return to the screen of step ⑦		MLM -1（A-B, A-C） dHD: 2.586 m dVD: 40.586 m ---- ---- HD ----
⑨Press [F3]（HD）to enter into MLM-1step 2（start to measure C、D. Steps is as same as step ⑥～⑧）	[F3]	MLM -1（A-B, A-C） STEP-2 HD: MEAS ---- ---- SET

9.3 Area Measurement

This mode calculates the area of a closed figure.

There are two area calculation methods as follows:

1） Area calculation from Coordinate data file

2） Area calculation from Measured data

Note：

Area is not calculated correctly if enclosed lines cross each other.

It is impossible to calculate what a mix of coordinate file data and measured data.

The number of points used to calculate are not limited.
The area to be calculated shall not exceed 200000 sq.m or 2000000 square feet.

1） 1.Area calculation from Coordinate data file

Operation Procedure	Operation	Display
①Go to menu of application program.		PROGRAMS F1：REM F2：MLM F3：AREA
②Press [F3] to enter into Area measurement.	[F3]	AREA F1：FILE DATA F2：MEASUREMENT
③Press [F1]（FILE）	[F1]	SELECT FILE FILE： ---- LIST ---- ENTER
④Press [F2]（LIST）continuously. Select file name. Press [F4]（ENTER）	[F2] [F4]	AREA FILE：DAD 0000 m.sq NEXT：D1 SRCH ---- UNIT NEXT
⑤Press [F1] (SEARCH) to enter into coordinate data. Input PtID D1 and find the data you needed.	[F1] [F3]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH N： 10.000m E： 80.000m Z： 0.000m PtID：D1 F4：SET
⑥Press [F4]（SET）.	[F4]	AREA FILE：DAD 0001 m.sq NEXT：D2 SRCH ---- UNIT NEXT

⑦Repeat step ⑤～⑥ to select 3 coordinates at least（Press [F4]（NEXT）to select if the coordinate data is continuing）It shows the area of graph which makes by the points you selected		AREA FILE: DAD 0003 56.522 m.sq NEXT: D4 SRCH ---- UNIT NEXT
⑧Press [F3]（UNIT） Press [F1]to select m.sq (square meter)as unit. Press [F2]to select ha (hectare)as unit. Press [F3]to select ft.sq (square feet)as unit Press [F4]to select acre as unit.	[F3] [F1] [F2] [F3] [F4]	AREA FILE: DAD 0003 m.sq m.sq ha ft.sq acre
●Press[ESC] to escape.		

2. Area calculation from Measured data

Operation Procedure	Operation	Display
①Go to menu of application program.		PROGRAMS F1: REM F2: MLM F3: AREA
②Press [F3]to enter into Area measurement.	[F3]	AREA F1: FILE DATA F2: MEASUREMENT
③Press [F2]（MEASUREMENT）	[F2]	AREA 0000 m.sq MEAS ---- UNIT ----
④Aim at the first target point, Press [F1]（MEAS）. The instrument shows calculated coordinate of the point（This coordinate is the coordinate used to calculating. It is not related to true coordinate.）.It measures next point after 2 seconds.	[F1]	AREA 0001 m.sq MEAS ---- UNIT ----

⑤Repeat step ④ to show the area of the graph which makes by 3 points at least.		AREA 0003 56.522 m.sq SRCH ---- UNIT NEXT
⑥ Press [F3]（UNIT） Press [F1]to select m.sq (square meter)as unit. Press [F2]to select ha (hectare)as unit. Press [F3]to select ft.sq (square feet)as unit Press [F4]to select acre as unit.	[F3] [F1] [F2] [F3] [F4]	AREA 0003 m.sq m.sq ha ft.sq acre
●Press [ESC] to escape.		

10. Memory Management

You can use any data in the memory of the instrument in the mode of memory management.: It explains as follows according to these items:

1.File Management and Search Data:：Edit file name、delete file、search and browse PtID and data、search the quantity of stored data

2.Input coordinate point：Create file name、save coordinate data to the file of coordinate data

3.Delete coordinate：Delete coordinate data in the file of coordinate data

4.Data communication：Send、receive measuring data and coordinate data

5.Initialize memory：Clear memory

10.1 Enter into Mode of Memory Management

Go to the mode of angle measurement

Operation Procedure	Operation	Display
①Press [MENU] to enter into the screen of menu 3-1	[MENU]	MENU 3-1 F1：COLLECTION DATA F2：S.O F3：MEMORY MANAGE P↓
②Press [F3]to enter into the screen of memory management 2-1	[F3]	MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA F3：INPUT COORD P↓

③Press [F4]to enter into the screen of memory management 2-2	[F4]	MEMORY MANAGE 2-2 F1：DELETE COORD.DATA F2：COMMUNICATION F3：INITIALIZE P↓

10.2 File Management & Search Data

Go to the mode of memory management

Operation Procedure	Operation	Display
①Go to memory management 2-1		MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA F3：INPUT COORD P↓
②Press [F1] **File No.：there are 8 files in the memory** **File name：The present file name is DAD** **C/0956：There are 956 coordinates in the file** **M/0956：There are 956 measured data in the file**	[F1]	FILE NUMBER：8 NAME：DAD [USED] C/0956 M/0956 EDIT LIST SRCH DEL
③Press [F1]（EDIT）to change present file name Example：Change to DAD1 （Refer to 3.8）	[F1]	FILE NUMBER：8 NAME= [USED] C/0956 M/0956 DEL ---- 123 ENTER FILE NUMBER：8 NAME：DAD1 [USED] C/0956 M/0956 EDIT LIST SRCH DEL
④Press [F2]（LIST）to search the quantity of coordinates and measured data in the present file name. （Press [F2] continuously）	[F2]	FILE NUMBER：8 NAME：DAD2 C/0956 M/0956 EDIT LIST SRCH DEL

⑤Press [F4]（DEL） **Press [F1]to delete coordinate data in DAD2** **Press [F2]to delete measured data in DAD2** **Press [F3]to delete coordinate data and measured data in DAD2** Take delete all data as an example Press [F3] Press [F1]	[F4] [F3] [F1]	DELETE FILE：DAD2 F1：COORD.DATA F2：MEAS.DATA F3：ALL DATA DELETE FILE：DAD2 DELETE THIS FILE AND ALL DATA YES ---- ---- NO FILE NUMBER：7 NAME：DAD3 C/0956 M/0956 EDIT LIST SRCH DEL
⑥Press [F3]（SEARCH）to enter into the screen of SEARCH DATA （Take search data as an example）		SEARCH DATA F1：COORD.DATA F2：MEAS.DATA C/0956 M/0956
⑦Press [F2] to enter into the screen of SEARCH COORD. DATA	[F2]	SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
⑧Press [F3]to enter into the screen of INPUT PtID SEARCH Press [F1]to input PtID	[F3] [F1]	IUPUT PtID SEARCH PtID： INPUT ---- ---- ENTER IUPUT PtID SEARCH PtID：D1 INPUT ---- ---- ENTER
⑨Press [F4]（ENTER）.※1）※2）	[F4]	PtID： D1 4-1 ID：111 R.HT： -0.001m EDIT ---- ---- P↓

Press [F4]（P↓）	[F4]	V↑： 122° 09′ 30″ 4-2 HR ： 90° 09′ 30″ INS.H： 10.000m ---- ---- ---- P↓
Press [F4]（P↓）	[F4]	SD： 10.000m 4-3 VD： 1.000m HD： 9.000m ---- ---- ---- P↓
Press [F4]（P↓）	[F4]	N： 10.000m 4-4 E： 80.000m Z： 0.000m ---- ---- ---- P↓
※1）Press [F1]（EDIT）to change PtID and ID. ※2）Press [▲][▼]to search coordinate data of previous point and next point. ● Press [ESC] to escape.		

10.3 Input Coordinate Point & Create File

Example：Create file and input coordinate

Go to the mode of memory management

Operation Procedure	Operation	Display
①Go to memory management 2-1		MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA F3：INPUT COORD P↓
②Press [F3]（INPUT COORD）	[F3]	SELECT FILE FILE： INPUT LIST ---- ENTER
③Press [F1]（CREATE）to input file name DA1（Refer to3.8）※1）	[F2] Input DA1	SELECT FILE FILE：=| DEL ---- 123 ENTER SELECT FILE FILE：DA1 INPUT LIST ---- ENTER

④Press [F4]（ENTER）to enter into the screen of inputting coordinate data.※2）	[F4]	INPUT PtID：* ID： INPUT ---- ---- ENTER
⑤Press [F1]（INPUT）to input PtID D1（Refer to 3.8）The cursor moves to next line after finishing it.	[F1]	INPUT PtID：D1 ID：* INPUT ---- ---- ENTER
⑥Press [F1]（INPUT）to input ID 111 （Refer to 3.8）	[F1]	INPUT PtID：D1 ID：111 INPUT ---- ---- ENTER
⑦Press [F4]（ENTER）	[F4]	N：* 0.000m E： 0.000m Z： 0.000m INPUT ---- ---- ENTER
⑧Press [F1]（INPUT）.Input the value of N、E、Z（Refer to3.8）	[F1]	N：* 10.000m E： 50.000m Z： 20.000m INPUT ---- ---- ENTER
⑨Press [F4]（ENTER） to turn to the screen of next point.	[F4]	INPUT PtID：D1 ID：111 INPUT ---- ---- ENTER
⑩Press [ESC]to escape。	[ESC]	MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA F3：INPUT COORD P↓
※1）Press [F2]（LIST）to select a filed existed as stored file of coordinate data. ※2）Press [▲][▼]to move the cursor.		

10.4 Delete Coordinate Point

Go to the mode of memory management

Operation Procedure	Operation	Display
①Go to memory management 2-1		MEMORY MANAGE 2-1 F1: FILE MANAGE AND SEARCH DATA F3: INPUT COORD P↓
②Press [F4] to enter into the screen of memory management 2-2	[F4]	MEMORY MANAGE 2-2 F1: DELETE COORD.DATA F2: COMMUNICATION F3: INITIALIZE P↓
③Press [F1]（DELETE COORD. DATA）	[F1]	SELECT FILE FILE: INPUT LIST ---- ENTER
④Press [F2]（LIST）to select the file in which you want to delete the point （Take D1 in DA1as an example)	[F2] Select DA1	SELECT FILE FILE: DA1 INPUT LIST ---- ENTER
⑤Press [F4]to enter into the screen of SEARCH COORD. DATA.	[F4]	SEARCH COORD.DATA F1: FIRST PtID F2: LAST PtID F3: INPUT SEARCH
⑥Press [F3]to enter into the screen of INPUT PtID SEARCH	[F3]	IUPUT PtID SEARCH PtID: INPUT ---- ---- ENTER
Press [F1] to input PtID D1.	[F1] Input D1	IUPUT PtID SEARCH PtID: D1 INPUT ---- ---- ENTER
⑦Press [F4]（ENTER）	[F4]	N: * 10.000m E: 50.000m Z: 20.000m PtID: D1 F4: DEL

⑧Press [F4]（ENTER）	[F4]	DELECT THIS PtID AND COORD.DATA YES ---- ---- NO
⑨Press [F1]（YES）to return to the screen of SEARCH COORD. DATA after deleting.	[F1]	NOW DELECT PtID… SEARCH COORD.DATA F1：FIRST PtID F2：LAST PtID F3：INPUT SEARCH
●Press [ESC] to escape.		

10.5 Data Communication

1. Send data（Sending way of coordinate data and measured data is the same. Take send measured data as an example）

Go to the mode of memory management

Operation Procedure	Operation	Display
①Go to memory management 2-1		MEMORY MANAGE 2-1 F1：FILE MANAGE AND SEARCH DATA F3：INPUT COORD P↓
②Press [F4] to enter into the screen of memory management 2-2	[F4]	MEMORY MANAGE 2-2 F1：DELETE COORD.DATA F2：COMMUNICATION F3：INITIALIZE P↓
③Press [F2] to enter into the screen of data communication.	[F2]	DATA COMMUNICATION F1：SEND DATA F2：RECEIVE C.DATA
④Press [F1]to enter into the screen of SEND DATA	[F1]	SEND DATA F1：SEND COORD.DATA F2：SEND MEAS.DATA

⑤Press [F2]	[F2]	SELECT FILE FILE: ---- LIST ---- ENTER
⑥Press [F2]（LIST）to select the file in which you want to send data （take DA1 as an example）	[F2] Select DA1	SELECT FILE FILE: DA1 ---- LIST ---- ENTER
⑦Press [F4] to return after finishing it.（Send it again if the screen shows ERROR）	[F4]	SEND COORD.DATA… SEND DATA F1: SEND COORD.DATA F2: SEND MEAS.DATA

2. Receive coordinate data

Go to the mode of memory management

Operation Procedure	Operation	Display
①Go to memory management 2-1		MEMORY MANAGE 2-1 F1: FILE MANAGE AND SEARCH DATA F3: INPUT COORD P↓
②Press [F4] to enter into the screen of memory management 2-2	[F4]	MEMORY MANAGE 2-2 F1: DELETE COORD.DATA F2: COMMUNICATION F3: INITIALIZE P↓
③Press [F2] to enter into the screen of data communication.	[F2]	DATA COMMUNICATION F1: SEND DATA F2: RECEIVE C.DATA

④Press [F2]（receive coordinate data）	[F2]	SELECT FILE FILE: ---- LIST ---- ENTER
⑥Press [F2]（LIST）to select the file for storing data （Take DA1 as an example）	[F2] Select DA1	SELECT FILE FILE: DA1 ---- LIST ---- ENTER
⑦Press [F4]to return after finishing it.（Receive it again if the wrong screen shows. It means file DA1 is full if the screen shows ERROR2）	[F4]	RECEIVE COORD.DATA … DATA COMMUNICATION F1: SEND DATA F2: RECEIVE C.DATA

10.6 Initializing Memory

Go to the mode of memory management

Operation Procedure	Operation	Display
①Go to memory management 2-1		MEMORY MANAGE 2-1 F1: FILE MANAGE AND SEARCH DATA F3: INPUT COORD P↓
②Press [F4] to enter into the screen of memory management 2-2	[F4]	MEMORY MANAGE 2-2 F1: DELETE COORD.DATA F2: COMMUNICATION F3: INITIALIZE P↓
③Press [F3]（Initialize memory）	[F3]	DELETE ALL FILE AND DATA! YES ---- ---- NO

④Press [F1]（YES）to return.	[F1]	MEMORY MANAGE 2-2 F1：DELETE COORD.DATA F2：COMMUNICATION F3：INITIALIZE P↓
●Press [F4]（NO）to cancel initialize memory. Escape.		

11. Parameter Setting Up

11.1 Enter into Setting up Parameter

Go to the mode of angle measurement

Operation Procedure	Operation	Display
①Press [MENU] to enter into the screen of menu 3-1	[MENU]	MENU 3-1 F1：COLLECTION DATA F2：S.O F3：MEMORY MANAGE P↓
②Press [F4]（P）to enter into the screen of menu 3-2	[F4]	MENU 3-2 F1：PROGRAMS F2：SET F3：LCD P↓
③Press [F2]（Parameter Setting）to enter into the screen of parameter setting menu 3-1	[F2]	SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS[V↑：] F3：TILT[ON] P↓
④Press [F4]（P）to enter into the screen of menu 3-2	[F4]	SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[1”] F3：DIST.UNIT[m] P↓
⑤Press [F4]（P↓）to enter into the screen of menu 3-3	[F4]	SET MENU 3-3 F1：DATA STORAGE SET [COORD.DATA] F3：SAVE AND EXIT P↓

11.2 Setting up Power off Automatically

Example：Change Power ON to OFF on the mode of power off automatically（Initial setting:[ON]）

Operation Procedure	Operation	Display
①Go to the screen of parameter setting menu 3-1		SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS[V↑：] F3：TILT[ON] P↓
②Press [F1]to change [ON] to [OFF]	[F1]	SET MENU 3-1 F1：POWER AUTO[OFF] F2：CMPS[V↑：] F3：TILT[ON] P↓

11.3 Setting up Position 0(Vertical Angle)

Example：Change position 0(Vertical angle) [V↑：] to [V→：]（Initial setting: [V↑：]）

Operation Procedure	Operation	Display
①Go to the screen of parameter setting menu 3-1		SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS[V↑：] F3：TILT[ON] P↓
②Press [F2]to change [V↑：] to [V→：] **V↑：Zenith distance** **V→：Height angle**	[F2]	SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS [V→：] F3：TILT[ON] P↓

11.4 Setting up Compensator

Example：Change compensator from[ON] to [OFF]（Initial setting: [ON]）

Operation Procedure	Operation	Display
①Go to the screen of parameter setting menu 3-1		SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS[V↑：] F3：TILT[ON] P↓
②Press [F3]to change [ON] to [OFF]	[F3]	SET MENU 3-1 F1：POWER AUTO[ON] F2：CMPS[V↑：] F3：TILT[OFF] P↓

11.5 Setting up Angle Unit

Example：Change angle unit from[Degree] to [MIL]（Initial setting: [MIL]）

Operation Procedure	Operation	Display
①Go to the screen of parameter setting menu 3-2		SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[1”] F3：DIST.UNIT[m] P↓
②Press [F1]to change [degree] to [MIL] **One time: [MIL]** **Two times: [GON]**	[F1]	SET MENU 3-2 F1：ANGLE UNIT [MIL] F2：READ[1”] F3：DIST.UNIT[m] P↓

11.6 Setting up Minimum Reading

Example：Change minimum reading from[1”] to [5”]（Initial setting: [1”]）

Operation Procedure	Operation	Display
①Go to the screen of parameter setting menu 3-2		SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[1”] F3：DIST.UNIT[m] P↓
②Press [F2]to change [1”]to [5”] **One time: [5”]** **Two times: [**10”**]** **Three times: [**20”**]**	[F2]	SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[5”] F3：DIST.UNIT[m] P↓

11.7 Setting up Distance Unit

Example：Change distance unit from[m]to [ft]（Initial setting: [m]）

Operation Procedure	Operation	Display
①Go to the screen of parameter setting menu 3-2		SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[1”] F3：DIST.UNIT[m] P↓
②Press [F3]to change [m]to [ft]	[F3]	SET MENU 3-2 F1：ANGLE UNIT[DEG] F2：READ[1”] F3：DIST.UNIT[ft] P↓

11.8 Setting up Data Storing

Example：Change data storing from[Coordinate Data]to [Measuring data]（Factory initial setting [Coordinate Data]）

Operation Procedure	Operation	Display
①Go to the screen of parameter setting menu 3-3		SET MENU 3-3 F1：DATA STORAGE SET [COORD.DATA] F3：SAVE AND EXIT P↓
Press [F1]to change [Coordinate Data]to[Measuring data] **One time: [Measuring data]** **Two time: [Coordinate and Measuring data]**	[F1]	SET MENU 3-3 F1：DATA STORAGE SET [MEAS.DATA] F3：SAVE AND EXIT P↓

11.9 Saving Setup

You must execute these steps after finishing above changes, or all changes are invalid.

Operation Procedure	Operation	Display
①Go to the screen of parameter setting menu 3-3		SET MENU 3-3 F1：DATA STORAGE SET [COORD.DATA] F3：SAVE AND EXIT P↓
②Press[F3]to save setting and escape.	[F1]	MENU 3-2 F1：PROGRAMS F2：SET F3：LCD P↓

11.10 Contrast Adjusting

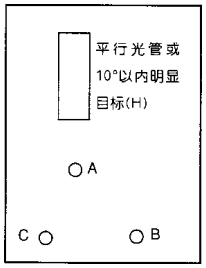
Operation Procedure	Operation	Display
①Go to the mode of angle measurement.		V↑： 82° 09′ 30″ HR： 90° 09′ 30″ OSET HOLD HSET P1↓

②Press [★]	[★]	F1：CONTRAST ADJ F2：LCD F3：EXIT
③Press [F1] Press [F1]（+）or [F2]（-） to change contrast adjusting.	[F1] [F1] [F2]	CONTRAST ADJ： [20] [+] [-] ---- ENTER CONTRAST ADJ： [25] [+] [-] ---- ENTER
④Press [F4]（ENTER）		F1：CONTRAST ADJ F2：LCD F3：EXIT
●Press [F3][ESC] to escape.		

12. Compensator (Tilt Sensor)

Compensator is a component to measure tilt angle of the instrument and horizontal surface. The compensator can make vertical angle you measured more accurate. So you must check and adjust it regularly.

Level the instrument. To set it as picture shows.



12.1 Enter into Mode of Compensator Adjusting

Operation Procedure	Operation	Display
①Press [F2]to power on until the screen (right side)shows and release [F2]	[F2]+[0] [POWE]	ADJUSTMENT MODE SENSOR SET TURN TELESCOPE

②Move telescope and make vertical angle passing 0. Enter into the mode of compensator adjusting.		ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
●Press [F3]（ESC）. The instrument power on again.		

12.2 Position 0 Check

Operation Procedure	Operation	Display
①Go to the mode of compensator adjusting.		ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
②Press [F2]to enter into the screen of CHECK TILTE SENSOR	[F2]	CHECK TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 10″ ----　　----　　----　　EXIT
③Aim at target H in the left position to get reading of compensator**,.** We say Y1.	Left position aim at H	CHECK TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 10″ ----　　----　　----　　EXIT
④Aim at target H in the right position to get reading of compensator**,.** We say Y2. If **Y1+Y2 > 30" or Y1+Y2 < -30"** you must adjust compensator because the position 0 of the compensator is over standard value.	Right position aim at H	CHECK TITLE SENSOR V：82° 09′ 30″ TITLE：-0° 00′ 20″ ----　　----　　----　　EXIT
⑤Press [F4]（ESC）to return.	[F4]	ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT

12.3 Position 0 Changing

Fellow these steps if the position 0 of the compensator is over standard value.

Open the right side cover, you may see a sealed component, that is, compensator.

Operation Procedure	Operation	Display
①Go to the mode of compensator adjusting.		ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
②Press [F1] to enter into the screen of SET TITLE SENSOR.	[F1]	SET TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 10″ ----　SET　----　EXIT
③Loose the screw of compensator and move the compensator slightly until the compensator reading is near to **0°00′00″（±2"） and then screw it.**		SET TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 00″ ----　SET　----　EXIT
④Press [F4]（ESC）to escape.	[ESC]	ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
⑤Repeat 12.2 and 12.3until the position 0 of compensator is reach standard value.		

12.4 Position 0 Adjusting

Operation Procedure	Operation	Display
①Go to the mode of compensator adjusting.		ADJUSTMENT SENSOR F1：SET SENSOR F2：CHECK SENSOR F3：EXIT
②Press [F1] to enter into the screen of SET TITLE SENSOR.	[F1]	SET TITLE SENSOR V：82° 09′ 30″ TITLE：0° 00′ 10″ ----　SET　----　EXIT

③Move foot screw A to make the reading of compensator as **0°00′00″**; Aim at target H in the left position to get the reading of vertical angle. We say M.		SET TITLE SENSOR V: 82° 09′ 30″ TITLE: 0° 00′ 00″ ---- SET ---- EXIT
④Move fine motion screw of vertical to make reading of vertical angle is as M+3′。		SET TITLE SENSOR V: 82° 12′ 30″ TITLE: -0° 02′ 10″ ---- SET ---- EXIT
⑤Move foot screw A. Aim at target H. Press [F2] (SET ） . The instrument power on again.	[F2]	
⑥Repeat steps ①、②		
⑦Move fine motion screw of vertical to make reading of vertical angle is as M-3′。		SET TITLE SENSOR V: 82° 06′ 30″ TITLE: +0° 02′ 10″ ---- SET ---- EXIT
⑧Move foot screw A. Aim at target H. Press [F2] （ SET ） . The instrument power on again.		

12.5 Accuracy Check

Do these steps below if only position 0 of the compensator is standard.

Operation Procedure	Operation	Display
①Go to the mode of compensator adjusting.		ADJUSTMENT SENSOR F1: SET SENSOR F2: CHECK SENSOR F3: EXIT
②Press [F2] to enter into the screen of CHECK TILTE SENSOR	[F2]	CHECK TITLE SENSOR V: 82° 09′ 30″ TITLE: 0° 00′ 10″ ---- ---- ---- EXIT

③Aim at target H in the left position to make the reading of compensator as **0°00′00″**; Aim at target H to get the reading of vertical angle. We say M1 .	Left position Aim at H Footscrew A	CHECK TITLE SENSOR V: 82° 09′ 30″ TITLE: 0° 00′ 00″ ---- ---- ---- EXIT
④Move foot screw A to make the reading of compensator as **+0°03′00″** aim at target H to get the reading of vertical angle. We say M2 .	Left position aim at H Footscrew A	CHECK TITLE SENSOR V: 82° 12′ 30″ TITLE: +0° 03′ 00″ ---- ---- ---- EXIT
⑤Move foot screw A to make the reading of compensator as **-0°03′00″** aim at target H to get the reading of vertical angle. We say M3 .	Left position Aim at H Footscrew A	CHECK TITLE SENSOR V: 82° 06′ 30″ TITLE: -0° 03′ 00″ ---- ---- ---- EXIT
⑥If｜M2-M1｜>3" or｜M3-M1｜>3"occurs; it means that compensator is out of standard. Repeat **"12.4Position 0 adjusting"**, until ｜M2-M1｜≤3"、｜M3-M1｜≤3"。		
⑦Press [F4]（ESC） to escape	[F4]	ADJUSTMENT SENSOR F1: SET SENSOR F2: CHECK SENSOR F3: EXIT

13. Check & Adjustment

13.1 Check & Adjustment of Constant

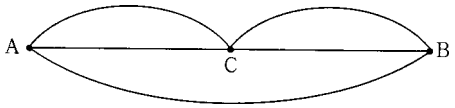
Instrument constant is addictive constant.

Instrument constant has been checked and adjusted in the factor. It changes seldom and we suggest checking one or two times every year. The check should be made on the base line, also you can set up a base line, 20m. Compare new instrument you purchased with the base line.

Instrument constant checking must avoid these factors: difference of instrument setting and prism, baseline accurate, aim difference, atmospheric correction, atmospheric refraction and earth curvature correction

Compare the result. Fellow these steps to check and adjust if the difference is over 5mm.

①Select one point C in a line AB(about 100m). Observe the length of AC， AB and BC.



②Repeat observation and get instrument constant K：

K = AC + BC - AB

③Set constant again if there is a difference between standard constant and calculated constant.

④Compare the instrument constant on a standard base line.

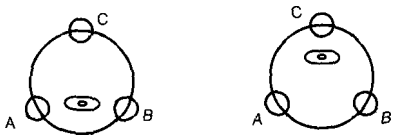
How to set instrument constant, please contact me.

13.2 Check & Adjustment of Plate Vial

Check

①Rotate the instrument horizontally by loosening the Horizontal Clamp Screw and place the plate vial parallel with the line connecting leveling screw A and B, and then bring the bubble to the center of the plate vial by turning the leveling screws A and B.

②Rotate the instrument 180°（200g）around its vertical axis. Observe the bubble of plate vial. Fellow the steps below to adjust it if the bubble is not in the center.

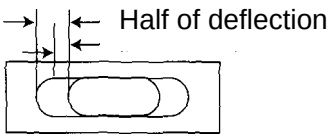


Adjustment

①If the bubble of the plate vial moves from the center, bring it half way back to the center by adjusting the leveling screw, which is parallel to the plate vial. Correct the remaining half by adjusting the screw of plate vial with adjusting pin.

②Confirm whether the bubble does is in the center by rotating the instrument 180°.If not, repeat step ①.

③ Turn the instrument 180°（200g）and adjust the third screw to center the bubble in the vial.



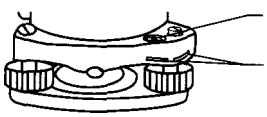
13.3 Check & Adjustment of Circular Vial

Check

No adjustment is necessary if the bubble of the circular vial is in the center after inspection and adjustment of the plate vial.

Adjustment

If the bubble of the circular vial is not in the center, bring the bubble to the center by using the adjusting pin to adjust two bubble-adjusting screws.



Circular Vial
Adjustment Screw for Circular vial

13.4 Check & Adjustment of Optical Plummet

Check

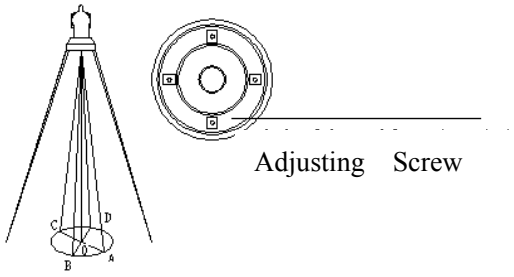
①Set the instrument on the tripod and place a piece of white paper with two perpendicular lines, then intersect drawn on it directly under the instrument. Adjust the leveling screws so that the center mark of the optical plummet coincides with the intersection point of the cross on the paper.

②Rotate the instrument around the vertical axis 180°（200g）observe whether the center mark position coincides with the intersection point of the cross. If the center mark always coincides with intersection point, no adjustment is necessary.

Otherwise, the following adjustment is necessary.

Adjustment

①Take off protective cover of the optical plummet, you may see 4 adjusting screws. Adjust 4 adjusting screw.



②Move woodscrew to make the center of optical plummet coincides with ground point.

③Rotate the instrument around the vertical axis 180°（200g）observe whether the center mark position coincides with the intersection point of the cross. If the center mark always coincides with intersection point, no adjustment is necessary. Otherwise, repeat steps above mentioned.

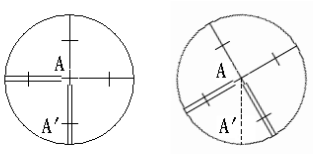
13.5 Check & Adjustment of Inclination of Reticle

Check

①Set the instrument on a tripod and level it.

②Aim at target A with telescope（One point, 50m away）。

③Observe point A moves along the vertical line of the reticle or not by moving telescope up and down.. If so, no adjustment is necessary. If not so, then need to adjust the reticle.

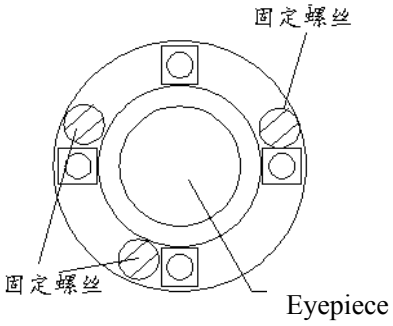


Adjustment

①Remove the eyepiece cover to expose the four reticle adjusting screws.

②Loosen the four reticle adjusting screws uniformly with an adjusting pin. Rotate the reticle around the sight line and align the vertical line of the reticle with point Ａ. Tighten the reticle adjusting screws.

③Repeat the inspection and adjustment to see if the adjustment is correct.



13.6 Check & Adjustment of Perpendicularity of line of sight to Horizontal Axis (c)

Check

①Set the instrument on a tripod and level it.

②Aim at cross line of the reticle of the collimator or a target away. Observe left position and right position.

③Calculate difference after getting horizontal angle reading (left position) HI and(right position)HR

$$C = (HI - HR \pm 180°)/2$$

If **C ≤ 8"**，no adjustment is necessary；If **C > 8"**，fellow these steps to adjust it.

Adjustment

①Rotate fine motion screw in the right position and make the reading is **HR + C**.

②Remove the eyepiece cover to adjust two adjusting screws, which makes reticle coincides with cross line of collimator or one target away.

③Repeat check and adjustment until C ≤ 8".

13.7 Check & Adjustment of Vertical Index Difference (i angle)

Inspect the item after finishing the inspection and adjustment of section 13.5 and 13.6.

Check

①Set the instrument on a tripod and level it.

②Sight object A in left position and read the Vertical angle value VI. Rotate the telescope. Sight object B in right position and read the Verticail angle value VR.

③Calculating， **i=(VI+VR-360°)/2**

④If **i≤10"**，no adjustment is necessary. If **i>10"**，to adjust it.

Adjustment

Operation Procedure	Operation	Display
①Keep to press [F1] to power on until right screen occurs. Loose [F1]	[F1]+ [POWER]	ADJUSTMENT MODE V ANGLE 0 SET TURN TELESCOPE
②Rotate telescope and make vertical angle passing 0. Enter into the mode of V ANGLE 0 SET		V 0 POINT SET (SETP-1) V：82° 06′ 30″ ---- ---- ---- SET
③Aim at target (left position). Press [F4]（SET）	Aim at target [F4]	V 0 POINT SET (SETP-1) V：182° 06′ 30″ ---- ---- ---- SET
④Aim at target (right position). Press [F4]（SET）. Power on automatically.	Aim at target [F4]	
⑤Finish adjustment Repeat, if not within standard.		

13.8 Check of Parallel between Line of Sight and Emitting Photoelectric Axis

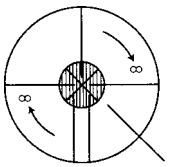
This step was done after finishing the inspection and adjustment of Item 13.5 and 13.6.

Check

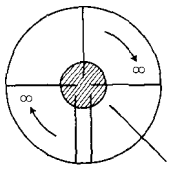
①Set the prism 2m from the instrument.(Power on)

②Sight the center of the prism with reticle.

③Set observe mode as the mode of distance measurement.



Prism



Red light point

④Observe eyepiece and focus to red point(flashing). If the difference between cross line of telescope and red point on the horizontal and vertical direction is within 1/5 of red point diameter, no adjustment is necessary. Otherwise, the instrument needs repairing or contacts me.

14 Technical Index

Telescope

Image	Erect
Magnification	30×
Effective aperture	48mm
Resolving power	3.75″
Minimum focus	1m
Stadia ratio	100
Sight distance precision	≤0.4%D
Tube length	172mm

Angle Measurement

Measuring method	photoelectric detection by incremental encoder
Diameter of circle (vertical, horizontal)	79mm
Minimum reading	1″、5″、10″Selectable
Measuring unit	360° /400gon/6400mil Selectable
Vertical angle 0°	Zenith 0° /Horizontal 0° Selectable
Accuracy	2″

Distance Measurement

Single prism (under fair weather condition)

DTM102N : 1.0km

DTM102NL: 1.8km

Triple prism (under fair weather condition)

Display	Max：999999.999m Min：1mm
Unit	m /ft Selectable
Accuracy	±(3mm+2ppm·D)
Measuring time	Fine single shot: 3S Tracking: 0.8 S
Meteorological Correction	Manual input, Auto correction
Reflection prism correction	Manual input, Auto correction

Vial

Plate vial	20″/2mm
Circular vial	8′/2mm

Vertical Compensator

System	Liquid-electric detection
Compensation range	±3′
Resolving power	1″

Optical Plummet

Image	Erect
Magnification	3×
Focusing range	0.3m～∞

Field of view	5 °
Display	
Type	LCD，Four lines，digital
Data Communication	
Port	RS－232C
On-board Battery	
Power resource	Rechargeable Ni-H battery
Voltage	DC7.2 V
Continuous operation time	BDC 3000mAh
	Angle measurement: 20 hours
	Distance measurement: 8 hours
Operation Environment	
Operating temperature	－20° ～＋45℃
Size & weight	
Dimension	180mm×175mm×355mm
Weight	6.5 k g

16. Packing List

- ●Case 1 pc
- ●Main body 1 set
- ●On-board battery 2 pcs
- ●Recharger 1 pc
- ●Plummet (only used for optical plummet instrument) 1 pc
- ●Correction pin 1pc
- ●Fur brush 1 pc
- ●Screwdriver 1 pc
- ● Hexagon wrench 1pc
- ●Cloth 1pc
- ●desiccant 1 bag
- ●Operating manual 1 pc