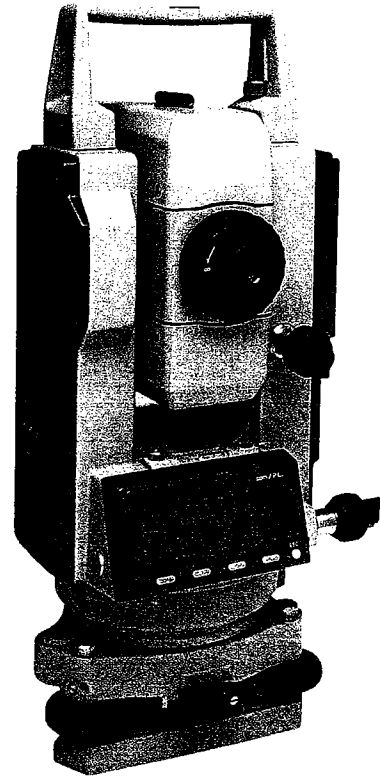


**SOKKIA**

**SET5F  
SET5FS  
SET5W  
SET5WS**

Electronic Total Station



OPERATOR'S MANUAL



Ni-Cd

- **[English]** CONTAINS NICKEL-CADMIUM BATTERY. MUST BE RECYCLED OR DISPOSED OF PROPERLY.
- **[Deutsch]** MIT NiCd AKKU. EFORDERT RECYCLING ODER FACHGERECHTE ENTSORGUNG.
- **[Français]** CONTIENT UNE BATTERIE AU CADMIUM NICKEL. DOIT ÊTRE RECYCLÉE OU DONNÉE A UN ORGANISME DE RETRAITEMENT.
- **[Italiano]** CONTIENE NiCd BATTERIA. DEVE QUINDI ESSERE RICICLATA O ELIMINATA IN MODO APPROPRIATO.
- **[Nederlands]** BEVAT EEN NiCd BATTERIJ. DIENT GERECYCLEERD TE WORDEN OF OP EEN CORRECTE MANIER VERNIETIGD TE WORDEN.
- **[Español]** CONTIENE UNA NiCd BATERÍA. DEBE RECICLARSE O ELIMINARSE ADECUADAMENTE.
- **[Português]** CONTEM BATERIA DE NÍQUEL CÁDMIO. DEVERÁ SER RECICLADA OU DECARTADA CONVENIENTEMENTE.
- **[Svensk]** INNEHÅLLER NiCd BATTERI. BÖR ÅTERVINNAS ELLER FÖRSTÖRAS PÅ ETT SÄKERT SÄTT.
- **[Suomi]** SISÄLTÄÄ NIKKELI-KADMIUM AKUN. HÄVITETTÄESSÄ KÄSITELTÄVÄ ONGELMAJÄTTEENÄ.
- **[Norsk]** NiCd BATTERIER MÅ RESIRKULERES ELLER KASTES PÅ EN FORSVARLIG MÅTE.
- **[Dansk]** INDEHOLDER NiCd BATTERI. SKAL GENVINDES ELLER KASSERES PÅ FORSVARLIG MÅDE.
- **[Ελληνικά]** ΠΕΡΙΕΧΕΙ ΜΠΑΤΑΡΙΑ ΝΙΚΕΛΙΟΥ-ΚΑΔΜΙΟΥ. ΠΡΕΠΕΙ ΝΑ ΑΝΑΚΥΚΛΩΝΕΤΑΙ Η ΝΑ ΚΑΤΑΣΤΡΕΦΕΤΑΙ ΜΕ ΤΟΝ ΚΑΤΑΛΛΗΛΟ ΤΡΟΠΟ.

**For U.S.A. ATTENTION:**

The product that you have purchased contains a rechargeable battery. The battery is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local solid waste officials for details in your area for recycling options or proper disposal. Use the standard battery charger.

**Die Schweiz:** Nach Gebrauch der Verkaufsstelle zurückgeben.

**La Suisse:** Après usage à rapporter au point de vente.

**Swizzera:** Ritornare la pila usate al negozio.



**SET5F**  
**SET5FS**  
**SET5W**  
**SET5WS**

Electronic Total Station

**OPERATOR'S MANUAL**

- Thank you for selecting the SET5F/SET5FS/SET5W/SET5WS Electronic Total Station.
- Before using the instrument, please read this operator's manual.
- Verify that all equipment is included by referring to "**STANDARD EQUIPMENT**", P168.
- The specifications and general appearance of the instrument may be altered at any time and may differ from those appearing in brochures and this manual.
- The picture on the cover and illustrations are of the SET5W.

► **IMPORTANT • For lithium battery**

A lithium battery is used to power the SET memory. This ensures "continuous memory" so that all data is safe. The lithium battery contains enough power to back up the memory for up to 10 years. If the lithium battery is completely discharged, all data will be cleared.

Backup battery low!

RAM cleared

Code file  
checksum error  
Code file deleted

Data checksum error!  
delete all data ?  
Yes No

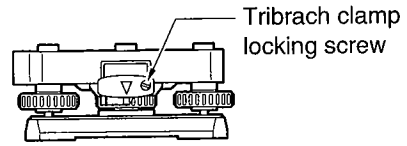
If the lithium battery becomes low, an error message "Backup battery low!", "RAM cleared" and "Code file checksum error Code file deleted" will be displayed at power-on. After that, "delete all data ?" is displayed. To download the data to a personal computer, press <No> and download the data in Data memory mode. If <Yes> is pressed, the data will be cleared. To replace the lithium battery, please contact your SOKKIA agent. When the battery is replaced, all data is cleared.

• **For rechargeable battery**

The battery has not been charged at the factory. Please charge the battery fully before using, referring to "22. POWER SUPPLIES".

• For Tribrach

When the new SET is shipped, the tribrach clamp is fixed with a screw. Loosen it and leave it loose. If the SET is again shipped, fix the tribrach clamp with this screw to secure the tribrach to the instrument.



► NOTE

```
Service Mode Entry
Password = 000
■■■ 3
■↑■ ■↓■ ■→■ Entry
```

- If the display appears as at left for some reason, please press <ESC>. The instrument returns to Basic mode. (Usually this mode is not used.)

## Table of Contents

ALWAYS FOLLOW PRECAUTIONS FOR SAFE OPERATION .....	viii
FEATURES .....	xii
EXPLANATION OF SOFTKEYS .....	xiii
HOW TO USE THIS MANUAL .....	xiv

### *Introduction*

1. PRECAUTIONS .....	3
2. PARTS OF THE INSTRUMENT .....	4
3. DISPLAY SYMBOLS .....	6
4. KEY FUNCTIONS .....	7
5. MODE DIAGRAM .....	10

### *Preparation for measurement*

6. MOUNTING THE BATTERY .....	13
7. SETTING UP THE INSTRUMENT .....	14
7.1 Centering .....	14
7.2 Levelling .....	16
8. POWER ON AND PREPARATION FOR MEASUREMENT .....	20
8.1 Power on and off .....	20
8.2 Indexing the vertical and horizontal circles .....	22
8.3 Focusing and target sighting .....	23
8.4 Display and reticle illumination .....	25
8.5 Setting the instrument options .....	26

# Table of Contents

	<i>Measurement</i>
<b>9. ANGLE MEASUREMENT .....</b>	<b>33</b>
9.1 Measure the horizontal angle between 2 points .....	34
9.2 Set Horizontal circle to a required value .....	35
9.3 Horizontal angle display selection .....	36
9.4 Horizontal angle repetition .....	37
9.5 Slope in % .....	39
<b>10. DISTANCE MEASUREMENT .....</b>	<b>40</b>
10.1 Atmospheric correction .....	41
10.2 Return signal checking .....	44
10.3 Distance and angle measurement .....	45
10.4 Tracking measurement .....	47
10.5 Review of measured data .....	48
<b>11. COORDINATE MEASUREMENT .....</b>	<b>49</b>
11.1 Instrument station coordinates setting .....	50
11.2 Target height and instrument height setting .....	52
11.3 Azimuth angle setting .....	53
11.4 3-Dimensional coordinate measurement .....	56
	<i>Advanced measurement functions</i>
<b>12. RESECTION MEASUREMENT .....</b>	<b>61</b>
<b>13. MISSING LINE MEASUREMENT .....</b>	<b>66</b>
13.1 Measuring the distance between 2 or more points .....	67
13.2 Changing the starting position .....	69
<b>14. SETTING-OUT MEASUREMENT .....</b>	<b>70</b>
14.1 Distance setting-out measurement .....	71
14.2 Coordinates setting-out measurement .....	74
14.3 REM setting-out measurement .....	77
<b>15. OFFSET MEASUREMENT .....</b>	<b>78</b>
15.1 Distance offset .....	79
15.2 Angle offset .....	81
<b>16. REM MEASUREMENT .....</b>	<b>83</b>

---

## Table of Contents

---

### *Using Data memory function*

<b>17. DATA MEMORY FUNCTION .....</b>	<b>89</b>
17.1 Changing the instrument options .....	91
17.2 Job selecting .....	92
17.3 Instrument station data and Measured data recording ...	93
17.4 Instrument station data and Measured data reviewing / deleting / outputting .....	101
17.5 Feature code inputting / deleting / reviewing .....	104
17.6 Coordinate data inputting / deleting / reviewing .....	107

---

### *Troubleshooting*

<b>18. ERROR MESSAGES .....</b>	<b>113</b>
<b>19. CHECKS AND ADJUSTMENTS .....</b>	<b>116</b>
19.1 Plate level .....	116
19.2 Circular level .....	118
19.3 Tilt sensor .....	119
19.4 Reticle .....	123
19.5 Optical plummet .....	128
19.6 Distance measurement check flow chart .....	130
19.7 Additive distance constant .....	131



## Table of Contents

### *Measurement options selection*

<b>20. CHANGING INSTRUMENT PARAMETERS .....</b>	<b>135</b>
<b>21. CHANGING LOCATION OF FUNCTIONS FOR KEYS... 144</b>	
21.1 Key function allocating .....	146
21.2 Registered location recalling .....	151
<b>22. POWER SUPPLIES .....</b>	<b>153</b>
<b>23. REFLECTING PRISMS AND ACCESSORIES .....</b>	<b>156</b>

### *Appendices*

<b>Appendix 1: Manually indexing the vertical circle by face left, face right measurements .....</b>	<b>161</b>
<b>Appendix 2: For distance measurement of the highest accuracy .....</b>	<b>162</b>
<b>Appendix 3: Earth-curvature and refraction correction .</b>	<b>164</b>
<b>Appendix 4: Standard accessories .....</b>	<b>165</b>
<b>Appendix 5: Optional accessories .....</b>	<b>166</b>
<b>STANDARD EQUIPMENT .....</b>	<b>168</b>
<b>MAINTENANCE .....</b>	<b>169</b>
<b>SPECIFICATIONS .....</b>	<b>170</b>
<b>ATMOSPHERIC CORRECTION CHART .....</b>	<b>174</b>
<b>REGULATIONS .....</b>	<b>175</b>

## ALWAYS FOLLOW PRECAUTIONS FOR SAFE OPERATION

For the safe use of the product and prevention of injury to operators and other persons as well as prevention of property damage, items which should be observed are indicated by an exclamation point within a triangle used with WARNING and CAUTION statements in this operator's manual.

The definitions of the indications are listed below. Be sure you understand them before reading the main text.

### Definition of Indication



#### WARNING

Ignoring this indication and making an operation error could possibly result in death or serious injury to the operator



#### CAUTION

Ignoring this indication and making an operation error could possibly result in personal injury or property damage

### Definition of Symbols



This symbol indicates items for which caution (hazard warnings inclusive) is urged.  
Specific details are printed in or near the symbol.








This symbol indicates items which are prohibited.  
Specific details are printed in or near the symbol.








This symbol indicates items which must always be performed.  
Specific details are printed in or near the symbol.

## General

### WARNING

-  Never look at the sun through the telescope. Loss of eyesight could result.
-  Do not look at reflected sunlight from a prism or other reflecting object through the telescope. Loss of eyesight could result.
-  Direct viewing of the sun in sun observation will cause loss of eyesight. Use the solar filter (option) for sun observation.
-  Do not perform disassembly or rebuilding. Fire, electric shock or burns could result.
-  Do not use the main unit in areas exposed to high amounts of dust or ash, in areas where there is inadequate ventilation, or near combustible materials. An explosion could occur.

### CAUTION

-  Secure handle to main unit with locking screws. Failure to properly secure the handle could result in the unit falling off while being carried, causing injury.
-  Tighten the adjustment tribrach clamp securely. Failure to properly secure the clamp could result in the tribrach falling off while being carried, causing injury.
-  Do not wield or throw the plumb bob. A person could be injured if struck.
-  Do not place the instrument in a case with a damaged catch, belt or handle. The case or instrument could be dropped and cause injury.
-  Do not use the carrying case as a footstool. The case is slippery and unstable so a person could slip and fall off of it.

## Power Supply

### ⚠WARNING


- ⊘ Do not use voltage other than the specified power supply voltage.  
Fire or electrical shock could result.
- ⚠ Use only the specified battery charger to recharge the batteries.  
Other chargers may be of different voltage rating or polarity causing sparking which could lead to fire or burns.
- ⊘ Do not place articles such as clothing on the battery power charger while charging batteries.  
Sparks could be induced leading to fire.
- ⊘ Do not use damaged power cords, plugs or loose outlets.  
Fire or electric shock could result.
- Do not use batteries or the battery charger if wet.  
Resultant shorting could lead to fire or burns.
- ⊘ Battery BDC25A meets IPX7 specification for waterproofing (immersion-proof). But shorting could occur if the terminals become wet.
- ⊘ Do not use power cords other than those designated.  
Fire or electric shock could result.
- ⚠ To prevent shorting of the battery in storage, apply insulating tape or the equivalent to the battery terminals.  
Otherwise shorting could occur resulting in fire or burns.
- ⊘ Do not heat or throw batteries into fire.  
An explosion could occur resulting in injury.


### ⚠CAUTION


- ⊘ Do not connect or disconnect power supply plugs with wet hands.  
Electric shock could result.
- ⊘ Do not touch liquid leaking from batteries.  
Harmful chemicals could cause burns or blisters.


## Tripod


### ⚠ CAUTION

- 

When mounting the instrument to the tripod, tighten the centering screw securely.  
Failure to tighten the screw properly could result in the instrument falling off the tripod causing injury.
- 

Securely tighten the leg fixing screws of the tripod on which the instrument is mounted.  
Failure to tighten the screws could result in the tripod collapsing, causing injury.
- 

Do not carry the tripod with the tripod shoes pointed at other persons.  
A person could be injured if struck by the tripod shoes.
- 

Keep hands and feet away from the tripod shoes when fixing the tripod in the ground.  
A hand or foot stab wound could occur.
- 

Tighten the leg fixing screws securely before carrying the tripod.  
Failure to tighten the screws could lead to the tripod legs extending, causing injury.

## FEATURES

### **WATERPROOF (SET5W/5WS)**

- SET W/WS conforms to IP grade X7 specification for waterproofing (Immersion-proof) when the Connector caps are attached and the Battery BDC25A is mounted.

### **DUAL AXIS TILT SENSOR**

- The vertical and horizontal angle value can be compensated.
- Vertical angle value only can be compensated.

### **SOFTKEYS**

- All 4 function keys can be customized for your needs.

### **RESUME FUNCTION**

- The previous mode at power off is memorized for about 1 week. When the SET is switched on, the previous mode is resumed.

### **AVERAGE IS CALCULATED**

- The average of horizontal angle can be calculated and displayed in the repetition mode.
- The average of distance can be calculated and displayed in the average measurement mode.

### **ADVANCED MEASUREMENT**

- Resection measurement
- Missing line measurement
- Setting-out measurement
- REM measurement

### **DATA CAN BE STORED IN AN INTERNAL MEMORY**

- 3000 point data can be stored in an internal memory.

### **DATA OUTPUT**

- The SET RS-232C compatible data output connector is provided for use with a data collector or an external device.

## EXPLANATION OF SOFTKEYS

### Softkeys

- The bottom line of the SET display lists 4 softkeys. A softkey is a software key; the definition of the key is shown in the bottom line of the display. Only the softkeys relevant to your current task appear. If you press the key under the displayed function, the function is performed. Up to 4 softkeys are available at a time. For example, if you press the number one left key at the following display, the horizontal angle display is been set to 0.

			13
ZA	90° 00' 00"	-30	
HAR	125° 56' 40"	■2	
0SET	HOLD	Tilt	→P3

- By pressing the key under "→PX", the next page is displayed.
- "ESC" key is available in any mode. By pressing the "ESC" key, the mode is closed and the display returns to Basic mode. By pressing and holding, the power off and illumination functions are displayed.

### Allocating functions for each key

- When SET left the factory, the location of the functions for each key were set to defaults. Any function can be allocated in any page of any mode. For a description of how to allocate functions, please refer to "**21. CHANGING LOCATIONS OF FUNCTIONS FOR KEYS**".

## HOW TO USE THIS MANUAL

- The SET allows you to change the location of functions for each key, so it is difficult to determine on which mode and page a function is located. Therefore, in this manual, the operations are mainly explained using the default location of the functions for keys.
- Typefaces are used in this manual as follows:

**<Key>** Indicates a keyboard key that causes an immediate action.  
Examples: **<Sdist>**, **<↓>**, **<↑>**, **<Enter>** .

▶ **NOTE** Indicates additional information.

▶ **IMPORTANT** Indicates important information.

▶ **PRECAUTION** Indicates precaution information.

▶ **EXAMPLE** Indicates an operation example.

▶ **EXPLANATION** Indicates an explanation for a particular term or operation.

▶ **PROCEDURE** Indicates an operation procedure.



1. PRECAUTIONS.....	3
2. PARTS OF THE INSTRUMENT .....	4
3. DISPLAY SYMBOLS .....	6
4. KEY FUNCTIONS .....	7
5. MODE DIAGRAM .....	10

W W

## 1. PRECAUTIONS

- Never place the SET directly on the ground.  
Avoid damaging the tripod head and centering screw with sand or dust.
- Do not aim the telescope at the sun.  
Avoid damaging the LED of the EDM by using a solar filter when the telescope is pointed at the sun.
- Protect the SET with an umbrella against direct sunlight, rain and humidity (SET F/FS).
- Handle the SET with care. Avoid heavy shocks or vibration.
- When the operator leaves the SET, the vinyl cover should be placed on the instrument.
- Always switch the power off before removing the standard battery.
- Remove the standard battery from the SET before putting it in the carrying case.  
When the SET is placed in the carrying case, follow the layout plan.
- Make sure that the inside of the carrying case and the instrument are dry before closing the case. If moisture is trapped inside the case, it may cause the instrument to rust.

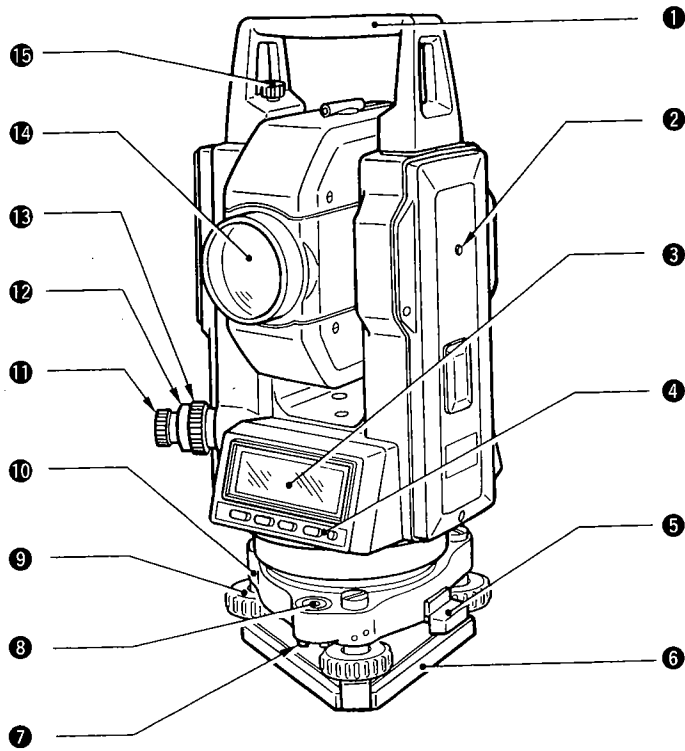
### **PRECAUTION for SET 5W/5WS**

- SET W/WS conforms to IP grade X7 specification for waterproofing (Immersion-proof) only when the Connector caps are attached and the Battery BDC25A is mounted. IPX7 does not guarantee the instrument if it is used or left in water.

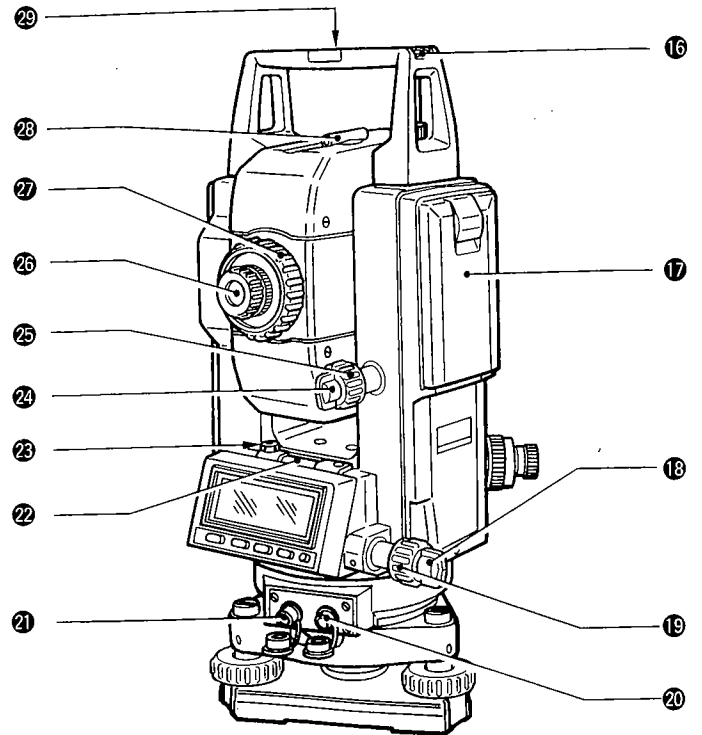
### **Degree of water resistance**

- Mount the Battery BDC25A and attach the Connector caps correctly. When remounting the battery or Connector caps, make sure water does not come in contact with the battery terminals and connectors. If moisture enters the inside of the instrument, it could damage the product.
- Make sure that the inside of the carrying case and the instrument are dry before closing the case. If moisture is trapped inside the case, it may cause the instrument to rust.
- The standard or optional accessories otherwise the Battery BDC25A do not meet IPX7 specifications.

## 2. PARTS OF THE INSTRUMENT



- |                          |   |
|--------------------------|---|
| ① Handle                 | ⑦ Circular level adjusting screws         |
| ② Instrument height mark | ⑧ Circular level                          |
| ③ Display                | ⑨ Levelling foot screw                    |
| ④ Keyboard               | ⑩ Tribrach                                |
| ⑤ Tribrach clamp         | ⑪ Optical plummet eyepiece                |
| ⑥ Base plate             | ⑫ Optical plummet reticle adjusting cover |
|                          | ⑬ Optical plummet focussing ring          |
|                          | ⑭ Objective lens                          |
|                          | ⑮ Handle securing screw                   |



- |    |                                       |    |   |
|----|---------------------------------------|----|---|
| 16 | Tubular compass slot                  | 21 | External power source connector / Connector cap |
| 17 | Battery                               | 22 | Plate level                                     |
| 18 | Horizontal clamp                      | 23 | Plate level adjusting screw                     |
| 19 | Horizontal fine motion screw          | 24 | Vertical clamp                                  |
| 20 | Data output connector / Connector cap | 25 | Vertical fine motion screw                      |
|    |                                       | 26 | Telescope eyepiece                              |
|    |                                       | 27 | Telescope focusing ring                         |
|    |                                       | 28 | Peep sight                                      |
|    |                                       | 29 | Instrument center mark                          |

### 3. DISPLAY SYMBOLS

ZA	: Zenith angle (Z=0)	S	: Slope distance
VA	: Vertical angle (H=0) / Vertical angle (H=0±90°)		: Slope in % at Missing line measurement
	: Slope in %	H	: Horizontal distance
HAR	: Horizontal angle right	V	: Height difference
HAL	: Horizontal angle left	Ht.	: REM value
HAh	: Horizontal angle hold	_tk	: Tracking measurement data
HARp	: Horizontal angle repetition	_A	: Average measurement data
dHA	: Horizontal angle from setting-out data	Stn	: Instrument station coordinates
		P	: Coordinate setting-out data
X	: Tilt angle in sighting direction	N	: N coordinate data
Y	: Tilt angle in horizontal axis direction	E	: E coordinate data
		Z	: Z coordinate data
⌂	: Tilt angle compensation on		

<Remaining battery power>

(BDC25A, Temperature=25°C, EDM on)

- 3 : 90 to 100%
- 2 : 50 to 90%
- 1 : 10 to 50%
- 0 : 0 to 10%

## 4. KEY FUNCTIONS

- The key functions are listed below. To use the functions marked with “ \* ”, allocate them to the softkeys by referring to “21. CHANGING LOCATION OF FUNCTIONS FOR KEYS”.

### General

**<ESC>**: Transfer to Angle & Distance measurement mode

While holding **<ESC>**, **<ILLUM>**

: Display and reticle illumination ON/OFF

While holding **<ESC>**, **<off>**: Switch the power off

**<THEO>** : Transfer to Theodolite mode

**<EDM>** : Transfer to EDM mode

**<S-O>** : Transfer to S-O mode

**<CONF>** : Transfer to Setting mode

**<→PX>** : Go to next page

**<--->\*** : No function

**<ILLUM>** : Display and reticle illumination ON/OFF

**<Enter>** : Memorize the selected data

**<Exit>** : Exit from each mode

**<CE>** : Return to previous display

**<EDIT>** : Edit the data

**<Input>** : Change the displayed data

**<Clear>** : Set the data to 0

**<off>** : Switch the power off

**<REC>\*** : Record Instrument station data and Measured data

**<↑>** : Move to previous option / Count up (\*1)

**<↓>** : Move to next option / Count down (\*1)

**<→>** : Move to right option / Go to the next column (\*1)

**<1>** : Select the number 1

**<2>** : Select the number 2

**<3>** : Select the number 3

**For Angle measurement**

- <OSET> : Set Horizontal angle to 0 / Index V circle
- <HOLD> : Hold H angle / Release H angle
- <Tilt> : Display the tilt angle
- <REP> : Transfer to Repetition mode
  - <BS> : Finish No.1 point sighting
  - <FS> : Finish No.2 point sighting
- <ZA/%> : Zenith angle / Slope in % (\*2)
- <VA/%> : Vertical angle / Slope in % (\*2)
- <R/L>\* : Select Horizontal angle right / left

**For Distance measurement**

- <\_dist> : Measure the distance
- <▲SHV> : Select Distance mode  
(S=Slope / H=Horizontal / V=Height)
- <PPM> : Go to ppm setting mode
- <M / TRK> : Repeat or single meas. / Tracking meas.
- <SIGNL> : Return signal check
- <f / m>\* : Change meters / feet for 5 seconds
- <RCL>\* : Review the measured data in the memory

**For Coordinate measurement**

- <Stn\_P> : Input Instrument station coordinates
- <Ht.> : Input Target & Instrument height
- <BSang>\* : Input Backsight station coordinates and set  
Azimuth angle
- <COORD> : Measure 3-Dimensional coordinates
- <MEM> : Input / Delete / Review Coordinate data

**For Advanced measurement**

- <RESEC> : Go to Resection measurement mode
  - <Known> : Input Known point coordinates
  - <StnHt> : Input Instrument height
  - <Obs> : Start the observation of Known station
- <OFFS> : Start offset measurement



- <MLM> : Start Missing line measurement
- <S / %> : Slope in % between 2 points
- <Move> : Change the starting position
- <REM> : Start Remote elevation measurement
- <S-O\_D> : Input Distance setting-out data
- <S-O\_P> : Input Coordinates of point to be set out
- <SO\_3D> : Start 3-dimension setting-out measurement
- <SO\_Xd>\* : Start Distance setting-out measurement
- <SO\_HA>\* : Start H angle setting-out measurement

► **NOTE** After performing these function, the display returns to the 1st page of the previous mode and the H angle and V angle are displayed.

- (\*1) : When <↑> , <↓> or <←→> is held down, scrolling of the selected function is performed.
- (\*2) : "ZA/%" is displayed when parameter "V angle format" is set to "Zenith 0".  
"VA/%" is displayed when parameter "V angle format" is set to "Horizontal 0" or "Horizontal ±90°".

## 5. MODE DIAGRAM

### Basic mode

EDM THEO S-O CONF

#### <EDM> EDM mode

Sdist ▲SHV THEO →P2

PPM M/TRK SIGNAL →P3

REM MLM OFFS →P1

- Distance measurement
- Atmospheric correction
- Tracking measurement
- Return signal checking
- REM measurement
- Offset measurement

#### <THEO> Theodolite mode

Sdist EDM ILLUM →P2

OSET HOLD Tilt →P3

REP ZA/% R/L →P1

- Horizontal angle 0 set
- Horizontal angle hold
- Tilt angle display
- Repetition measurement
- Slope in %
- Horizontal angle right/left

#### <S-O> Setting-out mode

SO\_3D S-O\_P S-O\_D →P2

Stn\_P Ht. COORD →P3

MEM RESEC ▲SHV →P1

- Coordinate measurement
- Setting-out measurement
- Resection measurement

#### <CONF> Setting mode

1.Configuration

2.Tilt correction

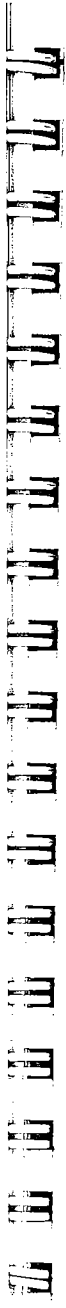
3.Key select

■1■ ■2■ ■3■ Exit

- Parameter setting
- Tilt sensor adjusting
- Key function allocating

• Press ESC key to go to Basic mode from every mode.

• This location of the functions for keys is the default setting.  
To use other functions, allocate them by referring to "21.  
**CHANGING LOCATION OF FUNCTIONS FOR KEYS**".



<b>6.</b>	<b>MOUNTING THE BATTERY .....</b>	<b>13</b>
<b>7.</b>	<b>SETTING UP THE INSTRUMENT .....</b>	<b>14</b>
	7.1 Centering .....	14
	7.2 Levelling .....	16
<b>8.</b>	<b>POWER ON AND PREPARATION FOR MEASUREMENT .....</b>	<b>20</b>
	8.1 Power on and off .....	20
	8.2 Indexing the vertical and horizontal circles .....	22
	8.3 Focusing and target sighting .....	23
	8.4 Display and reticle illumination .....	25
	8.5 Setting the Instrument options .....	26
	▶ <b>EXPLANATION</b> Automatic tilt angle compensation .....	27
	▶ <b>EXPLANATION</b> Horizontal angle back-up .....	27
	▶ <b>EXPLANATION</b> Resume function .....	28
	▶ <b>EXPLANATION</b> Parallax .....	28
	▶ <b>EXPLANATION</b> Power-saving cut-off .....	28
	▶ <b>EXPLANATION</b> Levelling using the tilt angle display .....	28

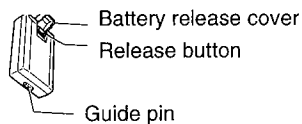


## 6. MOUNTING THE BATTERY

- Charge the battery fully before measurement.

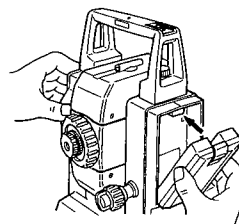
▶ **NOTE** Switch off the power before replacing the battery.

### ▶ **PROCEDURE** Mounting the battery



1. Close the battery release cover.

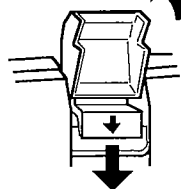
2. Match the battery guide with the hole in the instrument battery recess.



3. Press the top of the battery until a click is heard.

### Removing the battery

① Open the battery release cover



1. Open the battery release cover.

2. Press the release button downward.

3. Remove the battery.

② Press the release button downward

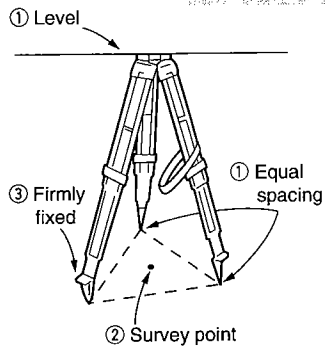
- If the power is to be switched on immediately after replacing the battery, please refer to "8.1 Power on and off".

## 7. SETTING UP THE INSTRUMENT

- Mount the battery in the instrument before performing this operation, because the instrument will tilt slightly if the battery is mounted after levelling.

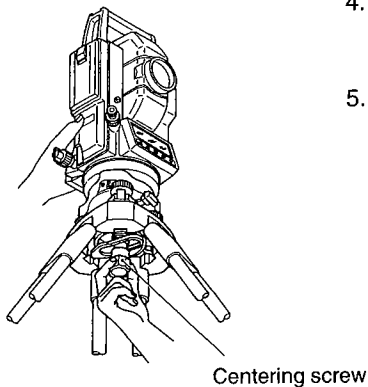
### 7.1 Centering

#### ► PROCEDURE Set up the tripod



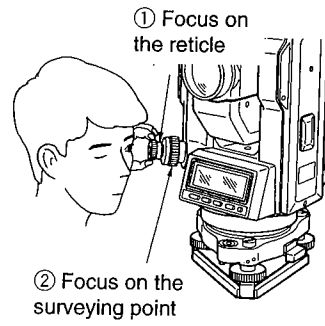
1. Make sure the legs are spaced at equal intervals and the head is approximately level.
2. Set the tripod so that the head is positioned over the surveying point.
3. Make sure the tripod shoes are firmly fixed in the ground.

#### Install the instrument



4. Place the instrument on the tripod head.
5. Supporting it with one hand, tighten the centering screw on the bottom of the unit to make sure it is secured to the tripod.

**Focus on the surveying point**



6. Looking through the optical plummet eyepiece ①, turn the optical plummet eyepiece to focus on the reticle.
7. Turn the optical plummet focusing ring ② to focus on the surveying point.

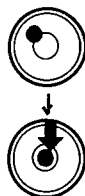
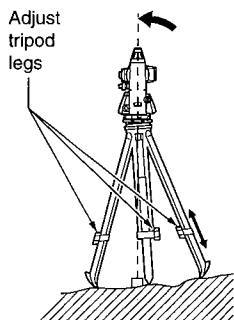
## 7.2 Levelling

### ► PROCEDURE Center the surveying point in the reticle



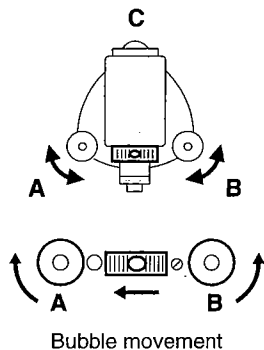
1. Adjust the levelling foot screws ⑨ to center the surveying point in the optical plummet reticle.

### Center the bubble in the circular level



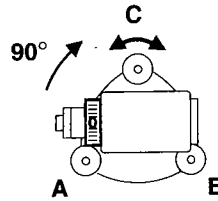
2. Observe the off-center direction of the bubble in the circular level ⑧, and shorten the nearest tripod leg, or extend the leg farthest from the direction to center the bubble.
3. One more tripod leg must be adjusted to center the bubble.

### Center the bubble in the plate level

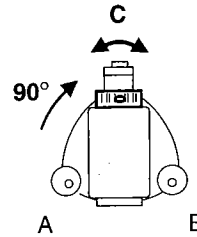


4. Loosen the horizontal clamp ⑬ to turn the upper part of the instrument until the plate level ⑭ is parallel to a line between levelling foot screws A and B.
5. Center the air bubble, using levelling foot screws A and B.
  - The bubble moves towards a clockwise rotated levelling foot screw.



**Turn 90° and center the bubble**

6. Turn the upper part of the instrument through 90°. The plate level is now perpendicular to a line between levelling foot screws A and B.
7. Center the air bubble, using levelling foot screw C.

**Turn another 90° and check bubble position**

8. Turn the upper part of the instrument a further 90° and check to see if the bubble is in the center of the plate level.

If the bubble is off-center, perform the following:

- ① Adjust levelling foot screws A and B in equal and opposite directions to remove half of the bubble displacement.
- ② Turn the upper part a further 90°, and use levelling foot screw C to remove half of the displacement in this direction.

Or try the adjustment described in "19.1 Plate level".

**Check to see if bubble is in same position in any direction**

9. Turn the instrument and check to see if the air bubble is in the same position for any position of the upper part. If it is not, repeat the levelling procedure.

**Center the SET over the Surveying point SET5F/5W**

10. Loosen the centering screw slightly.
11. Looking through the optical plummet eyepiece, slide the instrument over the tripod head until the surveying point is exactly centered in the reticle.
12. Retighten the centering screw securely.
13. Check again to make sure the bubble in the plate level is centered. If not, repeat the procedures starting from step 4.

**Center the SET over the Surveying point  
SET5FS/5WS**

10. Turn the tribrach shifting clamp counterclockwise.  
Shifting tribrach can be adjusted up to  $\pm 8\text{mm}$ .
11. Looking through the optical plummet eyepiece, adjust the instrument position on the tribrach to center the surveying point.
12. Tighten the shifting clamp to fix the instrument in the center position.

## 8. POWER ON AND PREPARATION FOR MEASUREMENT

- The following preparations are required for measurement.

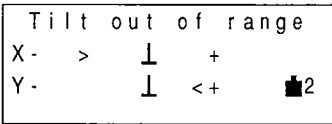
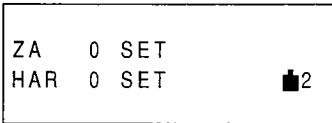
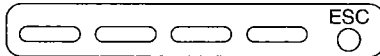
- 8.1 Power on and off
- 8.2 Indexing the vertical and horizontal circles
- 8.3 Focusing and target sighting
- 8.4 Display and reticle illumination
- 8.5 Setting the instrument options

### 8.1 Power on and off

#### ► PROCEDURE Power on and off

Press any one of the 5 keys

When the power is switched on, a self-check is run to make sure the instrument is operating normally. After that, the display indicates that the instrument is ready for vertical and horizontal circle indexing.



X: Tilt angle in the sighting direction  
 Y: Tilt angle in the horizontal axis direction

- If this error message is displayed, the instrument tilt sensor is indicating that the instrument is off-level. Relevel the instrument once again until is displayed. To switch the power off, while holding <ESC>, press <off>.

\* "Tilt angle compensation" ► EXPLANATION Automatic tilt angle compensation, on P.27

- **NOTE** Instrument parameter "Tilt correction" (refer to chapter 20)  
Parameter "Tilt correction" can be used to switch off and on the automatic tilt angle compensation; for example, it should be switched off if the display is unsteady due to vibration or strong wind.

RAM Cleared

ZA V 1  
HAR 0 SET

ZA 0 SET  
HAR 0° 00' 00"

Battery is low !

- When all data has been cleared from the memory, the display appears as at left. After that the instrument is ready for vertical and horizontal circle indexing.
- When "V1" is displayed for the vertical angle, please refer to "Appendix1: Manually indexing the vertical circle".
- When the parameter "H indexing" is set to "Manual", "0" is displayed for the horizontal angle.
- If the battery is at the "low" level, the message "Battery is low !" will be displayed. Switch the power off and charge the battery.

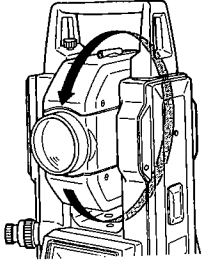
- **NOTE** Instrument parameter "V indexing" (refer to chapter 20)  
Parameter "V indexing" can change the vertical indexing method. Options are indexed by transiting the telescope or indexing by face left, face right sightings.

- **NOTE** Instrument parameter "H indexing" (refer to chapter 20)  
Parameter "H indexing" can be used to change the horizontal circle indexing method. Options are indexed by rotating the upper part or indexing and zero setting at power-on.

• "Horizontal angle back-up" ► **EXPLANATION** Horizontal angle back-up, on P.27

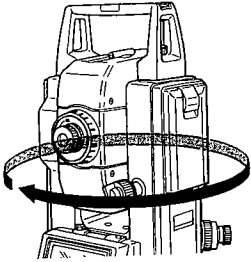
## 8.2 Indexing the vertical and horizontal circles

### ► PROCEDURE Vertical circle indexing



1. Loosen the vertical clamp 24 and transit the telescope completely.  
(Indexing occurs when the objective lens crosses the horizontal plane in face left.)  
An audio tone sounds, and the vertical angle (ZA) is displayed.

### Horizontal circle indexing



2. Loosen the horizontal clamp 18 and rotate the upper part of the instrument completely.  
An audio tone sounds, and the horizontal angle (HAR) is displayed.
- Vertical indexing and horizontal indexing have been completed.

► **NOTE** Each time the instrument is switched on, the vertical and horizontal indexes must be redetermined.  
If the parameter "Resume function" is set to "on", the screen previous to power off is displayed. To change the parameter to "off", refer to chapter 20.

• "Resume function" ► **EXPLANATION** Resume function, on P.28.

