

ELECTRONIC TOTAL STATION

SET4A

OPERATOR'S MANUAL

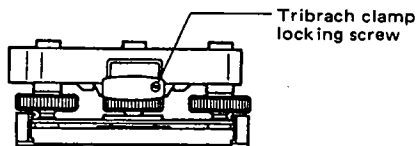


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IMPORTANT

When the new SET4A is shipped, the tribrach clamp is fixed with a screw. Loosen it and leave it loose.

1. PARTS OF THE INSTRUMENT

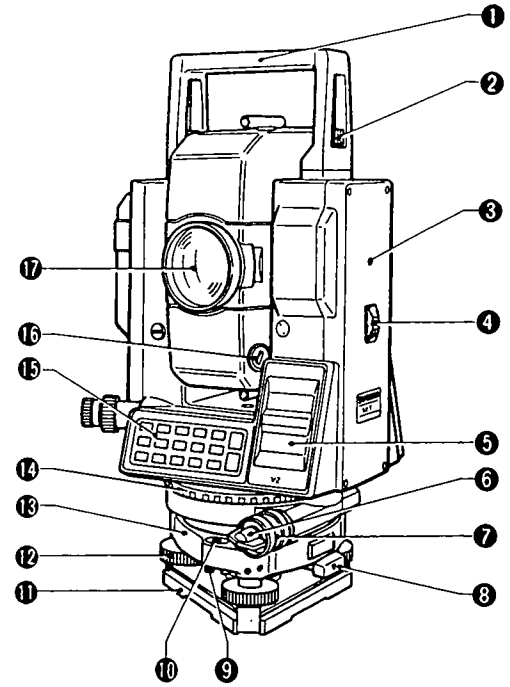


Fig. 1.1

- | | |
|----------------------------------|---------------------------------------|
| 1 Handle | 10 Circular level |
| 2 Handle securing screw | 11 Base plate |
| 3 Instrument height mark | 12 Leveling foot screw |
| 4 Internal switch cover | 13 Tribrach |
| 5 Display | 14 Horizontal circle positioning ring |
| 6 Lower clamp | 15 Keyboard |
| 7 Lower clamp cover | 16 Prism constant switch cover |
| 8 Tribrach clamp | 17 Objective lens |
| 9 Circular level adjusting screw | |

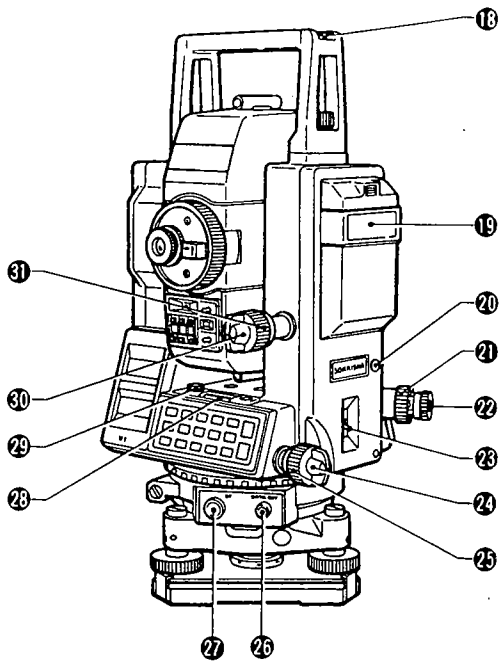


Fig. 1.2

- | | |
|----------------------------------|------------------------------------|
| 18 Tubular compass slot | 25 Horizontal fine motion screw |
| 19 Battery | 26 Data output connector |
| 20 Sensor index adjustment cover | 27 External power source connector |
| 21 Optical plummet focusing ring | 28 Plate level |
| 22 Optical plummet eyepiece | 29 Plate level adjusting screw |
| 23 Power switch | 30 Vertical clamp |
| 24 Horizontal clamp | 31 Vertical fine motion screw |

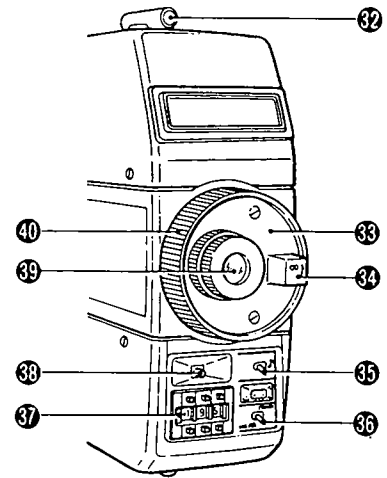


Fig. 1.3

- | | |
|---------------------------------------|----------------------------|
| 32 Peep sight | 36 Measure/track switch |
| 33 Telescope reticle adjustment cover | 37 ppm switch |
| 34 Telescope plunging knob | 38 Return signal lamp |
| 35 Return signal audio switch | 39 Telescope eyepiece |
| | 40 Telescope focusing ring |

2. FEATURES

- Horizontal angle, zenith angle, slope distance, horizontal distance, height difference are displayed by key operation.
- Horizontal distance between two prism points and remote measurement of objects above and below a prism point are automatically calculated.
- Self-diagnostic function. If, for any reason, the SET4A is not functioning correctly during use, an error code is displayed.
- The tilt angle of the vertical axis can be measured by the internal sensor and displayed. By referring to the display, the SET4A can be leveled. The zenith angle is automatically compensated by the tilt sensor and the compensated angle displayed.
- Horizontal circle can be set to zero in any direction.
- The SET4A automatically switches off 30 minutes after the last operation to save battery power.
- A RS-232C data-out connector is standard.
- Measured data can be collected and stored by using a data collector.

3. SPECIFICATIONS

Distance measurement

Range: (When using Lietz/Sokkisha standard reflecting prisms)

Average conditions: (Slight haze, visibility about 12.5 miles, sunny periods, weak scintillation)

1-prism 3,300 ft (1,000 m)

3-prism 5,300 ft (1,600 m)

Good conditions: (No haze, visibility about 25 miles overcast, no scintillation)

1-prism 4,300 ft (1,300 m)

3-prism 6,900 ft (2,100 m)

Standard deviation: $\pm (5 \text{ mm} + 3 \text{ ppm} \cdot D)$

Display: LCD 8-digit four display windows two on each face

Maximum slope distance

6,561.67 ft (1,999.999 m)

Minimum display: MEAS. 0.01 ft (1 mm)

TRACK. 0.1 ft (10 mm)

Measuring time:

	Mode	
	MEAS.	TRACK.
Slope distance	6 s + every 4 s	6 s + every 0.4 s
Horizontal distance		
Height difference		
Coordinates	6 s + every 1 s	
Remote elevation	1 s + every 0.5 s	
Horizontal distance between two points	8 s + every 4 s	8 s + every 1 s

Atmospheric correction: -99 ppm to +199 ppm
(1 ppm per step)

Prism constant correction: 0 to -9 cm (1 cm per step)

Earth-curvature and refraction correction: Selectable ON/OFF

Audio target acquisition: Selectable ON/OFF

Signal source: Infrared LED
Light intensity control: Automatic

Angle measurement

Telescope

Length: 6.7 inch (170 mm)
Aperture: 1.8 inch (45 mm)
Magnification: 30x
Resolving power: 3"
Image: Erect
Field of view: 1°30' (26 ft/1,000 ft)
Minimum focus: 4.3 ft (1.3 m)

Horizontal circle

Type: Incremental
Minimum display: 5"

Vertical circle

Type: Incremental with 0 index
Minimum display: 5"

Accuracy

Standard deviation of mean of measurement taken in positions V1 and V2 (DIN18723)

H: 5"
V: 5"

Automatic compensator

Selectable ON/OFF

Type: Liquid
Minimum display: 5"
Range of compensation: $\pm 3'$

Display

Range: $-1,999^{\circ}59'55''$ to $1,999^{\circ}59'55''$

Measuring mode

Horizontal angle: Right/Left/Repetition of angles
Vertical angle: Zenith 0° or Horizontal 0° or Horizontal 0° $\pm 90^{\circ}$
Measuring time: Less than 0.5 s

Sensitivity of levels
Plate level: 30"/2 mm
Circular level: 10"/2 mm

Optical plummet
Image: Erect
Magnification: 3x
Minimum focus: 0.3 ft (0.1 m)

Data output: Asynchronous serial, RS-232C compatible

Self-diagnostic function: Provided

Power saving cut off: 30 minutes after operation

Operating temperature: -4°F to +122°F (-20°C to +50°C)

Power source: Ni-Cd battery, No. 6651-01 (6V)
Working duration: About 600 measurements at 77°F, distance and angle measurement; 13 hours at 77°F, angle measurement only.
(About 4,000 measurements, distance and angle measurement; 90 hours at 77°F, angle measurement only, with optional battery No. 6661-02.)

Charging time: 12 hours, standard charger No. 6855-01
(1 hour, optional charger No. 6855-02, No. 6855-03)

Instrument height: 9.29 inch (236 mm)

Size (without handle): 6.6 (W) x 6.7 (D) x 13.0 (H) inch
(168 x 170 x 330 mm)

Weight: 16.7 lbs (7.6 kg) (w/internal battery)

4. STANDARD EQUIPMENT

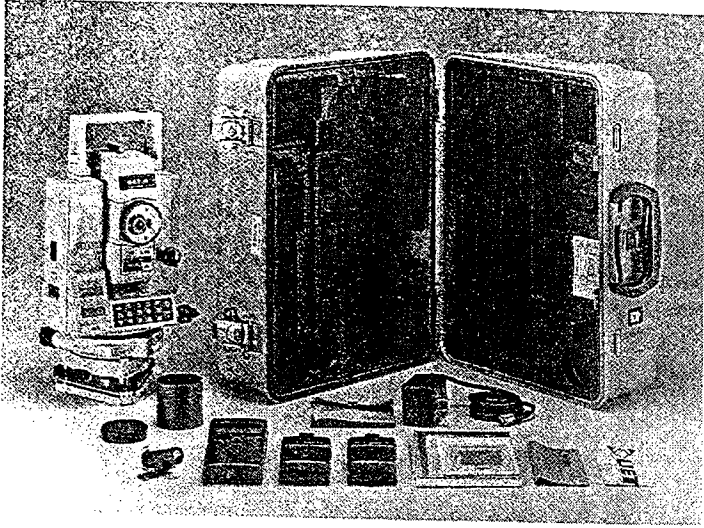


Fig. 4.1

SET4A main unit	1	Vinyl cover	1
Internal battery, No. 6851-01	2	Tool pouch	1
Battery charger, No. 6855-01	1	Screwdriver	1
Battery charging adaptor, No. 6660-00	1	Lens brush	1
Tubular compass, CP7 (accuracy: $\pm 1^\circ$)	1	Adjusting pin	2
Lens cap	1	Cleaning cloth	1
Lens hood	1	Atmospheric correction chart	1
		Operator's manual	1
		Field guide	1
		Carrying case, SC46	1

5. LIETZ SYSTEM S3 STREAMLINED SURVEYING SOLUTIONS

The complete, proven system for field measurement, data collection, data processing, printing and plotting.

Start an all-day job and finish before noon?

When you work with the Lietz System S3, you'll find yourself doing just that. This proven field-to-office connection doubles your productivity and at the same time, actually improves your accuracy.

Using S3 components, you can be twice as competitive on every job. Twice as profitable.

One sighting with a SET Total Station gives you simultaneous distance and angle measurements. This data is then fed electronically into the SDR Electronic Field Book. Electronically capturing the data eliminates keying-in errors and the need for handwritten notes. From here, data can be electronically transmitted into SDR MAP or SDR LINK surveying software on your IBM-XT/AT or 100% compatible computer.

System S3 Software includes the following programs:

SDRLINK

Is an automated data communications program allowing for data to be transferred from the SDR Electronic Field Book to your computer. SDRLINK also has the ability to reduce field angles and distances to a coordinate database. ASCII files can be generated from the information that has been stored in the coordinate database.

SDRMAP

Is an automated plotting program which includes the SDRLINK program. SDRMAP uses the codes that were entered into the SDR Electronic Field Book to automatically generate a detailed plot of information. SDRMAP includes user-definable symbols, line types and code libraries. Plot files can be displayed on the computer screen, plotted on supported plotters, or may be sent to a CAD program using the DXF file creation.

SDRCONTOUR

Is an automated contour calculations module which generates contours from the information transferred from the SDR Electronic Field Book. Definition of break lines, boundaries and omitted areas may be selected from the SDR file or graphically at the computer using a mouse. All plotting is performed by SDRMAP.

SDRCALC*

Is the COGO module that allows for defining coordinate information using coordinate geometry routines. Routines include: Traverse entry and adjustment, bearing/bearing intersection, bearing/distance intersection, curve calculations, establishment of parallel and perpendicular lines, subdivide a line, and area calculations. All plotting is performed by SDRMAP.

SDRROAD*

Is a module of SDRMAP that performs the vertical geometry computations for road design. SDRROAD supports a range of methods for specifying the profile of vertical geometry, including the application of super elevation. Up to seven profile lines can be handled simultaneously.

SDRPROFILE*

Plots profiles and cross sections of natural and design surface data such as road cuts and fills, stockpiles, etc. Allows cross section data to be entered in the format of distance along the route (stationing), offset to the center line of the route, and height—either as reduced data or in level book format.

SDRVOLUME*

Is a module of SDRMAP that has the ability to calculate volumes in three different ways. 1. compute end areas between two surfaces at each cross section and multiply these by the distance between the sections. 2. compute volume between one or two planes and a surface from the areas of the triangles in the digital terrain model, multiplied by their average height above the planes. 3. Compute and plot the lines of no cut/fill after merging two triangulated digital terrain models.

SDRDIGITIZE*

Is a module of SDRMAP that allows for a quick and easy means of converting data in the form of plans and maps into data which can be computer processed for subdivision layout, contouring, area computation or road design.

* Contact your local Lietz Authorized dealer for availability and cost.

You and your Lietz System S3 can do it all with a minimum amount of training.

The Lietz nationwide organization of more than 50 Systems Centers backs System S3 to give you all the training, service and software support you need. The Lietz Warranty insures your satisfaction. Leasing plans are also available from your local Authorized Distributor.

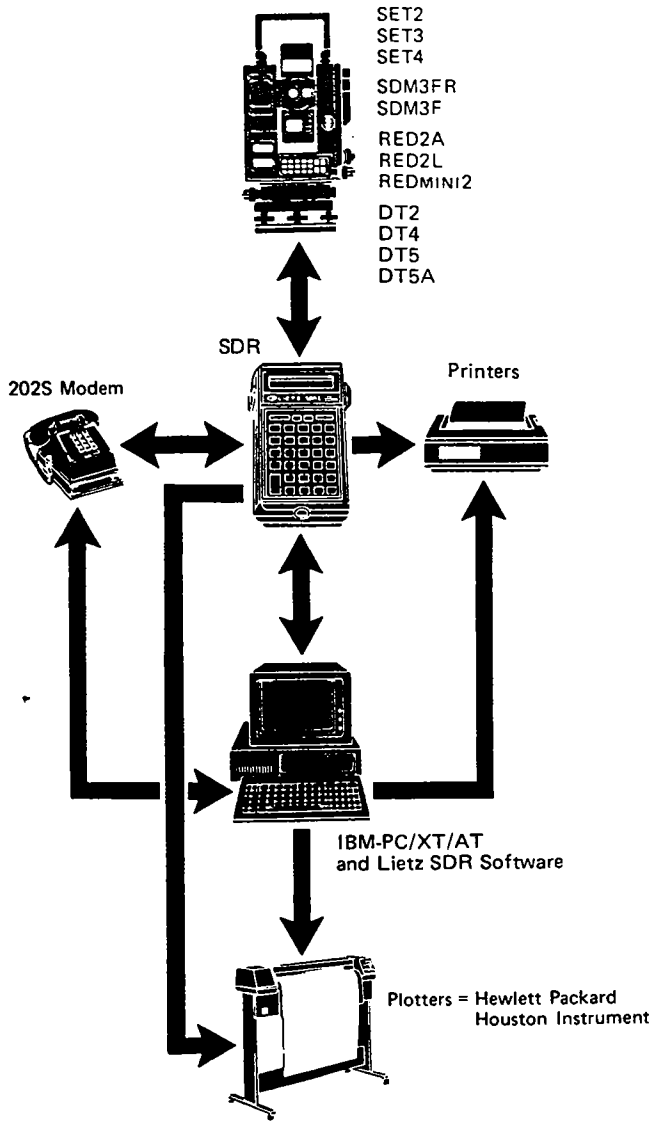


Fig. 5.1

SDR Surveying Software is designed to operate on your IBM PC/XT, IBM PC/AT, IBM System/2 or 100% IBM compatible computer. Listed below are the hardware requirements.

Configuration #1

IBM-Model 50
IBM-VGA Monitor
IBM-Pro Printer
HP or HI Pen Plotter
Serial Mouse

Configuration #2

IBM-AT (Enhanced)
IBM Enhanced Color Board
IBM Enhanced Color Screen
IBM Serial Port
IBM Pro Printer
HP or HI Pen Plotter
Serial Mouse

Configuration #3

IBM-XT with Hard Disk
IBM Enhanced Color Board
IBM Enhanced Color Screen
IBM Serial Port
IBM Parallel Port
IBM Pro Printer
HP or HI Pen Plotter
Serial Mouse

Note: When ordering, it is necessary to state which disk format you require. (3½" 720k or 5¼" 360k)

Lietz No. 5130-00 SDRMAP programs furnished on 5 ¼" diskettes.
Lietz No. 5130-01 SDRMAP programs furnished on 3 ½" diskettes.
Lietz No. 5140-00 SDRLINK programs furnished on 5 ¼" diskettes.
Lietz No. 5140-01 SDRLINK programs furnished on 3 ½" diskettes.
Lietz No. 5150-00 SDRCONTOUR programs furnished on 5 ¼" diskettes.
Lietz No. 5150-01 SDRCONTOUR programs furnished on 3 ½" diskettes.
Lietz No. 5155-00 SDRCALC programs furnished on 5 ¼" diskettes.
Lietz No. 5155-01 SDRCALC programs furnished on 3 ½" diskettes.
Lietz No. 5165-00 SDRVOLUMES programs furnished on 5 ¼" diskettes.
Lietz No. 5165-01 SDRVOLUMES programs furnished on 3 ½" diskettes.
Lietz No. 5170-00 SDRDIGITIZE programs furnished on 5 ¼" diskettes.
Lietz No. 5170-01 SDRDIGITIZE programs furnished on 3 ½" diskettes.
Lietz No. 5175-00 SDRROAD programs furnished on 5 ¼" diskettes.
Lietz No. 5175-01 SDRROAD programs furnished on 3 ½" diskettes.
Lietz No. 5180-00 SDRPROFILE programs furnished on 5 ¼" diskettes.
Lietz No. 5180-01 SDRPROFILE programs furnished on 3 ½" diskettes.

Note: Lietz guarantees your satisfaction with SDR Surveying Software. If, for any reason, you return the software within 30 days of receipt, you will be given a full refund.

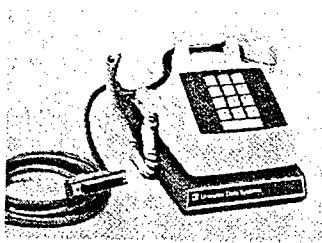


Fig. 5.2

202S MODEM

Universal Data system 202S LP Modem for use with SDR Electronic Field Book.

Note: SDR Electronic Field Books must be used with 202S modem to allow acoustic transmissions.

Lietz No. 5300-17

SDR ELECTRONIC FIELD BOOKS

The SDR collects and stores slope distance, zenith and horizontal angle data from the SET.

Calculations can be performed on the data so that the measurements can be verified in the field.

The stored data can be transmitted to a data processing system.

Lietz No. 5300-20 SDR20 Electronic Field Book with 32K memory complete with Sokkisha cable (5303-04), female DB-25 adaptor (5300-09), operation manual (5300-08) and field case (5290-15).

Lietz No. 5300-22 SDR22 Electronic Field Book with 64K memory complete with Sokkisha cable (5303-04), female DB-25 adaptor (5300-09), operation manual (5300-08) and field case (5290-15).

Lietz No. 5300-24 SDR24 Electronic Field Book with 128K memory. Data collection routines to support Wild, Topcon, Pentax and Elta 46R instruments. (Includes same accessories as SDR22.)

MOUNTING BRACKET

Fits on Lietz No. 7512-52 Tripods and holds SDR Electronic Field Books (or any hand-held calculator) in such a way that it rotates with the instrument for convenient and easy operation. Available in right hand or left hand configurations.

Lietz No. 5300-10 (Right hand)

Lietz No. 5300-11 (Left hand)

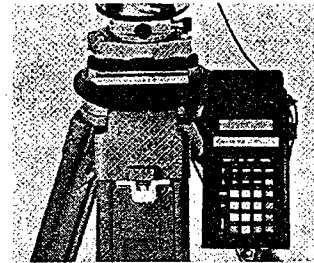


Fig. 5.3

6. POWER SUPPLIES

The SET4A can be operated with the following combinations:

- Standard set.
Optional accessories are not marked with an asterisk.

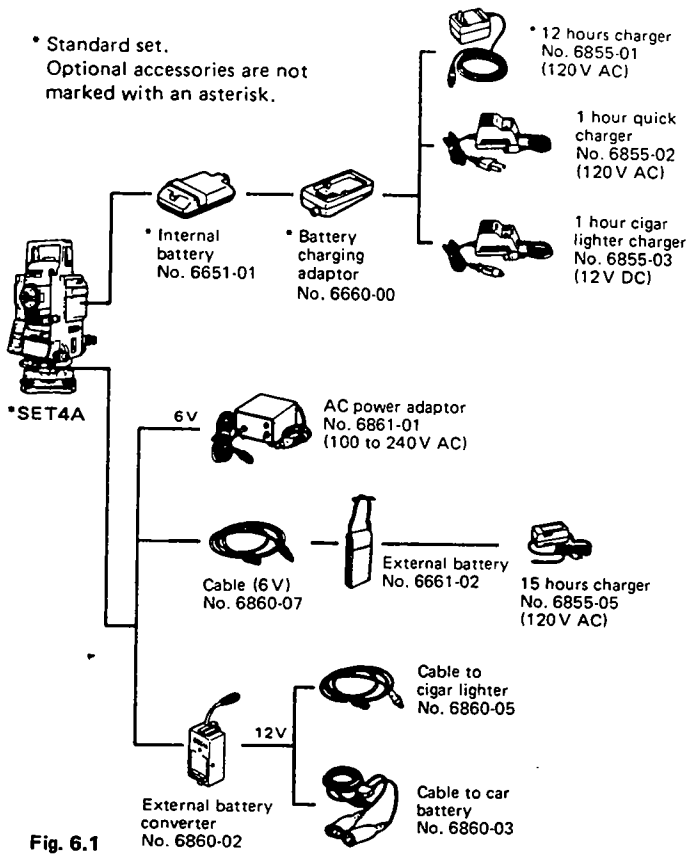


Fig. 6.1

Use the SET4A only with the combinations shown here.

Note: When using the SET4A with external power supplies, it is recommended that for the most accurate angle measurements, the No. 6651-01 battery be left in place to balance the weight on the axes.

Battery charging precautions

To charge the battery, use only the recommended charger.

- 1) Charge the battery at least once a month if it is not used for a long time.
- 2) Charge the battery at a temperature between 50°F to 104°F (10°C to 40°C).
- 3) Before using No. 6861-01, set the voltage selector to the proper voltage.
- 4) No. 6860-02 has a breaker switch. Normally the red mark appears on the breaker. If not, set the red mark in place.
- 5) When using a car battery, make sure that the polarity is correct.
- 6) Make sure that the cigar lighter has 12V output and that the negative terminal is grounded.
- 7) When charging the battery, first connect it to the battery charger and then connect the charger to the power supply. Check that the battery charger light is on. If not switch power supply off and on again until the light comes on.
- 8) The battery charger may become warm while charging. This is normal.
- 9) Do not charge the battery for any longer than specified.
- 10) Store the battery in a place where the temperature is between 32°F to 104°F (0°C to 40°C).
- 11) Battery operating life is shortened at extreme temperatures.

7. DISPLAY SYMBOLS

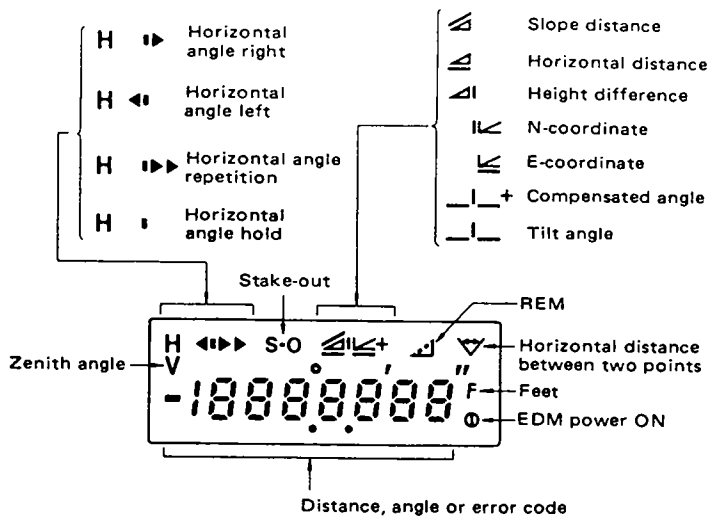


Fig. 7.1

8. KEY FUNCTIONS

SET4A has three measurement modes.
When it is switched on and the vertical circle is indexed by rotating the telescope, it is automatically in the theodolite mode.

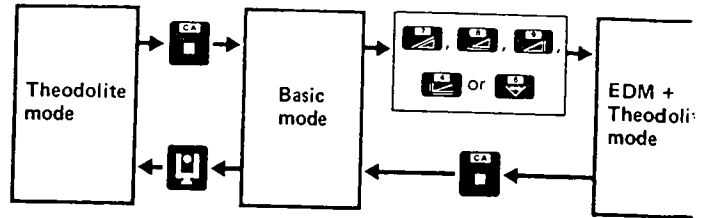


Fig. 8.1

Theodolite mode

Angle measurement.

SET4A accepts , , , , or keys.

Basic mode

Prism sighting and recall.

SET4A accepts all keys except , , or key.

EDM + Theodolite mode

Angle and distance measurement.

SET4A accepts or keys only.

- When entering setting-out values, keys ~ , , , , and can be used.

