

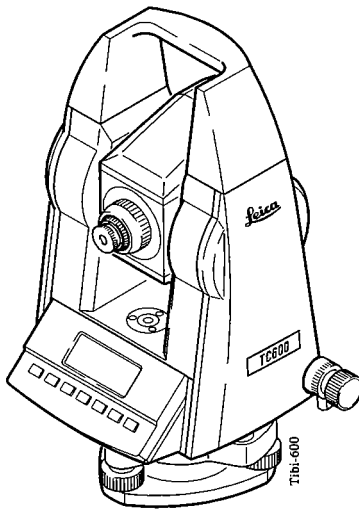
TC600/TC800

Electronic total station

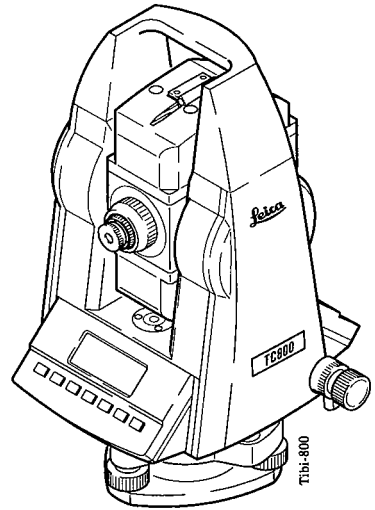
Version 2.0

English

TC600



TC800



Leica

**Congratulations on your purchase of a
TC600/TC800 total station !**



This manual contains important safety directions (*refer to section 'Safety directions'*) as well as instructions for setting up the instrument and operating it. Read carefully through the User's Manual before you switch on the instrument.

TC600/TC800

Electronic total station

Product identification

Enter model and serial number of your instrument in your User's Manual, and always refer to this information when you need to contact your agency or service workshop.

Serial no.: _____

Symbols used in this Manual

The symbols used in this User's Manual have the following meanings:



DANGER:

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING:

Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.



CAUTION:

Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor injury and/or in appreciable material, financial and environmental damage.



INFORMATION:

Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

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Introduction

The TC600/TC800 is particularly suitable for cadastral and engineering surveying. Its angle-measuring accuracy, and the range and accuracy of its EDM module, are matched to one another. The measured data can be stored in the internal memory or can be transferred across the serial interface to an external recorder.

Area of applicability of this User's Manual

This manual applies to the following types of total stations:

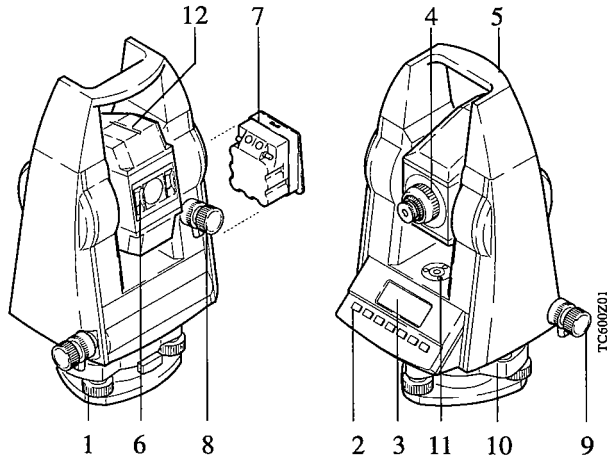
- TC600
- TC800

Differences between the two versions are clearly set out and assigned.

General text applies to both versions.

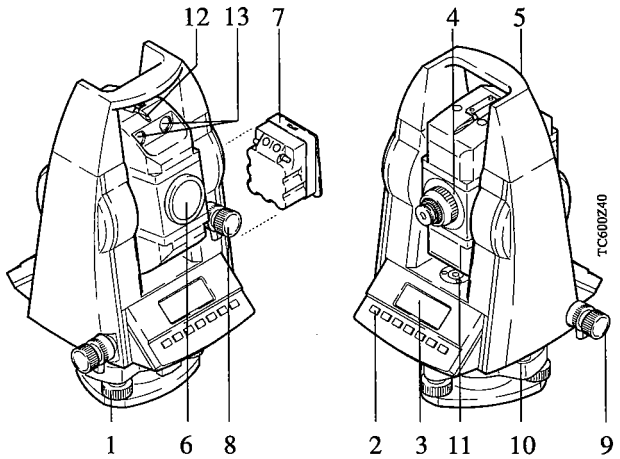
Important parts

TC600



- | | |
|-------------------|--------------------------|
| 1 Foot screw | 7 Battery |
| 2 Keypad | 8 Vertical drive screw |
| 3 Display | 9 Horizontal drive screw |
| 4 Focussing | 10 Interface RS-232 |
| 5 Carrying handle | 11 Circular level |
| 6 Exit EDM | 12 Optical sight |

TC800



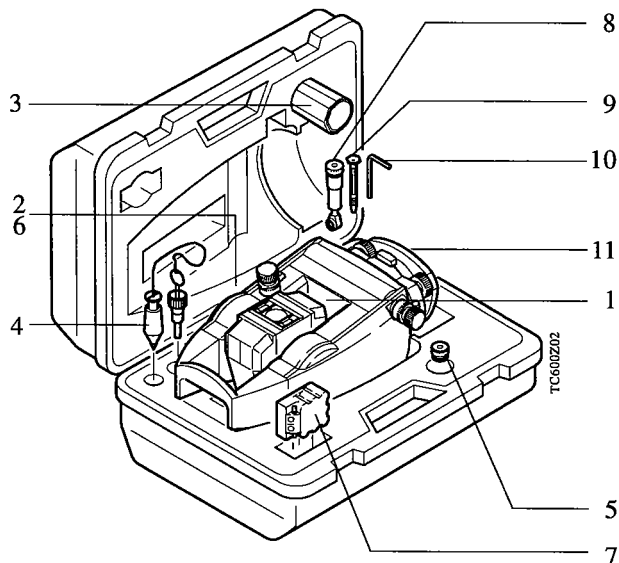
- | | |
|-------------------|--------------------------|
| 1 Foot screw | 8 Vertical drive screw |
| 2 Keypad | 9 Horizontal drive screw |
| 3 Display | 10 Interface RS-232 |
| 4 Focussing | 11 Circular level |
| 5 Carrying handle | 12 Optical sight |
| 6 Exit EDM | 13 Exit EGL1 (optional) |
| 7 Battery | |

Set-up, first steps

Unpacking

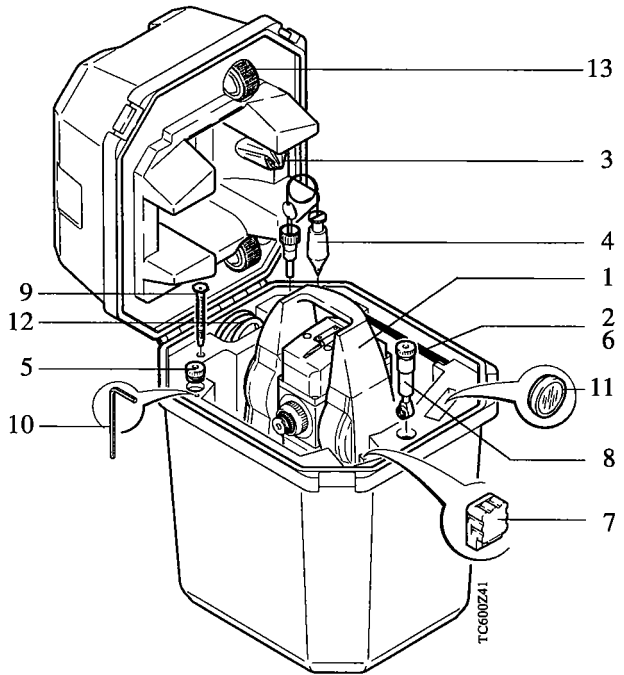
Remove TC600/TC800 from transport case and check for completeness.:

TC600



- | | |
|-------------------------|--|
| 1 Instrument | 7 Spare battery (optional) |
| 2 User's Manual | 8 Eyepiece for steep angles (optional) |
| 3 Protective cover | 9 Screwdriver, set pin |
| 4 Plummet(optional) | 10 Allen key |
| 5 Eyepiece (optional) | 11 Tribrach (optional) |
| 6 Diskette with TCTOOLS | |

TC800



- | | |
|-------------------------|--|
| 1 Instrument | 7 Spare battery (optional) |
| 2 User's Manual | 8 Eyepiece for steep angles (optional) |
| 3 Protective cover | 9 Screwdriver, set pin |
| 4 Plummet(optional) | 10 Allen key |
| 5 Eyepiece (optional) | 11 Lens(optional) |
| 6 Diskette with TCTOOLS | 12 cable (optional) |
| | 13 shoulder straps |

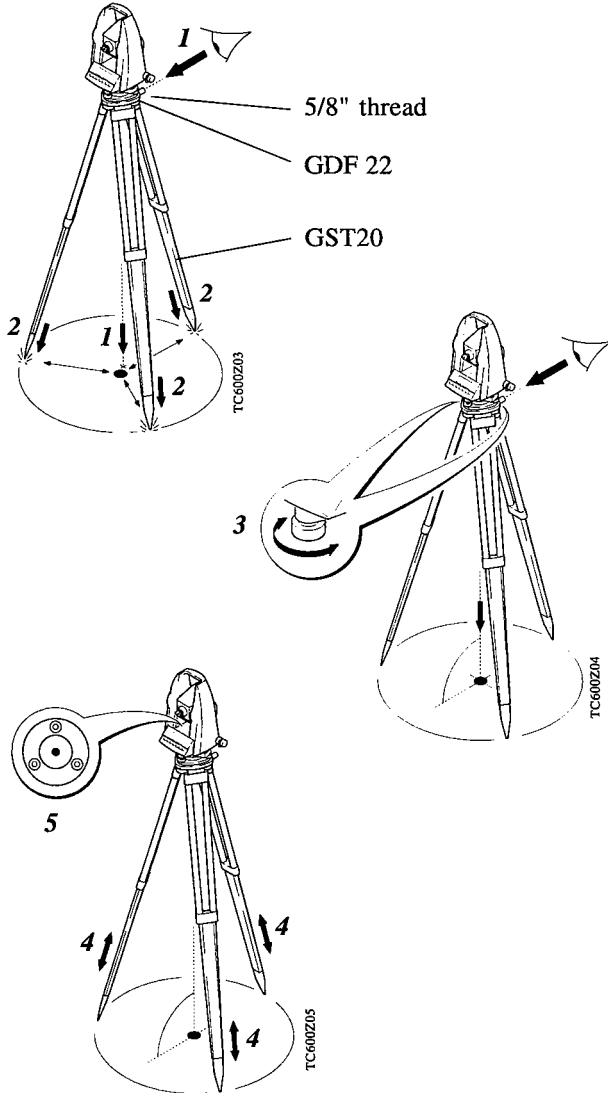
Charging battery

Charge batteries using GKL12, GKL14, GKL22 or GKL23 chargers. More information for charging batteries refer to section 'Battery charging'.

Set-up

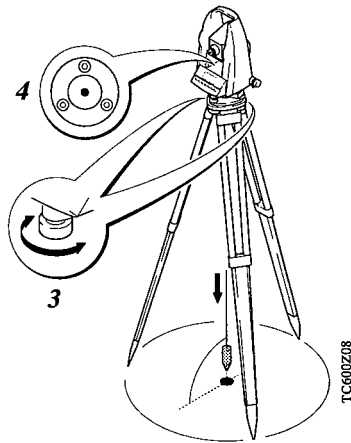
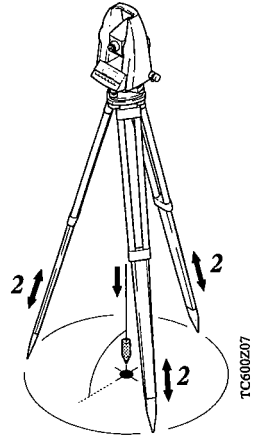
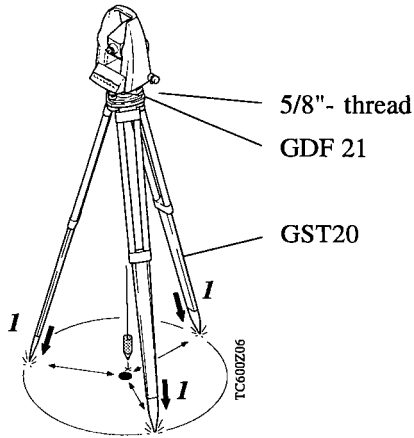
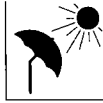
Tripod with optical plummet

Set-up TC600 with tribrach GDF 22 and tripod GST20

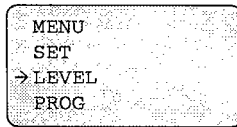
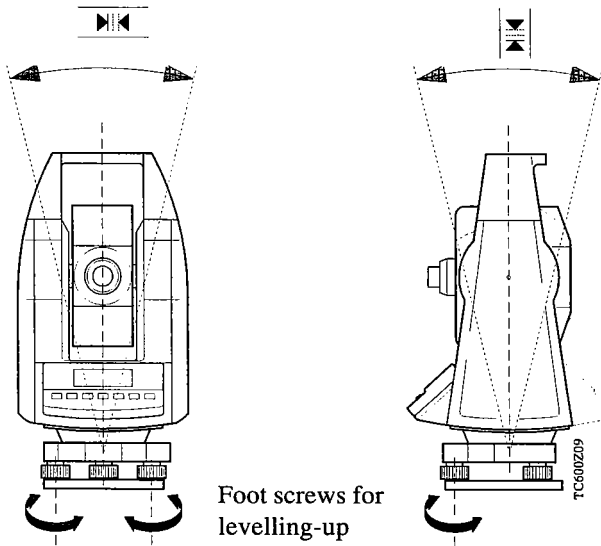


**Tripod without optical
plummet**

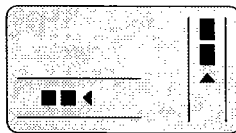
Set-up TC600 with
tribrach GDF 21 and
tripod GST20



Adjust electronic level



Insufficient levelling-up



Correct levelling-up



The TC600/TC800 unit is correctly levelled-up when the triangles are visible or there are markers **between** the triangles.

Operating the instrument

Settings, first steps

The following settings are possible:

Units for distance measurement (DIST):

- m = meters
- ft = feet (in decimals)
- ft/in = feet, inch and $\frac{1}{8}$ inch

Units for angle measurement (ANGLE):

- gon = 400gon
- 360d = 359°.999 (in decimals)
- 360s = 359° 59' 59" (sexagesimal)

Display number of decimal places (DSP ACC):

- high = 81°45' 24" (1"/0.5 mgon Interval) or 4 dec.
- med = 81°45' 25" (5"/1 mgon Interval) or 3 dec.
- low = 81°45' 20" (10"/1 mgon Interval) or 3 dec.

For more informations refer to *section 'Selecting units (UNITS)'*.

Units in this manual

Specifications within this manual always applies to the following units:

Units of length:

- in m (meter)
- in addition, within brackets in ft (feet)

Units of angle:

- in ° ' "
- in addition, within brackets in gon


Units of temperature:

- in °C
- in addition, within brackets in °F

Display and keypad

The TC600/TC800 unit has a dual-level interface. Keys are color-coded for each level.

white keys: active during measurements.

orange keys: key  activates orange keys for input of measuring and instrument parameters.

Display and keypad

Cursor for indicating sub-program



Display, max. 4x16 char.

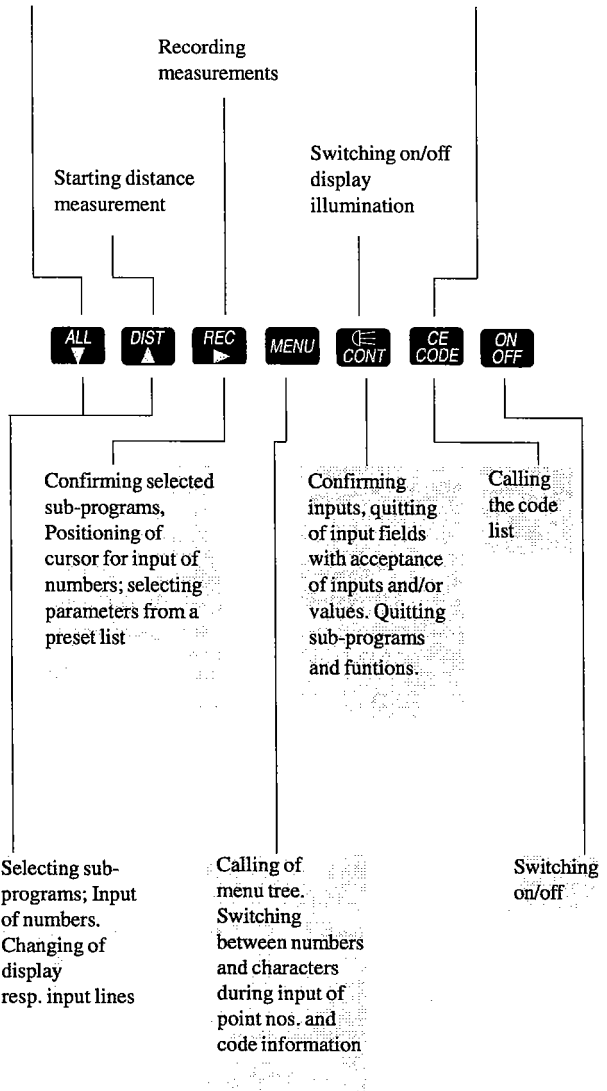


Keys

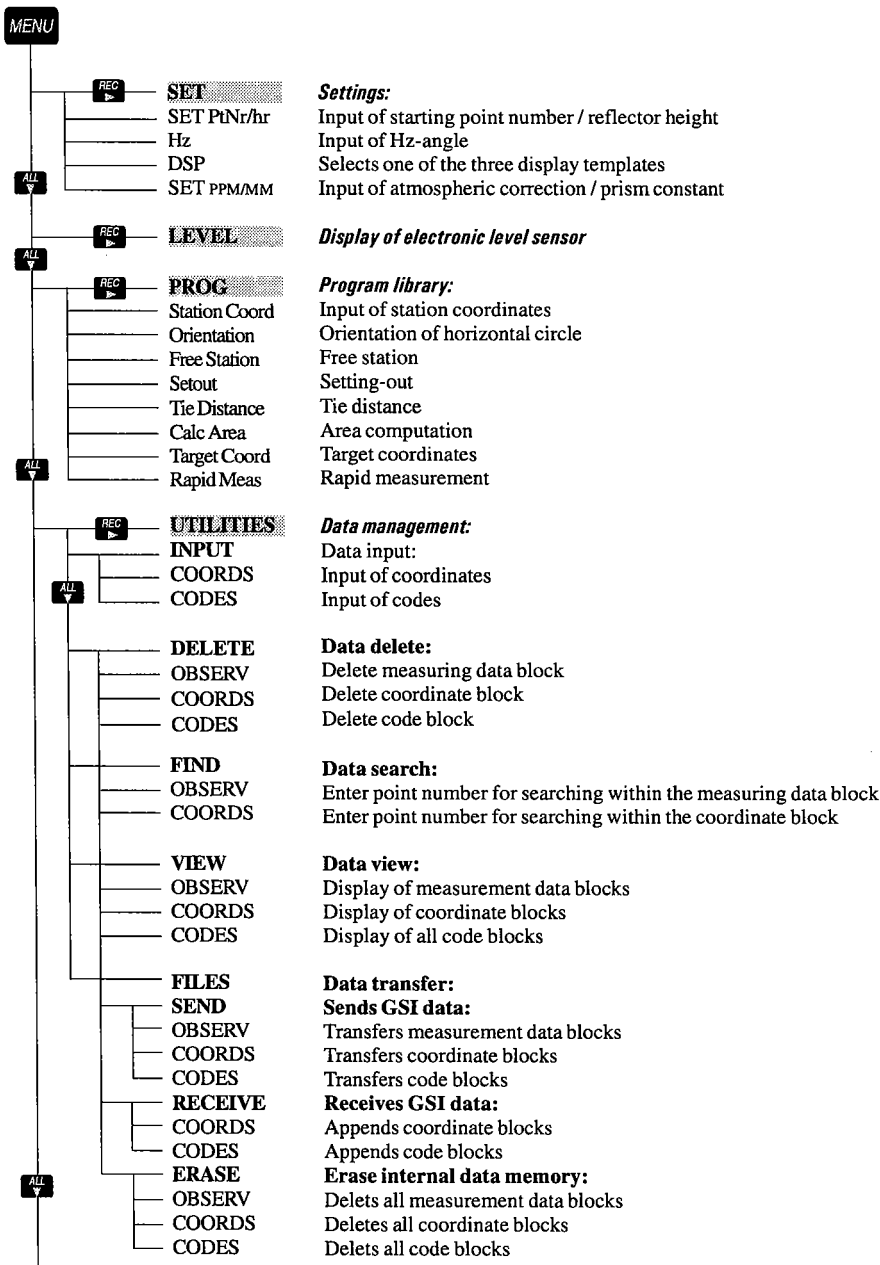
Key functions

Starting simultaneous measurement of distances and angles including data recording

Deleting error messages, terminating functions and quitting of input fields without accepting values. Quitting sub-programs and functions.



Menu tree (structure of menu key)



Settings:

Input of starting point number / reflector height
 Input of Hz-angle
 Selects one of the three display templates
 Input of atmospheric correction / prism constant

Display of electronic level sensor

Program library:

Input of station coordinates
 Orientation of horizontal circle
 Free station
 Setting-out
 Tie distance
 Area computation
 Target coordinates
 Rapid measurement

Data management:

Data input:
 Input of coordinates
 Input of codes

Data delete:

Delete measuring data block
 Delete coordinate block
 Delete code block

Data search:

Enter point number for searching within the measuring data block
 Enter point number for searching within the coordinate block

Data view:

Display of measurement data blocks
 Display of coordinate blocks
 Display of all code blocks

Data transfer:

Sends GSI data:

Transfers measurement data blocks
 Transfers coordinate blocks
 Transfers code blocks

Receives GSI data:

Appends coordinate blocks
 Appends code blocks

Erase internal data memory:

Deletes all measurement data blocks
 Deletes all coordinate blocks
 Deletes all code blocks

ALL Y	REC	TEST	Test functions:
		BATTERY	Display of battery voltage
		TEMP °C	Display of internal temperature of instrument
		SIGNAL DISPLAY	Display of signal strength of EDM Tests LCD and illumination
ALL Y	REC	CALIB	Instrument error:
		V-INDEX	Determination of vertical-index error
		HZ-COLLIM	Determination of horizontal collimation error
ALL Y	REC	CONE	Configure:
		PARAMETER	Various settings:
		CONTRAST	Sets contrast and viewing angle of display
		V-ANGLE	Sets vertical angle mode (measured from zenith), elevation angle (measured from horizontal) or slope in %: V, ±V, V%
ALL Y		INTERFACE	Interface parameter:
		BAUD	Sets transfer rate
		PARITY	Sets parity
		ENDMARK	Sets line end mark
ALL Y		REC	Recording:
		PORT	Selects data output to: RAM or RS232
		MASK	Selects recording template: MASK1 or MASK2
ALL Y		UNITS	Units:
		DIST	Sets distance units (m, ft or ft/in)
		ANGLE	Sets angle units (gon, 360d decimal, 360s sexagesimal)
		DSP ACC	Selects angle resolution displayed (low, medium or high)
ALL Y		EGL1	Guidelight: (just TC800)
		LIGHTS	Switch the Guidelight ON / OFF
		INTENSIT	Set the Guidelight intensity
ALL Y		ON/OFF	On / Off:
		BEEP 90°	Beep at 0°, 90°, 180° and 270°
		COMP	Compensator
		HZCOMP	Correction Hz-angle (only active if COMP = ON)
		RETROTAP	Select Retro Tape Target (active at RETROTAP=ON) (just TC800)
		BEEP	Acoustic input signal
		AUTO OFF	Automatic switch-off

Main menu

- Settings (SET)** Under **SETTINGS** specifications for measurements are entered (eg, point numbers, selection of display templates).
- Electronic level (LEVEL)** For the exact levelling-up of the instrument.
- Program library (PROG)** To make survey work easier, additional user programs are stored in the program library.
- Data management (UTILITIES)** Under **UTILITIES** data (measurements, coordinates or code definitions) can be entered, deleted, displayed, transmitted or received.
- Testing (TEST)** **TEST** contains different functions specifying status of instrument (eg, battery etc.)
- Instrument errors (CALIB)** Instrument errors (mechanical) are determined here.
- Configure (CONF)** Settings for your specific survey work.

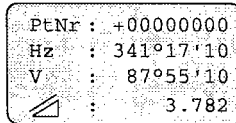
Measure and record

**ON
OFF**

After switching on and setting up the total station correctly, it is immediately ready for measuring.

Display symbols

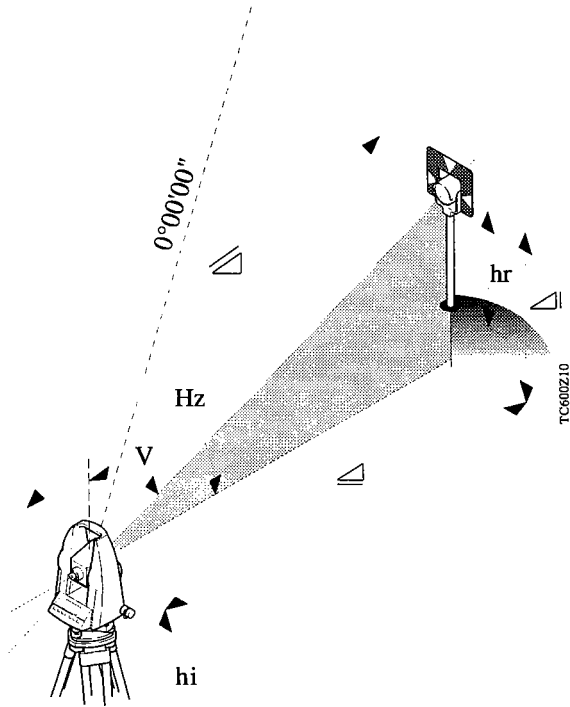
MENU



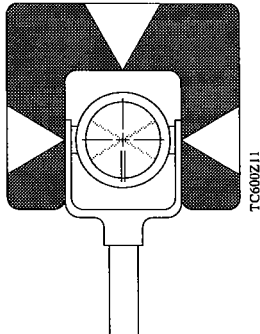
```
PtNr : +00000000
Hz   : 341°17'10
V    : 87°55'10
△    : 3.782
```

PtNr : Point number
Hz : Horizontal angle
V : Vertical angle
△ : Slope distance
△ : Horizontal distance
△ : Height difference
E : Easting (value right)
N : Northing (upper value)
H : Height
hr : Reflector height
hi : Instrument height
ppm : Atmospheric distance correction
mm : Prism constant (Leica multiple prism = 0)

Pointing and distance measurement



GPH1 prism holder with GZT4 target plate



When pointing through windows or if reflecting surfaces are present, incorrect readings may result. For long-range work or for surveys under unfavorable conditions, multiple prisms (e.g. GPH3 three-prism holder) are necessary.



```
PtNr : +00000000
Hz   : 341°17'10
V    : 87°55'10
 $\triangle$  : -----
```

Simultaneous determination of distances and angles, including data recording.

The point number is incremented by 1 after each recording.

or



```
PtNr : +00000000
Hz   : 341°17'10
V    : 87°55'10
 $\triangle$  : 3.782
```

Distance measurement without automatic data recording. After approx. 3 seconds the measured data is displayed. will record the measured distance. The Hz-angle always refer to the actual pointing direction of the telescope.

Example: for offset or hidden points



The DIST-function enables distances and horizontal angles to be measured separately. First determine the distance and then adjust the direction (eg, for surveying corners of buildings). will record the data (*refer to section 'Recording'*).

Tracking mode

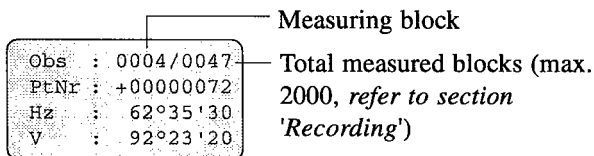
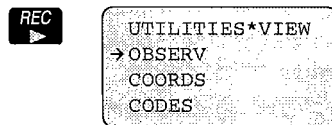
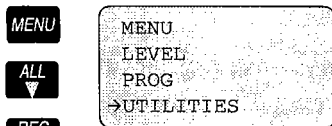


Press for 2 seconds and the tracking is switched on.



Stops tracking mode and returns into single mode.

Display of recorded data



By pressing, measured data is scrolled upwards or downwards block by block. By keeping pressed down, measured data is scrolled continuously up or down.



Display of data, line by line within a measurement (block)

Concept of coding

For each measurement, codes can be assigned providing additional information.

Example of additional information:

House - Driveway - ? Width

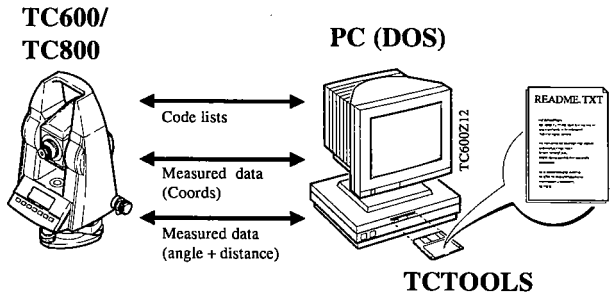
**CE
CODE**

```
LIST : 0005/0050  
CODE : +      500  
INF1 :      House  
INF2 :      Driveway  
INF3 :      ? Width
```

Alphanumeric code lists can be defined on the PC using TCTOOLS and then transferred to the TC600/TC800 unit via RS232 interface. Code lists from the PC can be adapted on the instrument any time, even during field operation.

TCTOOLS

For more information about TCTOOLS refer to the file README.TXT on the diskette supplied with each instrument.



Editing code blocks

Up to 50 code blocks can be specified within a code list. Each code block consists of max. four elements, the code and three further elements for description.

Example code block:

CE
CODE

```
LIST : 0005/0050  
CODE : + 500  
INF1 : House  
INF2 : Driveway  
INF3 : ? Width
```

LIST : actual block number in the complete code list (**0005**) as well as number of loaded code blocks (**0050**)

CODE : code no. (**500**)

INF1 : object to be measured (eg, **House**)

INF2 : exact specification (eg, **Driveway**)

INF3 : dimension for INF2 (? **Width**)

With lines containing a question mark a point-specific alphanumeric value can be entered. The **MENU** key switches to alpha characters.

ALL
▼

DIST
▲

Steps through code list (eg, 1 to 50)

Editing code

REC
▶

```
CODE EDIT  
INF1 : House  
INF2 : Driveway  
→INF3 : ? Width
```

Only lines with a '?' can be edited. If no input is made the value '0' is recorded.

For code blocks containing elements without '?', the individual elements are scrolled.

Storing code directly



At position **0000** of the code list values for **CODE** and **INF1...INF3** that are not defined in the code list can be individually entered. Input values using keys

```
LIST : 0000/0050
CODE :
INF1 : CODE INP
INF2 :
```

INF3 :

This code is not appended to the code list but only stored with the measured data.



To enter new codes into the code list *refer to section 'Input of coordinates and codes (INPUT)'*.



The selected or edited code is stored and assigned to the last measurement. Returns to the measuring display.



Returns to the measuring display without recording the code.

Recording a code block in the GSI format

The four elements of a code block are recorded under the following word identifiers (WI) in the measurement file.

WI41 Code
WI42 Info 1
WI43 Info 2
WI44 Info 3

Example:

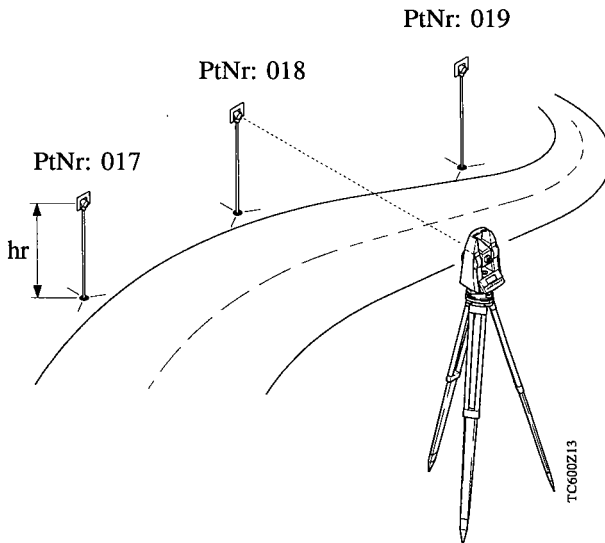
Code list : ; 302 ; House ; _____ ; _____ ;
Records : 41....+00000302 42....+0000House

Code list : ; 302 ; House ; _____ ; Driveway ;
Records : 41....+00000302 42....+0000House
43....+00000000 44....+Driveway

Empty elements (= _____) within a code block are recorded as '00000000' if the following elements are not 'empty'. Otherwise, 'empty elements' are not recorded.

Settings (SET)

Entering point number and reflector height (SET PtNr/hr)



MENU

```
MENU*SET  
→SET PtNr/hr  
Hz  
DSP
```

REC

```
SET*SET PtNr/hr  
PtNr: +00000017  
hr : 0.000
```

This point number is recorded with the measurements and is always automatically incremented by '+1' after recording.

The point number can also be transferred to the instrument from an externally connected PC.

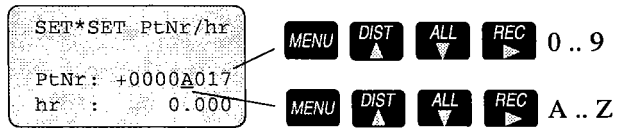
Command structure :

(_ = space char.)

PUT/11....+12345678_CRLF

Alphanumeric entry of point number

Use the **MENU** key to toggle between numeric or alphanumeric entry mode.



Point number search

Refer to section 'Searching for point numbers and multiple recordings (FIND)'.

Entering reflector height

The reflector height is entered under **hr:** and stored with each recorded measurement.

Setting the horizontal circle (Hz)

1st variant (set Hz to 0°00'00")

MENU

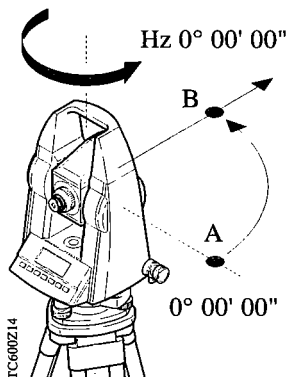
REC

```
MENU*SET
SET PtNr/hr
→Hz
DSP
```

ALL

REC

```
SET*Hz
Hz : 0°00'00
V : 85°12'55
Cont to hold
```



(**ALL** changes the direction of the Hz-system.)

CONT

Hz - direction is held on 0° 00' 00" (0.0000 gon).

Aim on point B.

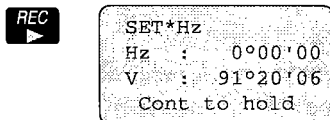
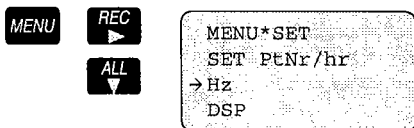
CONT

```
SET*Hz
Hz : 0°00'00
V : 85°12'55
Cont to release
```

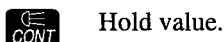
The Hz-angle to the new point (B) is now 0° 00' 00" (0.0000 gon).

Return to measuring display.

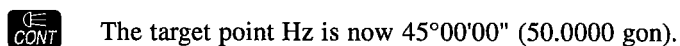
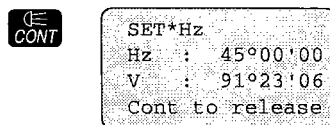
2nd variant (set Hz to a specified value)



Turn instrument until required Hz = 45°00'00"
(50.0000 gon) is indicated.



Aim on the corresponding point.



Setting the display mask (DSP)

MENU

REC

ALL

REC

```
MENU*SET
SET PtNr/hr
Hz
→ DSP
```

Depending on desired use, 3 different display masks can be selected on the TC600/TC800 unit.

Display-masks

Display of mask 1 :

ALL

```
PtNr : +00000005
Hz   : 341°17'10
V    : 87°55'10
 $\triangle$  : 3.782
```

Point number
Horizontal angle (Hz)
Vertical angle (V)
Slope distance

Display of mask 2 :

ALL

```
PtNr : +00000005
E    : -----
N    : -----
H    : -----
```

Point number
Easting
Northing
Height

Display of mask 3 :

ALL

```
Hz   : 341°17'10
V    : 87°55'10
 $\triangle$  : -----
 $\triangle$  : -----
```

Horizontal angle (Hz)
Vertical angle (V)
Horizontal distance
Height difference

CONT

Confirm selected display mask within 5 seconds.

Setting distance corrections

Meteorological correction (ppm)

The distance measurement is affected by the meteorological conditions. The distance can be corrected with appropriate **ppm** values. The ppm values for temperature and atmospheric pressure are obtainable from the diagram in *section 'Technical data'*. Instead of the atmospheric pressure the mean height above sea level of the survey site may be used for interpolation. For example, 10°C (18°F) temperature difference makes a difference of 1mm in a measured distance of 100 m = 10 ppm.

Using command sequence **MENU - SET - SET ppm/mm** to select the entry screen.

The diagram illustrates the sequence of button presses and screen displays to set meteorological correction:

- Press **MENU** and **REC** (right arrow) to display the main menu screen:

```
MENU*SET
HZ
DSP
->SET PPM/MM
```

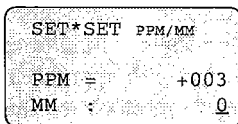
- Press **ALL** (down arrow) to move the cursor to the **SET PPM/MM** option.
- Press **REC** (right arrow) to enter the **SET*SET PPM/MM** screen:

```
SET*SET PPM/MM
PPM = +003
MM : 0
```

- Press **ALL** (down arrow) and **DIST** (up arrow) to enter a value.
- Press **REC** (right arrow) to shift the cursor.
- Press **CONT** (right arrow) to confirm input and continue to enter the prism constant.

Prism constant (MM)

The prism constant **MM** for Leica circular prisms is 0. It must be determined when using other types of prism. The prism constant must be always entered in units of (mm).



Confirm input. The value is stored after switching off the total station.

During a distance measurement the instrument displays both of the correction values (**PPM**) and (**MM**) for your information.

Data management (UTILITIES)

Utilities contains additional functions enabling the input and check of data in the field and to exchange data with computers (DOS).

The following additional functions are possible:

- Input of codes and coordinates (**INPUT**)
- Erasing measurement blocks, coordinates and codes (**DELETE**)
- Searching for point numbers and multiple recordings of identical point numbers (**FIND**)
- Display of stored data (**VIEW**)
- Data transfer from/to PC using PC Programme TCTOOLS and detection of complete files (**FILES**)

Input of coordinates and codes (INPUT)



With both submenus, coordinates and codes can be entered via the keypad and appended to the existing coordinate or code list.

**Coordinate entry
(COORDS)**



```
MENU*UTILITIES  
-> INPUT  
DELETE  
FIND
```



```
UTILITIES*INPUT  
-> COORDS  
CODES
```



```
Coord Input  
PtNr: +00000000  
E : 0.000  
N : 0.000  
H : 0.000
```



Input of coordinates.



Confirm and store coordinates.



Quit submenu.

Code input (CODES)



```
UTILITIES*INPUT
COORDS
-> CODES
```



```
Code Input
Code: +00000000
INF1: +00000000
INF2: +00000000
INF3: +00000000
```



Input for a new code.

Up to 50 code blocks can be specified. The newly entered code is appended to the existing list.



Confirm the inputs in each individual line.



```
Code Input
Append > Yes
```

Confirm **Yes** : The codes append to the code list.

No : Returns to input mode without recording..




Quit submenu.

**Deleting
measurements,
coordinates and codes
(DELETE)**

In all three options, the blocks stored in the total station are indicated:

- Measurements (**OBSERV**) from measuring range
- Coordinates (**COORDS**) from coordinate range
- Code blocks (**CODES**) from code list



Select block using cursor keys and confirm with .

```
MENU*UTILITIES
INPUT
->DELETE
FIND
```

```
UTILITIES*DELETE
->OBSERV
COORDS
CODES
```

```
OBS : 0004/0047
PtNr: +00000072
Hz : 62°35'03
V : 92°02'32
```



```
PtNr Obs/Del.
DELETE > No
```



```
PtNr Obs/Del.
DELETE > Yes
```



The selected block is deleted.



Quit sub-program.

Searching for point numbers and multiple recordings (FIND)

This function enables display of data blocks, searches for point numbers and multiple recordings of the same point numbers, including the use of 'Wildcards'.



```
MENU*UTILITIES
INPUT
DELETE
->FIND
```



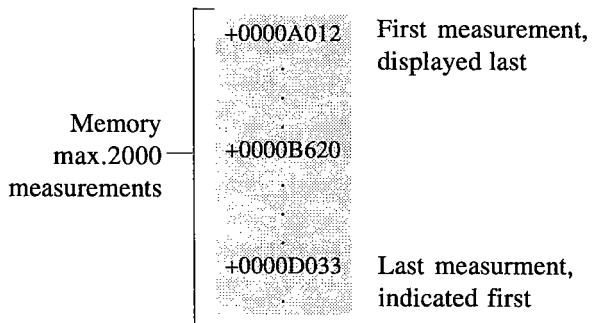
```
UTILITIES*FIND
->OBSERV
COORDS
```



```
PtNr Obs/Find
PtNr= +0000A012
```



Activate search of entered point number. Always the last available point within the data range is indicated.



Point number search

Point numbers can be searched in application programs or in the data display using 'Wildcards'. They can be used to search for specific character groups or character sequences.

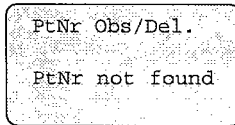
Example:

+xAxx9xxx This example searches for all point numbers counting from left to right with an 'A' at the 2nd place and a '9' at the 5th place and presents the points in a list. The character 'x' is selected when scrolling between '9' and '0'.


The following character set exists for numeric entries:
0 1 2 3 4 5 6 7 8 9 x 0 1 2 ... etc.

Searching for several data blocks with the same point number

If a specific point number is found, cursor keys can be used to search for further data blocks. The direction of search is always from the last recorded point towards the first point.



Error message if point number was not found.

Delete error message with .



Quit sub-program.

**Display of stored data
(VIEW)**

Measuring data (**OBSERV**), fixed-points (**COORDS**) and code lists (**CODES**) can be selected individually.



```
MENU*UTILITIES
DELETE
FIND
->VIEW
```



```
UTILITIES*VIEW
->OBSERV
COORDS
CODES
```



```
OBS : 0004/0047
PtNr: +00000072
Hz : 62°35'03
V : 92°23'02
```



Scrolls data block by block upwards and downwards. Always starts with the last data block (eg, **0004**) within the selected data range (**OBSERV**; **COORD**; **CODES**).



Displays the data, line by line within the selected block.

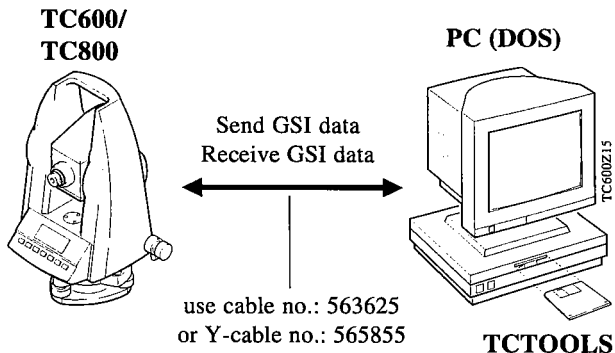


Quit sub-program.

Data transfer and deleting data

Data transfer with TCTOOLS (FILES)

TCTOOLS is a DOS program and transfers data between PC and TC600/TC800.

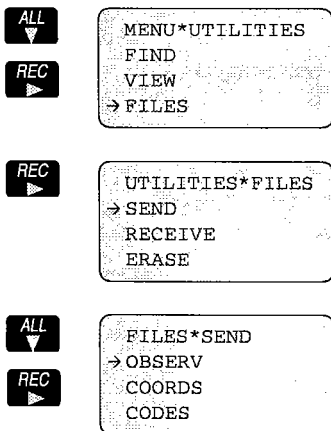


The transfer parameters of the TC600/TC800 unit (**CONF - INTERFACE**) and the corresponding program TCTOOLS must be the same:

The following parameters are recommended:

Baud = 9600
Parity = Even
Endmark = CR LF

Sending GSI data (SEND)



```

Send DATA
Nr of Blks: 64
Send Blk : 1

```

Data transfers from internal memory via the serial interface to the PC. Transmission of the following data blocks is possible (GSI format):

OBSERV = distances, angles (measuring data)

COORDS = coordinates (fix-points)

CODES = code list

During transmission, the number of blocks as well as the actual block number is displayed.

CE
CODE

Abort data transmission.

REC
▶

```

Send DATA
Nr of Blks: 64
Stop > No

```

Observe display data and confirm.

- **No:** Send more data.

- **Yes:** Interrupts data transmission.

CE
CONT

Receiving GSI data (RECEIVE)

ALL
▼

REC
▶

```

MENU*UTILITIES
FIND
VIEW
->FILES

```

REC
▶

```

UTILITIES*FILES
SEND
->RECEIVE
ERASE

```

ALL
▼

REC
▶

```

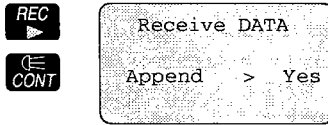
FILES*SEND
->COORDS
CODES

```

Data transfer is from PC to the internal memory (GSI format). Transmission of the following data blocks is possible:

COORDS = coordinates (fixed-points)

CODES = code list



With 'Append > Yes' the data are appended to the existing data (not overwritten).

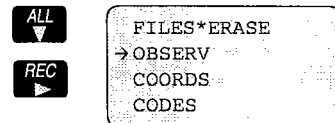
With 'Append > No' the receive mode is aborted.



During transfer the number of free data blocks is displayed:

- max. 4000 fix-points (**COORDS**)
- max. 50 code definitions (**CODES**) are possible.

Deleting data contents (ERASE)





```
Erase DATA
Nr of Blks: 64
Erase > No
```

Data records can be selected and deleted one after the other.


OBSERV = distances, angles, ... (measuring data)

COORDS = coordinates (fixed-points)

CODES = code definitions



```
Erase DATA
Nr of Blks: 64
Erase > Yes
```

Data contents deleted if 'Erase > Yes' selected and confirmed with .



Data records are deleted.



Caution: All data records are deleted (eg, all 64 data records as shown in the example).

Communication PC-TC600/TC800

For more detail information of command and data structures refer to the handbook 'Leica Instruments On-Line' which is available from your Leica representative.

Set station coordinates by PC

Station coordinates can be transmitted from a external data recorder via RS232 interface at any time without having to reset the instrument. However, the instrument must be in the highest level (measuring mode).

Command structure:

(_ = space char.)

Point number (PtNr)	PUT/11....+12345678_CRLF
Easting (Eo)	PUT/84....+12345678_CRLF
Northing (No)	PUT/85....+12345678_CRLF
Height (Ho)	PUT/86....+12345678_CRLF
Instrument height (hi)	PUT/88....+12345678_CRLF

Orientation by PC

A new direction can be transmitted at any time provided that the instrument is in the measuring display mode.

Command structure: (_ = space char.)

Hz PUT/21...2+12345678_CRLF

Setting-out by PC

Command structure



(- = space char.)

Call the function	'SETOUT' (setting-out)
Point number (PtNr)	PUT/11....+12345678_CRLF
Hz-angle to be set out:	PUT/24...2+12345678_CRLF
Horizontal distance to be set out:	PUT/34...0+12345678_CRLF
Height to be set out:	PUT/83...0+12345678_CRLF

Return to data transfer (c for a new point)

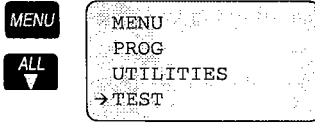
Terminates program function 'setting-out' x

After the required 4 data lines are transmitted to the TC600/TC800 unit, the display changes automatically to the mode showing the divergence between specified direction and present instrument direction.

After distance measurement (**DIST**) the difference between the computed and measured horizontal distance as well as the difference in height between the instrument position and the setting-out point are displayed. At the same time, the keys  and  are active to send data to an external data recorder. Measurements and data recordings can also be activated from an external data recorder.

Testing the instrument

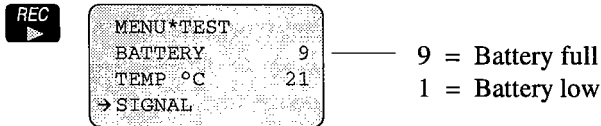
Test functions are for displaying instrument parameters and status.



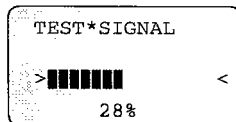
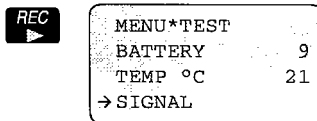
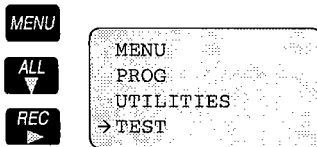
Battery and instrument temperature

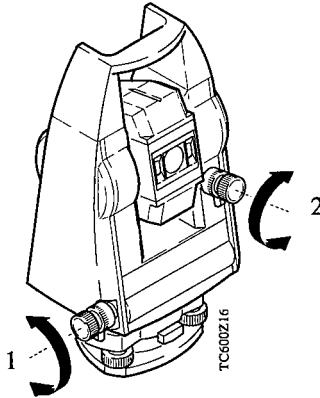
After the submenu has been called, the instrument temperature and the battery status is displayed. Low battery charge also triggers (even during a measurement) an acoustic signal and the warning **'Battery low'**.

With low battery charge, distances cannot be measured and the instrument switches off automatically.



EDM Signal



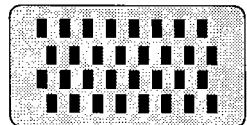
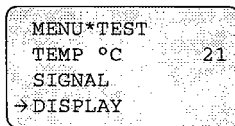


Under difficult measuring conditions (e.g. fog) the TC600/TC800 unit can be optimised to the prism using this function.

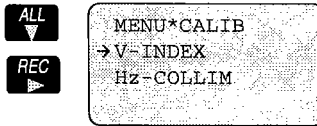
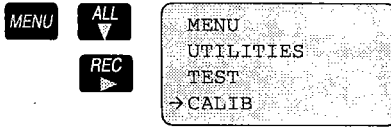
- Align TC600/TC800
- Adjust the fine drives (1, 2) until the max. value (eg.,28%) is reached.
- Measure the distance.

Display test

In the display test a continually changing, flashing checkerboard pattern is displayed. If the image does not conform to this pattern a failure could be the cause. Call your local Leica service center.

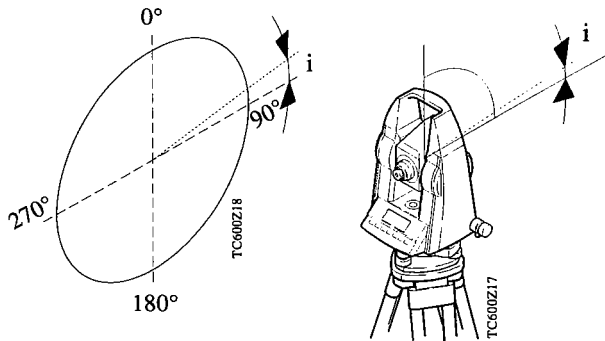


Determine instrument errors



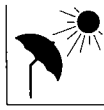
Vertical index error

The vertical circle should read exactly 90° (100 gon) when the line of sight is horizontal. Any deviation from this figure is termed vertical index error (i).

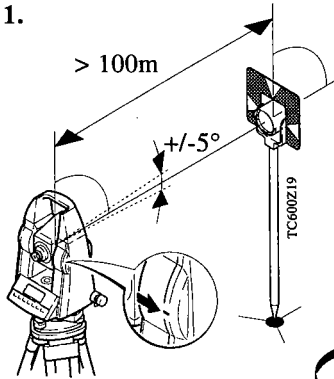


The stored vertical index error is displayed as an angular value in the units selected.

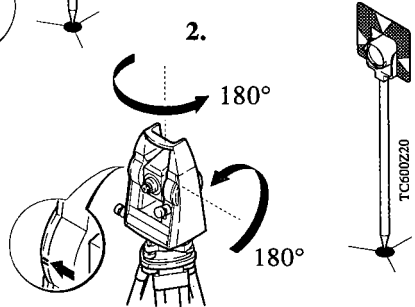
Before determining the vertical-index error use the electronic level to level up the instrument correctly.



1.



2.



```
CALIB*V-INDEXX:
I : 0°00'00
Inew: ----
>Measure Index<
```

```
> Aim Point <
> Wait <
> Another Face <
> Wait <
> Set Value? <
```



```
CALIB*V-INDEXX:
I : 0°00'00
Inew: ----
> Set Value? <
```

Adopt the calculated value or

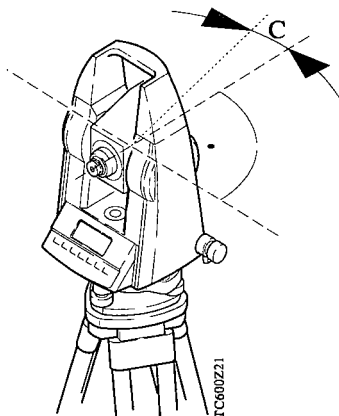


retain the old value and switch back to menu CALIB

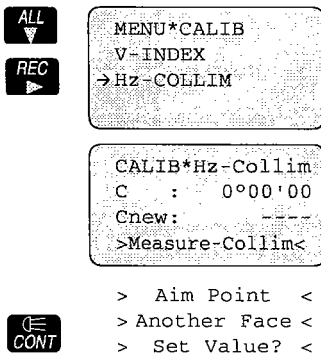


When you determine the vertical index error the electronic level is adjusted at the same time.

Line-of-sight error



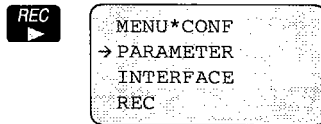
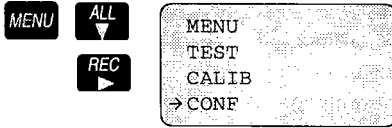
The line-of-sight error or collimation error (C) is the deviation from the right-angle between the tilting axis and the line of sight. It is determined and stored in a similar manner to the vertical-index error and corrects the Hz-angle. The value for the correction depends on the vertical angle.



Index- and line-of-sight errors can change with time and temperature. They should, therefore be newly determined before the first use, before precision surveys, after long periods of transport, before and after long periods of work, and if the temperature changes by more than 10°C (18°F).

Configure

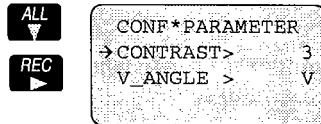
Under configure, specific settings can be carried out with the TC600/TC800 unit so the instrument is optimally adjusted to particular survey work.



Parameter

Contrast

Adjusting the display contrast from **0** (low) to **3** (high).



V-Angle

Setting vertical-angle indication.

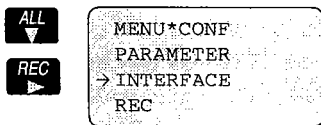
V = zenith angle (zenith = 0)

±V = vertical angle (horizontal = 0)

V% = slope: (horizontal = 0%, rise (+%); fall (-%))

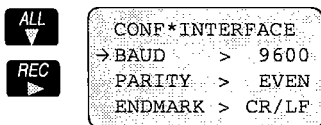


Confirm selected values.



To record measurements, a data recorder (eg, GPC1) can be connected to the serial data port (RS232 interface).

The parameters of the serial interface are already adapted for data transmission with LEICA data recorders. They remain stored after switching off the total station.



To use data recorders of other makes (eg, IBM-compatible PCs) the interfacing parameters may need changing. For data transmission a protocol containing an exact command and data structure is necessary (for more information refer to the handbook "Leica Instruments online").



Do not turn the total station during measurements until data recording is finished. The current horizontal direction is always transmitted !

Settings for data communication GPC1:

Call up 'MAIN' in the menu of the GPC1. Set the transfer parameters (2400 baud, EVEN, CRLF) for the COM2 interface.

Recording



```
MENU*CONF
PARAMETER
INTERFACE
→ REC
```

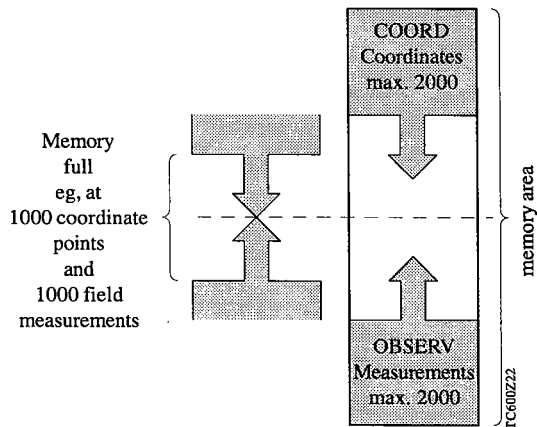


```
CONF*REC
→ PORT > RAM
MASK > MASK1
```

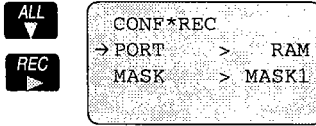
The measured data (**OBSERV**) and the fixed-point coordinates (**COORDS**) are stored in the internal memory (refer to section 'Data Management (UTILITIES)'). The internal memory can store information for a maximum of 2000 measurements or 2000 coordinate points.

It is possible to store, for instance, 1000 field measurements and simultaneously 1000 coordinate points in the internal memory.

New data are always appended to existing data.



Data formats in the internal memory



The **REC** commands contain all relevant parameters and settings for data recording. Set these parameters as required and before starting recording for the first time.



Specify data port and recording template before data transmission to the recording device.

Select data port (internal **RAM**, external **RS232**).
Select recording template (**MASK1** or **MASK2**).

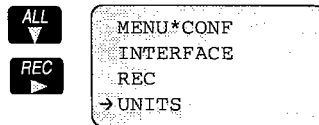
Two recording formats (templates) are available for accepting measurement data:

MASK1 Pt Nr, Hz, V, slope distance, ppm/mm,
hr, hi

MASK2 Pt Nr, Hz, V, slope distance, E, N, H, hr

Coordinate points are always stored in the format PtNr, E, N, H.

Selecting units (UNITS)



**Units for distance
measurement (DIST):**



```
CONF*UNITS
→DIST > m
ANGLE > 360S
DSP ACC > low
```

- m = meters
- ft = feet (in decimals)
- ft/in = feet, inch and $\frac{1}{8}$ inch

**Units for angle
measurement (ANGLE):**



```
CONF*UNITS
DIST > m
→ANGLE > 360S
DSP ACC > low
```

- gon = 400gon
- 360d = 359°.999 (in decimals)
- 360s = 359° 59' 59" (sexagesimal)

**Display number of
decimal places
(DSP ACC):**



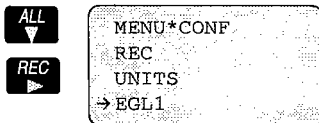
```
CONF*UNITS
DIST > m
ANGLE > 360S
→DSP ACC > low
```

- high = 81°45' 24" (1"/0.5 mgon Interval) i.e. 4 dec.
- med = 81°45' 25" (5"/1 mgon Interval) i.e. 3 dec.
- low = 81°45' 20" (10"/1 mgon Interval) i.e. 3 dec.



Confirm selection.

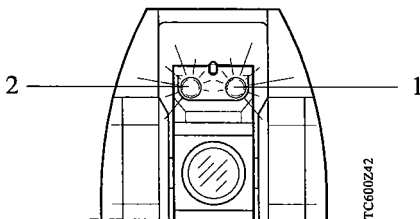
Guidelight EGL 1 (just TC800, optional)



Turns the Guidelight (**EGL1**) **ON** or **OFF**.
Set the Guidelight (**EGL1**) intensity (**0, 1, 2**).



Confirm selected values.



- 1 Exit for blinking red LED
- 2 Exit for blinking yellow LED

Total station settings



```

MENU*CONF
REC
UNITS
→ ON/OFF
    
```

```

RETROTAP > ON
BEEP > ON
AUTO OFF > ON
    
```

(RETROTAP just TC800)

Setting-out right angles (BEEP 90°)

To simplify setting-out of right angles an acoustic signal (BEEP) can be activated. Set **BEEP 90°** to **ON** and confirm.



```

CONF*ON/OFF
→ BEEP 90° > ON
COMP > ON
HZCOMP > ON
    
```

BEEP pulsating
+/- 4° (5gon)



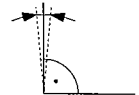
TC600Z23

BEEP continuous
+/- 30' (0.5gon)



TC600Z24

no signal
+/- 30" (10mgon)



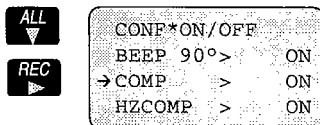
TC600Z25

Compensator (COMP, HZCOMP)

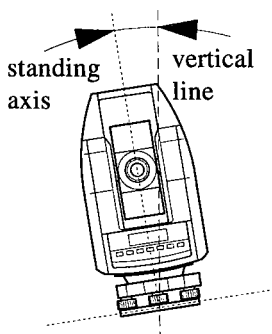
The acoustic warning signal and the error message (Error **58 TILT**) can be suppressed if the total station is not required to be properly leveled up. (eg, on swaying platforms or ships).

For normal use set **COMP = ON**.

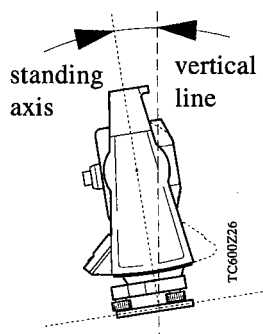
After switching off the total station the function is automatically set to **COMP = ON**.



Transverse

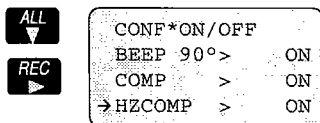


Longitudinal



When the compensator is switched off (**COMP = OFF**) the vertical angle refers to the standing axis.

When the compensator is switched on (**COMP = ON**) the vertical angles refers to the vertical line.



Function **HZCOMP = ON** corrects the Hz-angles for the tilt of the standing axis.

Switching the compensator (**COMP**) off also sets the function **HZCOMP** to **OFF**.

Retrotape (RETROTAP) (just TC800)



CONF*ON/OFF		
BEEP 90°	>	OFF
COMP	>	ON
→RETROTAP	>	ON

Sets the EDM into a mode to measure to prism or to retro tape targets.

One of two different reflector types can be selected:

ON: Set the RETRO TAPE TARGET as reflector

OFF: Set the prism as reflector



Pay attention to the correct setting: retro tape and prism have different adding constants which are automatically set in the TC800.

Input signal (BEEP)



CONF*ON/OFF		
COMP	>	ON
HZCOMP	>	ON
→BEEP	>	ON

After each key touch, the instrument acknowledges the correct input by an acoustic signal.

The signal can be switched off but is reactivated each time the total station is switched on again.

Automatic switch-off (AUTO OFF)



CONF*ON/OFF		
HZCOMP	>	ON
BEEP	>	ON
→AUTO OFF>	>	ON

In case of longer breaks (> 10 minutes) the function **AUTO OFF** automatically switches off the total station to save battery capacity.

Once the instrument is switched on **AUTO OFF** is always active (**ON**) and so may need to be suppressed (**OFF**).

Programs



In order to use the software correctly and reliably, you must follow the instructions given in the user manual or in the on-line help system. You must also adhere to the directions given in the user manual for the product with which you are using the software.




Introduction

Integrated programs ensure high functionality of the TC600/TC800 total station. Daily survey work is simplified by using internally stored coordinates. This largely eliminates the risk of entering wrong information. Points to be measured or setting out points can be transferred from a computer to the total station.

The following programs are installed in the instruments :

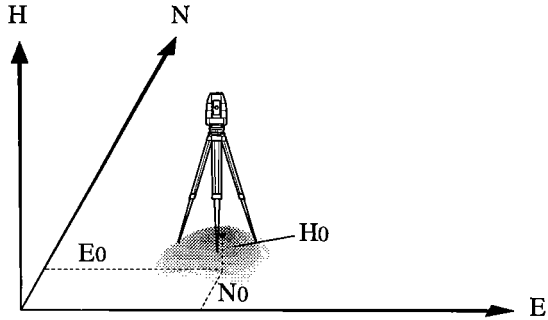
- Set station coordinates (**STATION COORD**)
- Orientation of horizontal circle (**ORIENTATION**)
- Free station (**FREE STATION**)
- Setting-out (**SETOUT**)
- Tie distance (**TIE DISTANCE**)
- Area computation (**CALC AREA**)
- Target coordinates and target height (**TARGET COORD**)
- Rapid measurement and recording (**RAPID MEAS**)



Programs are generally aborted using the key . In programs with active measuring displays (i.e. **ALL**, **DIST** and **REC** active), the -key calls the code list. To return to the point number input, keep the -key pressed for about 1 second.

**Set station coordinates
(Station Coord)**

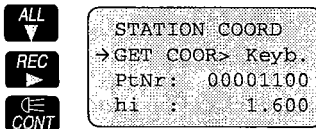
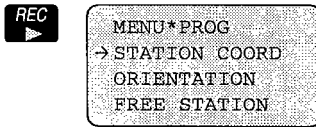
The program 'Station Coord' is used for setting station coordinates in the instrument. These can be entered manually or can be read from the internal memory.



TC600227

With manual input, the entered coordinates can be stored in the COORD area. The station coordinates are set simultaneously.

The coordinates are stored in the format PtNr, E, N, H.



Optionally select manual input (**Keyb.**) or point search from internal memory (**File**).

- point number entry
- instrument height entry

Set station point manually (Keyb)

(for alphanumeric entry refer to section 'Entering point number')



```
STATION COORD
→ E : 40.000
N : 45.500
H : 33.520
```

- Input of Easting (E0)
- Input of Northing (N0)
- Input of Height (H0)

Display of entered coordinates



```
STATION COORD
* PCNR: 00001100
E0 : 40.000
N0 : 45.500

H0 : 33.520
hi : 1.600
hr : 1.650
```

stores the point in the **COORD** area, enters it as the station point and quits the program.

sets the displayed coordinates as the instrument station coordinates and quits the program.

```
STATION COORD

Station Set
```

Confirms that station coordinates have been set and returns to the program selection menu.

To record coordinates, the interface parameter must be set to 'RAM', otherwise the -key is not active. (refer to section 'Recording').

**Set the instrument station
from coordinates stored
(File) (COORD area)**



```
STATION COORD  
→GET COOR> File  
PtNr: 00000100  
hi : 1.600
```

On the basis of the point number entered, the coordinates are searched for in the COORD area of the internal COORD area (RAM).

```
STATION COORD  
File:Coordinate  
PtNr: 00000100
```

The search for the point number entered always proceeds from the end to the beginning within the COORD area.

If the same point number is stored more than once, the last point in memory will be found.



```
STATION COORD  
• PtNr: 00000100  
EO : 40.000  
NO : 45.500  
HO : 33.520  
hi : 1.600  
hr : 1.650
```

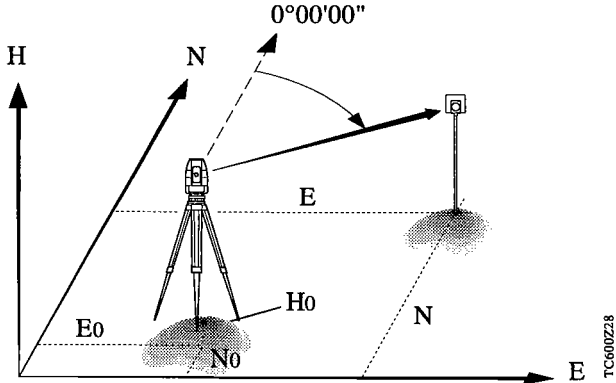
Displays coordinates

```
STATION COORD  
Station Set
```

Confirms that station coordinates have been set.

Orientation of horizontal circle (Orientation)

Calculation of horizontal circle orientation from direction measurements to one tie point.



MENU

ALL
▼

REC
▶

```
MENU
SET
LEVEL
-> PROG
```

ALL
▼

REC
▶

```
MENU*PROG
STATION COORD
-> ORIENTATION
FREE STATION
```

The horizontal circle can be oriented either with internally stored coordinate points or with coordinates entered manually.

Before you start the program 'ORIENTATION', enter the correct station coordinates first by using 'Station Coord'

CONT

```
ORIENTATION
* PENr : +00001100
E0 : 40.000
N0 : 45.500
H0 : 33.520
hi : 1.600
```

As a check, the present station coordinates are displayed, but they cannot be altered here.

**Orientation with a search
for points within the
internal memory**



```
ORIENTATION
->GET COOR> File
PtNr: 00000100
```

- Choice of **File**.
- Input of point number

The point in the 'Orientation' is local and does **not** overwrite the system point number.



```
ORIENTATION
File:Coordinate
->PtNr: 00000100
```

Search for points in the internal COORD area.

```
ORIENTATION
PtNr: +00000100
Hz : 352°44'05
V : 101°57'07
```

Sight the tie point.

Hz : 352°44'05" (391.9257 gon) is the calculated angle to the tie point.



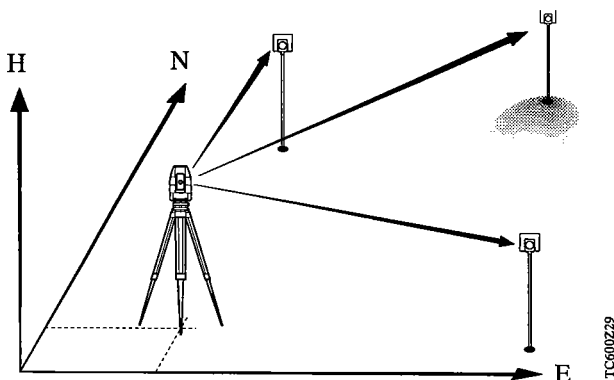
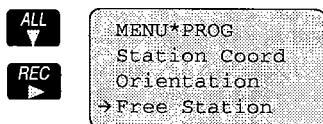
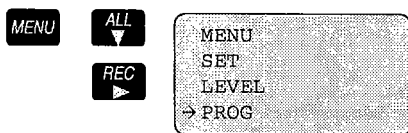
```
ORIENTATION
Orientation
SET
```

Final display.

Returns to program selection menu after about two seconds. **MENU** returns to measuring mode.

To check the orientation to additional points use program 'Set-out'.

Free Station



Calculates coordinates and height of instrument site using min. 2 to max. 5 points of known coordinates. Stored or manually entered points and coordinates can be used.

Two different methods can be used, which the program automatically recognizes.

Procedure 1

Distances are measured to all points and a best fit will be used to determine the station coordinates (E, N, H). The standard deviation is derived from the coordinate residuals for the connection points.

Procedure 2

Not all distances are measured. In this case the shortest measured distance is used to determine the station coordinates.

The shortest measured distance must be smaller than the calculated distance between the 2 target points, otherwise the error message 'Bad Configuration' appears and the program terminates.

The computed standard deviation (mp) refers to the accuracy of orientation used for the shortest measured distance. The calculation of the station height uses only those points with height data (i.e., height does not equal zero). The station height is the mean of the single heights determined from the connection points.



```
FREE STATION
→PtNr: +00000006
hi : 1.602
```

Input of station number and instrument height
(For alphanumeric point entry *refer to section 'Entering point number'*)



```
FREE STATION
2 Faces > Yes
```

Selection of 1 or 2 face measurements.

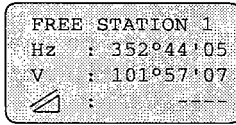
Retrieving targets:

Target can be retrieved by 2 methods:

1. **File:** Points are searched within the internal memory. The use of 'Wildcards' is possible.
2. **Keyb.** Manual coordinate entry.



```
FREE STATION 1
Get COOR> File
PtNr: +00000022
hr : 0.00
```



Display of measurement, aiming point.

Carry out measurement



Measure with simultaneous data recording.



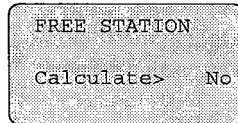
Measure without distance with data recording at the same time.



Measure without data recording.



Measure distance, then subsequent data recording.

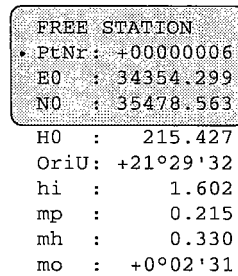


Results can be computed with at least 2 measurements or continued with more measurements.

'No': Continue with more measurements

'Yes': Compute results

Display results:



- station point number
- calculated station coordinates
- orientation unknown
- instrument height
- Standard deviation of station
- Standard deviation of station height
- Standard deviation of orientation

The standard deviations are reset to 'zero' if only 1 distance and 2 angles are measured.

Display standard deviations:



```
RESIDUALS 1/2
PtNr : +00000006
ΔHz  : -0°01'15
ΔDist: 0.020
ΔH   : 0.010
```

ΔHz : Angle differences

ΔDist : Differences between computed and measured distance.

ΔH : Height differences

If distances are not measured to all points, the shortest measured distance is used for the computation of the station coordinates. The residual (**ΔDist = Zero**) is displayed.



```
FREE STATION
Record > Yes
```

The computed station coordinates can be stored and set. Orientation is adopted.

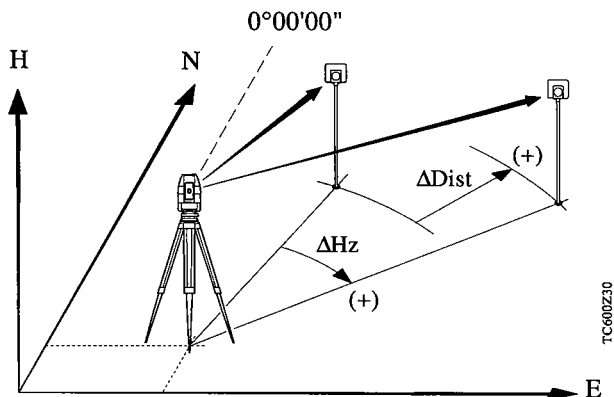


Return to the program selection menu.

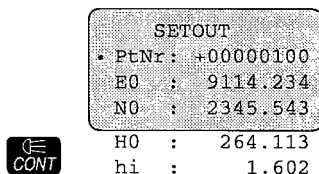
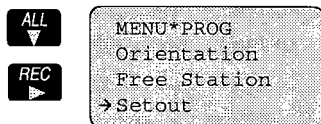
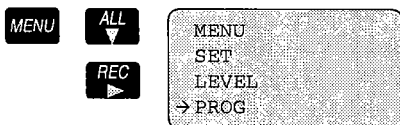
Setting out (Setout)

The setting-out technique is based on the coordinate system of the points to be set out. The program calculates setting out elements from manually entered or stored coordinates and station data.

Before you start setting out, make sure that the correct station point is set and the instrument has been oriented.



The 'Setout' program supports the polar setting out technique. The divergence between the computed direction and the measured direction is displayed first.



The present station coordinates are displayed for inspection, but cannot be changed here.



```
SETOUT
Get COOR> File
PtNr : +00001234
hr   : 1.550
OffH: 0.000
```

Input of point number, reflector height and height offset **OffH**. The amount of **OffH** is added to or subtracted from the height to be set out, in accordance with its sign. This takes account of infill, etc...

(Alphanumeric point entry or search, *refer to section 'Entering point number'*)

The entered point number is local within the application 'Setout' and does **not** overwrite the system point number.

Search for coordinates in the COORD-file or for manual entries after switching to **Keyb**. It is possible to use 'Wildcards' (*refer to section 'Searching for point numbers and multiple recordings'*).

```
PtNr: +00001234
ΔHz : 0°21'31
Δ $\triangle$  : 0.462
Δ $\triangle$  : 0.131
```

Turn instrument until $\Delta Hz = 0^{\circ}00'00''$ (0.0000gon). Repeat the measurements of the distance with **DIST** until the displayed difference in distance is within the required accuracy, i.e., close enough to 'zero'.



```
HZ : 75°57'35
V  : 92°08'59
 $\triangle$  : 82.325
H  : 410.800
```

You can use the **MENU** key to switch between the upper and lower displays.



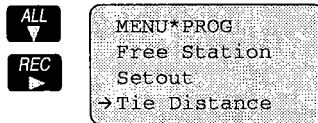
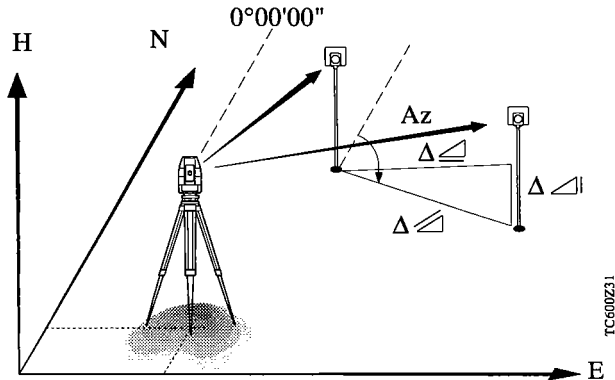
Continue with the next point.



Records the measurements and continues the program to enter the next point.

Tie Distance

With program 'Tie distance' the distance, height difference and azimuth between two points is computed.



Tie distances can be determined using three different methods:

OnLine: measurements to target points

File: from coordinates read in the internal memory

Keyb: from coordinates entered manually

It is possible to combine all three methods.

The program supports the polygonal technique, i.e. the calculation of the tie distance between the two last points which were measured, entered or selected.



```
TIE DISTANCE
Get COOR>OnLine
→ PtNr: +00000050
hr : 0.000
```

Start display:

- Select appropriate procedure ('File', 'Keyb.', 'OnLine')
- Input of point number
- Input of reflector height

(For alphanumeric point entry refer to section 'Entering point number')

```
TIE DISTANCE 1
File:Coordinate
PtNr: +00000050
```

Coordinates from internal memory (**Get COOR> File**):

Searches the coordinates in the internal memory of the instrument. It is possible to use 'Wildcards' (refer to section 'Input of coordinates and codes').



```
TIE DISTANCE 1
E : 0.000
N : 0.000
H : 0.000
```

Manual input of coordinates (**Get COOR> Keyb.**):

- Input of Easting
- Input of Northing
- Input of Height

```
TIE DISTANCE 1
Hz : 321°04'01
V : 94°26'40
△ : 33.850
```

Tie distances derived from measurements (**Get COOR > OnLine**):

- Display of horizontal angle
- Display of vertical angle
- Display of slope distance



Measure distance to origin, or
 Measure and record data and continue with the next
 point, or
 Record measurements and continue with the next point.
 Press **CONT** to the next point without recording data.



```
TIE DISTANCE 2
Get COOR> File
→ PtNr: +00000060
hr : 0.000
```

Set next target and again use coordinates or
 measurements to compute tie distance.

Display results:

```
TIE DISTANCE
* PtNr: +00000050
PtNr: +00000060
Az : 83°48'11
```

- Display of first point number (PtNr)
- Display of second point number (PtNr)
- Display of azimuth
- $\Delta \sloperight$: 10.949 - Display of slope tie distance
- $\Delta \triangleleft$: 10.866 - Display of horizontal tie distance
- $\Delta \triangleup$: 1.347 - Display of height difference



The second point now becomes the first. The
 measurement or data input continues with the next
 point.



Starts a new measurement sequence.

Press **CE CODE** twice to obtain the closing display.

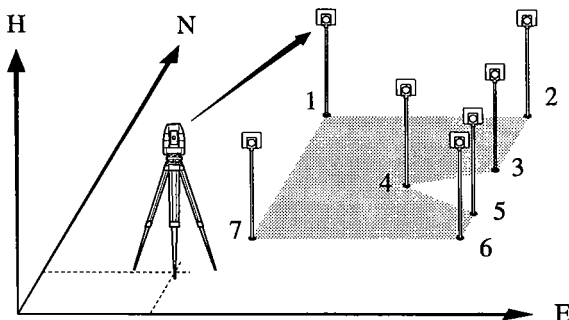
```
TIE DISTANCE 2

Program End
```

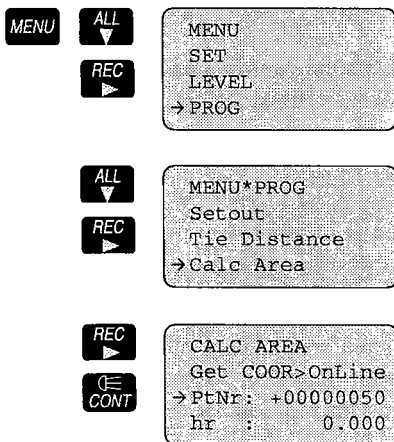
After about two seconds the display returns to the
 program selection menu.

Area computation (Calc Area)

This program computes the area from points which are connected by straight lines (eg, points 1...7). The number of points is unlimited. Points can be defined from continuous measurements, from coordinate entries or from existing point coordinates. Each time a new point is defined the user can use one of these three definition methods.



TC600232



Target can be retrieved by 3 methods:

OnLine : Jumps into the measuring display and enables point measurement

File : Points are searched within the internal memory. The use of 'Wildcards' is possible.

Keyb. : Manual coordinate entry.



```

CALC AREA      1
Hz   :  78°46'55
V    : 102°53'55
  /  :  -----

```

Measure display (OnLine)

Distance measurements are required for each point. An error message appears if no distance is measured and a new measurement can be carried out.



Measure with simultaneous data recording



Measure without data recording



Measure distance, then subsequent data recording

```

CALC AREA      1
E    :  80.000
N    : 100.000
H    : 120.123

```

Input display with the option 'Keyb'



Confirms the coordinates entered and continues with the next coordinate entry.



```

CALC AREA

Area : 2233.845
PtCnt:      5

```

Closes the area to the starting point. Displays the calculated area and the number of points used.



Returns for more measurements.



Aborts the program.

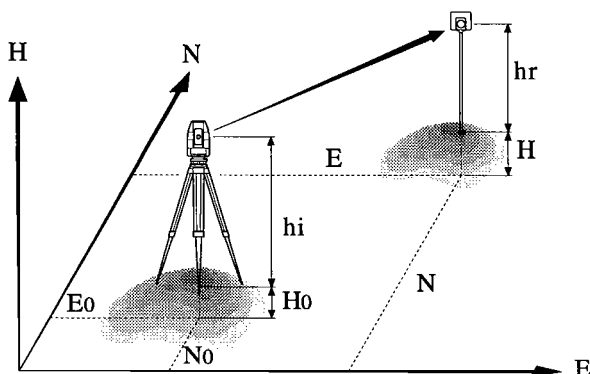
Target coordinates and target height (Target Coord)

These coordinates are calculated from point measurements and stored. As a result, these point coordinates (**COORDS**) can be set as station coordinates, if necessary.

Examples for use: Polars, open traverse, eccentric points, new stations for setting-out.



Points not set as station must be stored to the measurement file (refer to section 'Measure and record' and 'Recording').



TC600Z13



```
MENU
SET
LEVEL
-> PROG
```



```
MENU*PROG
Tie Distance
Calc Area
-> Target Coord
```

When the program is called, the present station coordinates are displayed along with the instrument height.



```
TARGET COORD
• PtNr: +0000100
E0 : 9114.234
N0 : -2345.543
H0 : 264.113
hi : 1.602
```

The station coordinates cannot be altered here.



```
TARGET COORD
→ PtNr: +00001234
hr : 0.000
```

Enter point number and reflector height.

(Alphanumeric point entry or search, *refer to section 'Entering point number'*)



```
PtNr: +00001234
E : ---
N : ---
H : ---
```

Measurement display

Measure distance to target point.



```
PtNr: +00001234
E : 100.000
N : 103.636
H : 99.071
```

Display of target coordinates.



Moves to next point input or



Recording of target coordinates. Returns to the measurement display. The point number is automatically incremented by +1.



Distance measurement and recording. The target coordinates are not displayed. The coordinates are recorded in the COORD area of the internal memory in the format PtNr, E, N, H. Returns to the measurement display. The point number is automatically incremented by +1.

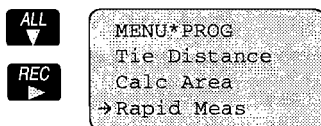
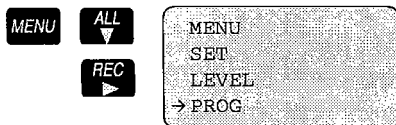


```
TARGET COORD
Program End
```

Repeated pressing of causes a return to the program selection menu.
Closing display.

Rapid measurement and recording (Rapid Meas)

This program enables quick measurements and data recording.

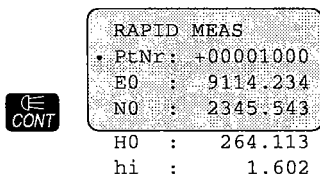


Measurement procedure

Switches to tracking mode; it is now permanently active. Distances are measured with 0.5-second intervals and the measurements are recorded in the measurement-data area in accordance with the recording template selected.

The reflector must be sighted so that the Hz- or V-drive is continuously in motion until the reflector has been targeted with the accuracy required. The data are recorded as soon as the change between the Hz- or V-angle amounts to less than 16" (50^{cc}) between two valid distance measurements.

If, after this recording, the instrument remains in the rest position, no additional data are recorded even though the distance continues to be measured every 0.5 seconds. The recording mode is reactivated after there has been a change of at least 5' 24" (= 0.1 gon) to the last recorded horizontal direction .



When the program is called, the present station coordinates are displayed along with the instrument height.

The station coordinates cannot be altered here.




```
RAPID MEAS
PtNr : +00000012
hr   :      1.790
```

- Input of point number
- Input of reflector height

(For alphanumeric point entry *refer to section 'Entering point number'*)

```
DIST*TRACKING
ppm :      0
mm  :      0
```

Automatic activation of tracking mode.


```
PLNr : +00000012
Hz   : 49°56'02
V    : 98°56'01
 : 20.150
```

Display of measurements.

Recording of data is confirmed acoustically with a double beep.

After data have been successfully recorded, the point number is automatically incremented by +1.



Abort recording by pressing -key for 2 seconds.

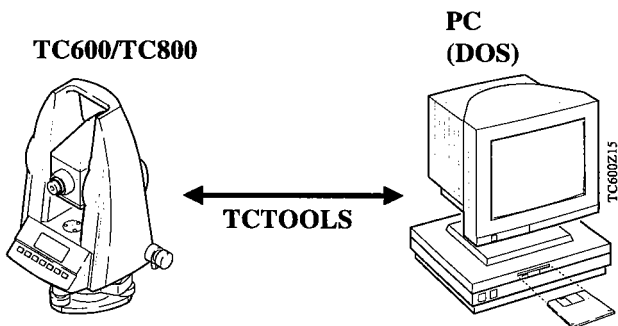
Repeated pressing of  causes a return to the program selection menu.



This program requires the prisms to be sighted quickly and a good experience in observations techniques. The EDM is permanently switched on, and therefore power consumption is greater than usual.

TCTOOLS

The program TCTOOLS manages the data of the TC600/TC800 unit. The individual functions support bidirectional data transfer, conversion from Leica GSI-format to ASCII and vice versa. It can also be used for creating and editing code lists used on the TC600/TC800 unit.



The program TCTOOLS consists of three main functions:

- 1. Codelist:** This function creates and edits code lists and transfers code lists between the TC600/TC800 unit and the PC. Up to 50 code blocks can be established and used on the TC600/TC800 unit.
- 2. Convert:** This function converts Leica GSI-format to ASCII-text-format. The ASCII-text format can be user defined. It outputs measurements or coordinates in columns or lines. The columns can be separated by spaces or by tabs. If the output is in lines, the date elements can be separated by ,, , ; tab etc.

Coordinates can be converted from ASCII-text format to Leica GSI-format. The ASCII-data must be in columns or in lines and separated by non-numeric character.

3. Up-and download: This function transfers files in Leica GSI-format from the PC to the TC600/TC800 via the serial interface.

Upload: This transfers data from the PC to the TC600/TC800. The files to upload must contain coordinates or code lists in Leica GSI-format.

Download: This transfers data from the TC600/TC800 to the PC. Measurements, coordinates and codelists can be transferred. The downloaded data are stored in a file on the PC in Leica GSI-format.

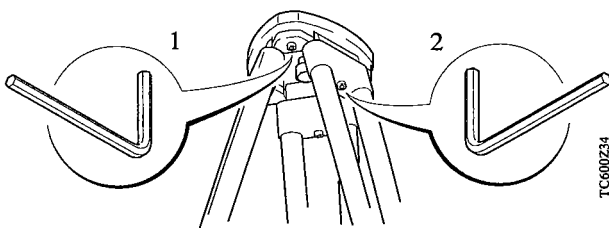
For more information about the functions of TCTOOLS, refer to the On-Line help within the program, under Info/Help.

Checking and adjusting

Tripod

The connections between metal and timber components must always be firm and tight.

- Tighten the Allen screws (2) moderately from time to time, as necessary.
- The same key is also suitable for adjusting the articulated joints on the tripod head (1). Tighten these just enough to keep the tripod legs open when you lift it off the ground.

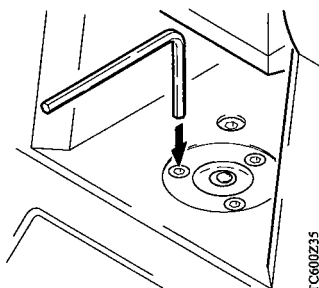


TC600Z34

Circular level

Level-up the instrument in advance with the electronic level. The bubble must be centered. If it extends beyond the circle, use the allen key supplied to center it with the adjustment screws.

Care has to be taken, that, after adjustment, no screw remains loose.



TC600Z35

Line-of-sight error

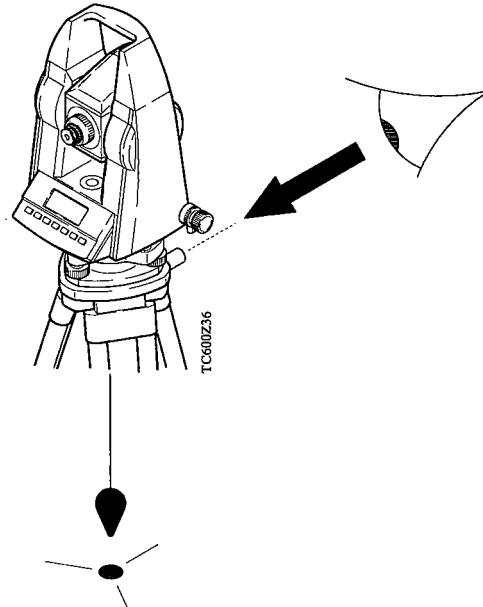
At the factory and prior to delivery, the line-of-sight is adjusted. The residual line-of-sight error should be checked at regular intervals. *Refer to chapter 'Configuration'*. It is automatically taken into account in all measurements.

Optical plummet

Check the optical plummet of the tribrach at regular intervals. Any deviation of the line-of-sight from the vertical axis of the instrument causes a centering error.

Checking by plumb-bob:

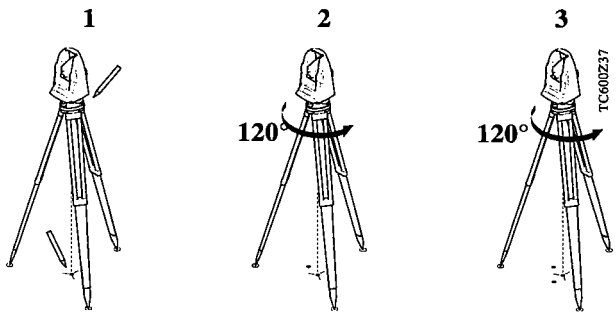
Set up and level up the instrument (with plummet) on the tripod. Mark the ground point. Remove the plumb-bob. Check that the crosshairs of the optical plummet intersect at the ground point. The accuracy achievable is about 1mm.



Checking by turning the tribrach:

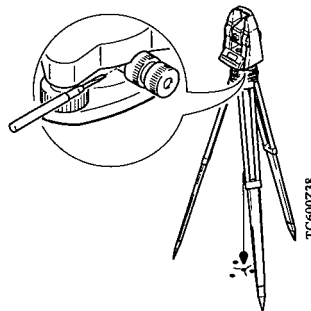
1. Level up the instrument using the electronic level. Mark the ground point. Using a pencil, mark the outline of the tribrach on the tripod plate.
2. Turn the tribrach 120° , fit it into the outline, level up the instrument, and again mark the ground point.
3. Repeat this procedure in the third position.

If the three points do not coincide, adjust the crosshairs of the tribrach to the center of the triangle formed by the three ground points.



Adjustments:

Use a screwdriver to turn the two set screws alternately by the same small amount in order to center the crosshairs on the marked ground point.

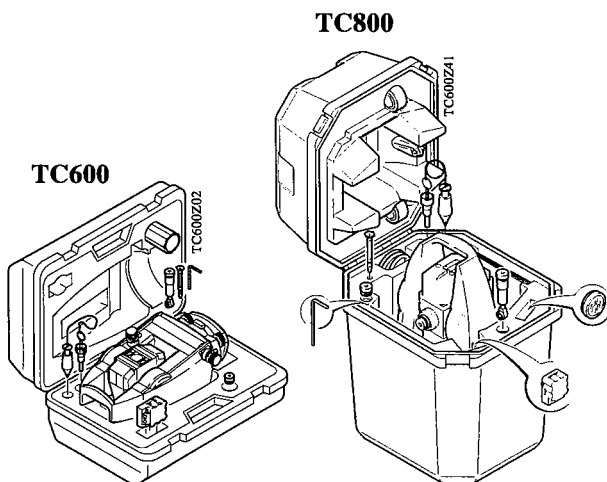


Care and storage

Transport:

When dispatching the equipment, always use the complete original Leica packaging (case and cardboard box). When transporting the equipment in the field, always make sure to:

- either carry the instrument in its original case or
- carry the tripod with its legs splayed across your shoulder, keeping the **attached instrument upright**.



Cleaning and drying:

Objective, eyepiece and prisms

- blow dust off lenses and prisms
- Never touch the glass with fingers
- Use only a clean, soft and lint-free cloth for cleaning. If necessary, moisten the cloth with pure alcohol.

Use no other liquids; these may attack polymer components.



When storing the equipment, particularly in summer and inside a vehicle, take the storage temperature limits (-40°C to + 70°C / -40°F to +158°F) into account.

Cables and plugs:

Keep plugs clean and dry. Blow out any dirt lodged in the plugs of the connecting cables.

If you unplug connecting cables during the measurement, you may lose data.

Always switch off the instrument before removing the connecting cables.

Fogging of prisms:

Reflector prisms that are cooler than the ambient temperature tend to fog. It is not enough to simply wipe them. Keep them for some time inside your jacket or in the vehicle to allow them to adjust to the ambient temperature.

Storage:

If the instrument becomes wet, leave it unpacked. Wipe down, clean, and dry the instrument (at not more than 40 °C/ 108°F), transport case, foam inserts, and accessories. Pack up the equipment only when it is perfectly dry.

Battery charging



WARNING:

Use a battery charger in a dry room only, never outdoors. Charge batteries only at an ambient temperature between 10°C and 30°C (50°F to 86°F). We recommend a temperature of 0°C to +20°C (32°F to 68°F) for storing the batteries.

Battery chargers GKL22 and GKL23

Charger GKL22:

The charger outputs constant current and charges a NiCd battery within 14 hours. The charging procedure starts automatically whenever a battery is connected to the charger and a red control lamp indicates a fully charged battery.

Charging batteries with 2 pole plug requires an adapter cable.

Fast charger GKL23:

Fast charging with the GLK-23 is possible with Leica NiCd-batteries equipped with a 5-pole plug. Fast charging requires 1.5 to 5 hours depending on the battery capacity.

Leica batteries with 2-pole plugs can be charged using an adapter cable - this charging procedure will take 14 hours.

Connecting 2 batteries at the same time, will charge the batteries sequentially. Batteries with fast charging capabilities are priority.

Charging modes and status of the GKL-23 is shown by three color-LEDs.

For more information about use, functions and displays refer to the user manual of the GKL-23.

Battery chargers **GKL12 and GKL14**

The GKL12 charger is suitable for charging the total station's battery insert (2-pole charging plug) and the GEB70 compact battery. For the GEB71 universal battery, use a GKL14 charger.

Before you use new batteries for the first time, charge them for 20 to 24 hours. This also applies to batteries that have not been used for several months. NiCd batteries reach full capacity after two or three normal cycles each of a 14-hour charge followed by a full discharge

If battery performance drops noticeably, run one or two full cycles, i.e. charge for 14 hours and allow to discharge until the instrument displays 'Battery low'.

Leave flat batteries to charge for fourteen hours. If you do not know a battery's state of charge, also leave it to charge for fourteen hours.

Set the battery charger's voltage selector to your AC mains voltage, **115V** or **230V**. Plug in the charger to the mains. The green indicator lamp should light. If it does not light, there is a power cut or the mains cable or charger is faulty.

Connect the battery to the charger. The red charging indicator should light. If it does not, the battery is not charging, i.e. the battery cable is faulty or the battery fuse has blown and should be replaced. On the GKL12, you may not have started the timer or it may have stopped at the end of the charging period.

Safety directions

The following directions should enable the person responsible for the TC600/TC800, and the person who actually uses the instrument, to anticipate and avoid operational hazards.

The person responsible for the instrument must ensure that all users understand these directions and adhere to them.

Intended use of instrument

Permitted uses

The TC600/TC800 electronic total stations are intended for the following applications:

- Pointing at targets or reflectors (reflectors just TC800)
- Measuring horizontal and vertical angles
- Measuring distances
- Recording measurements
- Computing by means of applications software
- Visualising the aiming direction (with EGL1 Guidelight; just TC800)

Adverse uses

- Activation of the total station without previous instruction
- Use outside of the intended limits
- Disabling safety systems and removal of hazard notices
- Opening the instrument using tools (screwdriver, etc.), unless this is specifically permitted for certain functions
- Modification or conversion of the instrument
- Activation after misappropriation
- Use with accessories from other manufacturers without the prior express approval of LEICA
- Aiming directly into the sun
- Inadequate safeguards at the measuring station (e.g. when measuring on roads, etc.)

**WARNING :**

Adverse use can lead to injury, malfunction, and damage.

It is the task of the person responsible for the instrument to inform the user about hazards and how to counteract them. The TC600/TC800 total stations are not to be used until the user has been properly instructed how to use them.

Limits of use**Environment:**

Suitable for use in an atmosphere appropriate for permanent human habitation: not suitable for use in aggressive or explosive environments. Use in rain is permissible for limited periods.

Refer to section 'Technical data'.

Responsibilities

Area of responsibility for the manufacturer of the original equipment LEICA AG, CH-9435 Heerbrugg (hereinafter referred to as LEICA):

LEICA is responsible for supplying the product, including the user manual and original accessories, in a completely-safe condition.

Responsibilities of the manufacturers of non-LEICA accessories:

The manufacturers of non-LEICA accessories for the TC600/TC800 electronic total station are responsible for developing, implementing and communicating safety concepts for their products, and are also responsible for the effectiveness of those safety concepts in combination with the LEICA product.

Responsibilities of the person in charge of the instrument:**WARNING:**

The person responsible for the instrument must ensure that it is used in accordance with the instructions. This person is also accountable for the training and deployment of personnel who use the instrument and for the safety of the equipment when in use.

The person in charge of the instrument has the following duties:

- To understand the safety instructions on the product and the instructions in the user manual.
- To be familiar with local regulations relating to accident prevention
- To inform LEICA immediately if the equipment becomes unsafe.

Hazards of use

Main hazards of use



WARNING:

The absence of instruction, or the inadequate imparting of instruction, can lead to incorrect or adverse use, and can give rise to accidents with far-reaching human, material, financial and environmental consequences.

Precautions: All users must follow the safety directions given by the manufacturer and the directions of the person responsible for the instrument.



WARNING:

The charger must not be used in damp or inclement conditions. If moisture penetrates the charger, the user may receive an electric shock.

Precautions: Use the charger only indoors, in dry rooms. Protect it from damp. If the charger is damp, do not use it.



WARNING:

If you open the charger, either of the following actions may cause you to receive an electric shock:

- Touching live components
- Using the charger after incorrect attempts to carry out repairs

Precautions: Do not open the charger yourself. Only a LEICA-approved service technician is entitled to repair it.

**WARNING:**

If the equipment is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gases are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the equipment irresponsibly you may enable unauthorized persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.
- Leakage of silicone oil from the compensator can damage the optical and electronic subassemblies.

Precautions: Dispose of the equipment appropriately in accordance with the regulations in force in your country. Always prevent access to the equipment by unauthorized personnel.

**CAUTION:**

Watch out for erroneous distance measurements if the instrument is defective or if it has been dropped or has been misused or modified.

Precautions: Periodically carry out test measurements and perform the field adjustments indicated in the user manual (*refer to section 'Determine instrument errors' and 'Checking and adjusting'*), particularly after the instrument has been subjected to abnormal use and before and after important measurements.

**CAUTION:**

Be careful not to point the instrument directly towards the sun, because the telescope functions as a magnifying lens and can injure your eyes or damage the internal components of the EDM and EGL1 Guidelight (just TC800, optional)

Precautions: Avoid pointing the telescope directly at the sun.

**WARNING:**

During target recognition or stakeout procedures there is a danger of accidents occurring if the user does not pay attention to the environmental conditions around or between the instrument and the target (for example: obstacles, excavations or traffic).

Precautions: The person responsible for the instrument must make all users fully aware of existing dangers.

**WARNING:**

Inadequate securing of the surveying site can lead to dangerous situations, for example in traffic, on building sites and at industrial installations.

Precautions: Always ensure that the survey site is adequately secured. Adhere to the regulations governing accident prevention and road traffic.

**WARNING:**

If a target lamp accessory is used with the instrument the lamps surface temperature may be extreme after a long working period. It may cause pain if touched. Replacing the halogen bulb before the lamp has been allowed to cool down may cause burning to the skin or fingers.

Precautions: Use appropriate heat protection such as gloves or wollen cloth before touching the lamp, or allow the lamp to cool down first.

**WARNING:**

If computers intended for use indoors are used in the field, there is a danger of electric shock.

Precautions: Adhere to the instructions given by the computer manufacturer with regard to field use in conjunction with LEICA instruments.

**CAUTION:**

If the accessories used with the instrument are not properly secured, and the equipment is subjected to mechanical shock (e.g. blows, falling etc.), the equipment may be damaged or people may sustain injury.

Precautions: When setting-up the instrument, make sure that the accessories (e.g. tripod, tribrach, connecting cables, etc.) are correctly adapted, fitted, secured and locked in position.

Avoid subjecting the equipment to mechanical shock. Never position the instrument on the tripod baseplate without securely tightening the central fixing screw. If the screw is loosened always remove the instrument immediately from the tripod.



CAUTION:

During the transport or disposal of charged batteries it is possible for inappropriate mechanical influences to constitute a fire hazard.

Precautions: Before transporting or disposing of equipment, discharge the battery (e.g. by running the instrument in tracking mode until the batteries are exhausted or discharging with the GKL23 battery charger).



DANGER:

Because of the risk of electrocution, it is very dangerous to use reflector poles and extensions in the vicinity of electrical installations such as power cables or electrical railways.

Precautions: Keep at a safe distance from electrical installations. If it is essential to work in this environment, first contact the safety authorities responsible for the electrical installations and follow their instructions.



WARNING:

By surveying during a thunderstorm you are at risk from lightning.

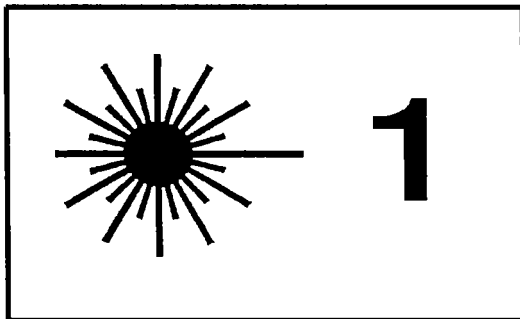
Precautions: Do not carry out field surveys during thunderstorms.

Laser classification

Integrated EDM

The EDM module built into the total station produces an invisible infrared beam which emerges coaxially from the telescope objective (*refer section 'Important parts'*). The product is a Class 1 LED product in accordance with:

- IEC 825-1 : 1993 'Radiation safety of laser products'.
- EN 60825-1 : 1994 'Radiation safety of laser products'.



TC600

Beam divergence:	2.5 mrad
Impulse duration:	10 ns
Maximum power output:	200 μ W peak
Measurement uncertainty:	\pm 5%

TC800

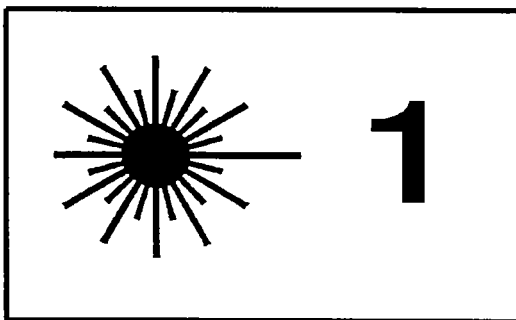
Beam divergence:	2.02 mrad
Impulse duration:	10 ns
Maximum power output:	360 μ W peak
Measurement uncertainty:	\pm 5%

**Guidelight EGL1
(just TC800)**

The Guidelight option produces an visible LED light beam from the upper front side of the telescope. The product is a Class 1 LED product *) in accordance with:

- IEC 825-1 : 1993 'Radiation safety of laser products'.
- EN 60825-1 : 1994 'Radiation safety of laser products'.

*) within the specified working range > 5 m (> 16 ft).



Blinking diode	Yellow	Red
Beam divergence	2.4 °	2.4 °
Impulse duration	2 x 35 ms	35 ms
Maximum power output	0.55 mW	1.2 mW
Measurement uncertainty	± 5 %	± 5 %



CAUTION:

Use the Guidelight option within the specified range (at a distance of more than 5 m (16 ft) from the telescope).

Class 1 laser or LED products are safe under reasonably foreseeable conditions of operation and are not harmful to the eyes provided that the products are used and maintained in accordance with the instructions.

**CAUTION:**

Allow only authorized LEICA service workshops to service the total station.

***Electromagnetic
acceptability***

The term 'electromagnetic acceptability' is taken to mean the capability of the instrument to function correctly in an environment where electromagnetic radiation and electrostatic discharges are present, and without causing electromagnetic disturbances in other equipment.

**WARNING:**

Electromagnetic radiation can cause disturbances in other equipment.

Although the total station meets the strict regulations and standards which are in force in this respect, LEICA cannot completely exclude the possibility that other equipment may be disturbed.

**CAUTION:**

There is a risk that disturbances may be caused in other equipment if the total station is used in conjunction with accessories from other manufacturers (e.g. field computers, personal computers, portable radios, non-standard cables, external batteries etc.).

Precautions: Use the equipment only with accessories from LEICA. When combined with total stations, the strict requirements stipulated by the guidelines and standards are assured. When using computers and portable radios, pay attention to the information provided by the manufacturer., regarding electromagnetic acceptability.

**CAUTION:**

Disturbances caused by electromagnetic radiation can result in the tolerance limits for measurements being exceeded.

Although the total station meets the strict regulations and standards which are in force in this connection. LEICA cannot completely exclude the possibility that the total station may be disturbed by very intense electromagnetic radiation, for instance near radio transmitters, portable radios, diesel generators etc.

Precautions: Check the plausibility of results obtained under these conditions.

**WARNING:**

If the total station is operated with cables attached at only one of their two ends (e.g. external power supply cables, interface cables, etc.), the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other instruments may be impaired.

Precautions: While the total station is in use, cables (e.g. instrument to external battery, instrument to computer, etc.) must be connected at both ends.

FCC statement
(applicable in U.S.)



WARNING:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



WARNING:


Changes or modifications not expressly approved by Leica for compliance could void the user's authority to operate the equipment.

Product labeling

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

Error reports and warnings

	Error report	Cause	Remedy
02	Full	Internal memory is full	Clear internal memory
03	Invalid Value	Non-valid value was entered	Enter a valid value
12	Battery Empty	Battery exhausted	Change battery
19	Temperature	The inside of the instrument is too hot or too cold	Cool or warm the instrument
21	Parity Error	Parity error at interface	Inspect cables and interface parameters
22	RS232 Timeout	The system is receiving no response from the interface	Inspect cables, and functionality of external recording device. Inspect baud rate
24	RS232 Overflow	The data are being transmitted too quickly	Repeat using a lower baud rate
44	Value >1 gon	V-index measured, or line-of-sight error, is > 54' (> 1 gon)	Redetermine value, or contact service department
50	Angle Error	Measuring error angle scanning	Contact service department
51	System error	System error in compensator	If fault re-occurs, contact service department
55	EDM Signal	EDM signal faint, absent or distorted	Inspect pointing. Check that distance is not too great

	Error report	Cause	Remedy
56	EDM System	System error in EDM	If error occurs repeatedly, contact service department
58	TILT	Total station not leveled	Level the instrument or re-adjust the V-index, which adjusts also the electronic level
	Invalid Data	Invalid data for transfer to TC600/TC800	Press  key
82	Out of Range	For determination of index- or collimation error, V-angle is more than $\pm 6^\circ$ (6.6666 gon) off the horizontal plane	Bring target point within tolerance range
9x		System defective	Contact service department

	Warning	Cause	Remedy
09	PtNr Overflow	PtNr outside the upper and lower limits	Enter a new PtNr max. 8 digits
12	Battery Low	The battery is practically flat (Level=0)	Change battery or connect an external battery

Technical data

Angle measurement	absolute, continuous
Updates	0.3 seconds
Units of measurement (selectable)	400 gon, 360°decimal, 360°sexagesimal, V%
Angle display (selectable)	1", 5", 10"; 0,001° 1 mgon, 0.5 mgon
Standard deviation	TC600: Hz: 5" (1.5 mgon) V : 5" (1.5 mgon) TC800: Hz: 3" (1.0 mgon) V : 3" (1.0 mgon)
Automatic vertical index	Working range: $\pm 5'$ (± 0.018 gon) Accuracy: $\pm 2''$ (± 0.6 mgon)
Bubble sensitivity	Circular level: 4/2mm Electronic level: 5" (1.5 mgon)
Telescope	Field of view at 1000 m: 27m/km Height of tilting axis: 196 mm TC600: Magnification 28X Objective aperture: 28mm Shortest focusing distance: 2m TC800: Magnification 30X Objective aperture: 42mm Shortest focusing distance: 1.7m

Optical plummet	In tribrach, focusable, 2X magnification
Display	TC600: On face I, 4 lines of 16 characters TC800: On face I + II, 4 lines of 16 characters
Keyboard	TC600: On face I, 7 function keys Contact pressure: 30g TC800: On face I + II, 7 function keys Contact pressure: 30g
Distance measurement	Infra-red measuring frequency 50MHz 3 m, Carrier wave 0.860 μm
Standard deviation	TC600: 3 mm + 3 ppm TC800: 2 mm + 2 ppm
Range	TC600: 1100 m with 1 prism TC800: 2500 m with 1 prism

Range

Number of circular prisms	Atmospheric conditions		
	poor ¹	fair ²	excellent ³
TC600			
1	800 m	1100 m	1300 m
3	1000 m	1600 m	2000 m
TC800			
1	1200 m	2500 m	3500 m
3	1500 m	3500 m	5000 m

- ¹) Very hazy, visibility 3 km, or strong sunlight and heavy heat shimmer
²) Light haze, or some cloud and slight heat shimmer
³) Overcast, no haze, visibility 30 km, no heat shimmer

Time per measurement **TC600:** about 3 sec.
 TC800: about 2 sec.

Data recording Internal data storage for about 2000 standard measurement blocks

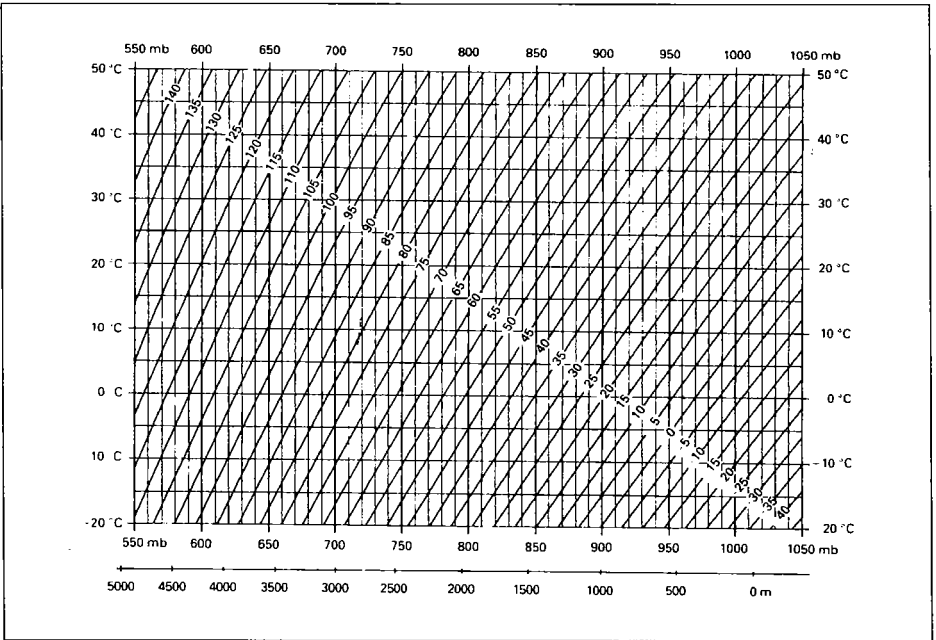
Power supply The voltage must range from 10 to 16 V= (DC) when using external power cables.

Operating life of batteries	battery module GEB77	compact battery GEB70	universal battery GEB71
Number of measurements			
TC600	about 400	about 1200	about 4000
TC800	about 600	about 1800	about 6000
	(angle and distance measurements)		
Capacity	0.6 Ah	2.0 Ah	7.0 Ah
Weight	0.2 kg	0.9 kg	3.0 kg

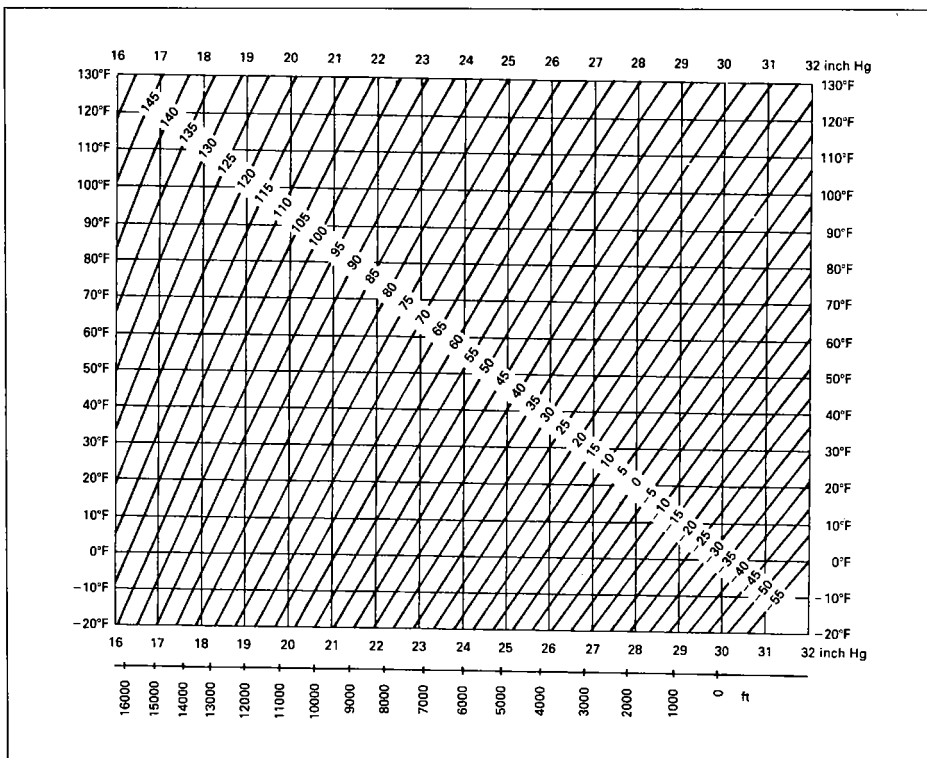
Weight about 4.2 kg (9¹/₄ lb),
excluding battery and tribrach

Temperature range Operation: -20°C to +50°C
(-4° F to 122° F)
Storage: -40°C to +70°C
(-40° F to 158° F)

**Atmospheric correction in ppm with °C, mb, H (meter)
at 60% relative humidity**



**Atmospheric correction in ppm with °F, inch Hg, H (Feet)
at 60% relative humidity**



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***Leica AG, Heerbrugg,
Switzerland
has been certified as being
equipped with a quality
system which meets the
International Standard of
Quality Management
and Quality Systems
(ISO standard 9001)***



***Total Quality Management-
Our commitment to total
customer satisfaction***

***Ask your local Leica agent for
more information about our
TQM program***

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