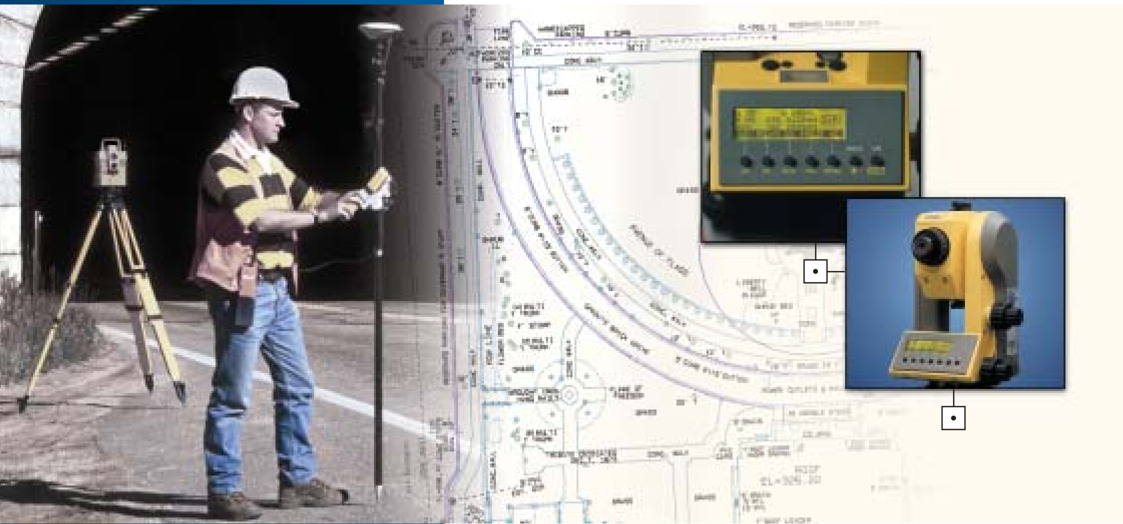
Trimble 3300DR
User Guide



Topo Software
PN 571 703 151

www.trimble.com

Trimble™

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1 Introduction

Dear Customer

By purchasing a Trimble® 3300DR Routine Total Station from Trimble you have opted for a leading-edge product in the field of surveying instruments. We congratulate you on your choice and would like to thank you for the trust placed in our company.

The System Philosophy

For quite some time, surveying has no longer been limited to the measurement of bearings and distances. Complex measurement systems have been in demand that do not only satisfy ever increasing needs for automatization, but also those involving digital data processing as well as the effectiveness of daily measuring practice. New standards have thus been set regarding technology and operating convenience.

The Trimble 3300DR Routine Total Station is part of a complete range of surveying instruments from Trimble. Data interchange between all the instruments is ensured by a common data format.

The operating convenience offered by the Trimble 3300DR hardware is very high within this group of total stations. The clear graphic display and only 7 keys give the user a wide variety of information for the processing in the field and provide him with valuable aids for achieving high productivity in solving his surveying tasks.

The software version “Topo[1]” meets high standards with the special programs for this application.

[1] topography

☝ Attention !

Please read the safety notes in chapter 2 carefully before starting up the instrument.

The instrument was manufactured by tested methods and using environmentally compatible quality materials.

The mechanical, optical and electronic functions of the instrument were carefully checked prior to delivery. Should any defects attributable to faulty material or workmanship occur within the warranty period, they will be repaired as a warranty service.

This warranty does not cover defects caused by operator errors, inexpert handling or inappropriate application.

Any further liabilities, for example for indirect damages, cannot be accepted.

User manual:	**Edition ver.03.00**
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Date:	October 2004
Software release:	> **V 5.61**

Subject to alterations by the manufacturer for the purposes of further technical development.

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☞ Tip

The type label and serial number are provided on the left-hand side and under-side of the instrument, respectively. Please note these data and the following information in your user manual. Always indicate this reference in any inquiries addressed to our dealer, agency or service department:

Instrument:

- ☐ Trimble 3303DR
- ☐ Trimble 3305DR
- ☐ Trimble 3306DR

Serial number: Software version:

We would like to wish you every success in completing your work with your Trimble 3300DR. If you need any help, we will be glad to be of assistance.

Yours

Trimble®

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2 Trimble® 3300DR - The Routine Total Stations

This chapter gives you an overview of the operation and controls of the instrument as well as the programs which are a special feature of the Trimble® 3300DR Routine Total Stations.

Hardware Overview

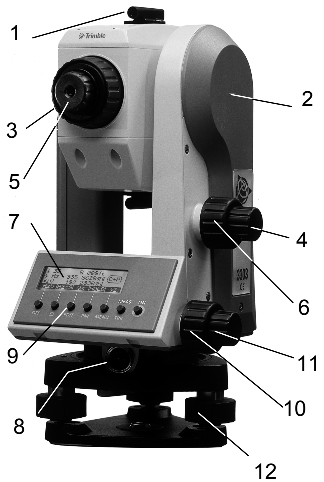


Fig. 1-1: Trimble 3303 DR,
Control side

1	Sighting collimator
2	Mark for trunnion axis height
3	Telescope focusing control
4	Vertical clamp
5	Eyepiece
6	Vertical tangent screw
7	Display (graphic capabilities 128 x 32 pixels)
8	Interface
9	Keyboard
10	Horizontal tangent screw
11	Horizontal clamp
12	Tribrach screw
13	Telescope objective with integrated sun shield
14	Battery cassette lock
15	Vertical axis level
16	Battery
17	Circular level
18	Adjustment screws for optical plummet
19	Optical plummet
20	Tribrach clamping screw

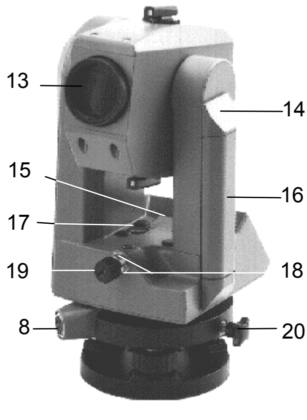


Fig. 1-2: Trimble 3300DR,
Objective side

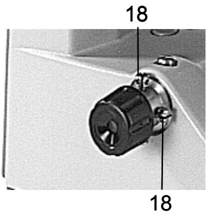


Fig. 1-3: Trimble 3300DR,
Optical plummet

The Total Stations Trimble 3303DR, 3305DR and Trimble 3306DR

The electronic Routine Total Stations as instruments of mean accuracy are not only appropriate for land-measuring by geodesists, but also users on building sites appreciate their uncomplicated handling as well as rapidity, reliability and clearness in measuring.
Measurements are made easy thanks to menu guidance supported by graphics, instrument software with flexible point identification and universal data record formats.

The principal features:

Distance measurement	by phase comparison method (PR and DR mode)
Measuring range	up to 100m Direct reflex up to 5000m/7500 m with 1/3 prism(s)
Angle measurement	Hz and V electronically all common units and angle reference systems
Error compensation	Automatic compensation of sighting axis and index errors
The advantages in operating	Display screen with graphic capabilities (128 x 32 pixels), user-friendly surface, easy familiarisation, simple handling, reliable control of all measuring and computing processes with clear references, integrated, practical application programs, ergonomic arrangement of controls, light, compact construction
Quick charging, longer times of measuring	Eco-friendly power supply for about 1000 angle and distance measurements, charging time 2 hours
Data management	RS 232 C (V 24) interface as data input and output Internal data memory of Trimble 3303DR and Trimble 3305DR can record 1900 data lines.

DR Measurement

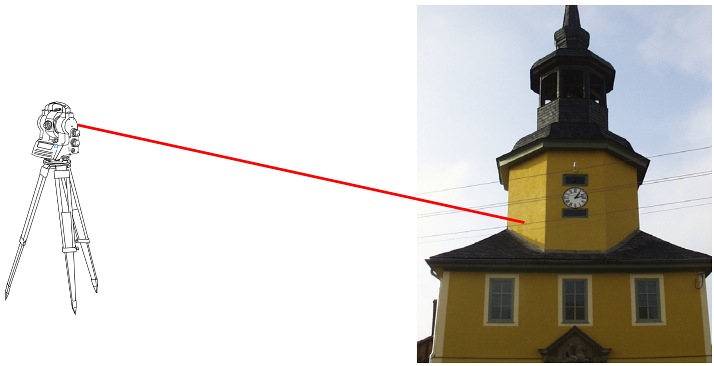
Direct Reflex Mode and Laser Pointer

In addition to the well known prism mode (PR) the instrument is equipped with:

- Direct Reflex Mode (DR) and Laser Pointer

The Laser pointer can be used to support aiming on any surface in- and outdoor and to search prisms at distances greater than 1000 meters.

> ☝ Attention!
>
> Do not use the laser pointer function below 1000 m on prisms and high reflecting surfaces.



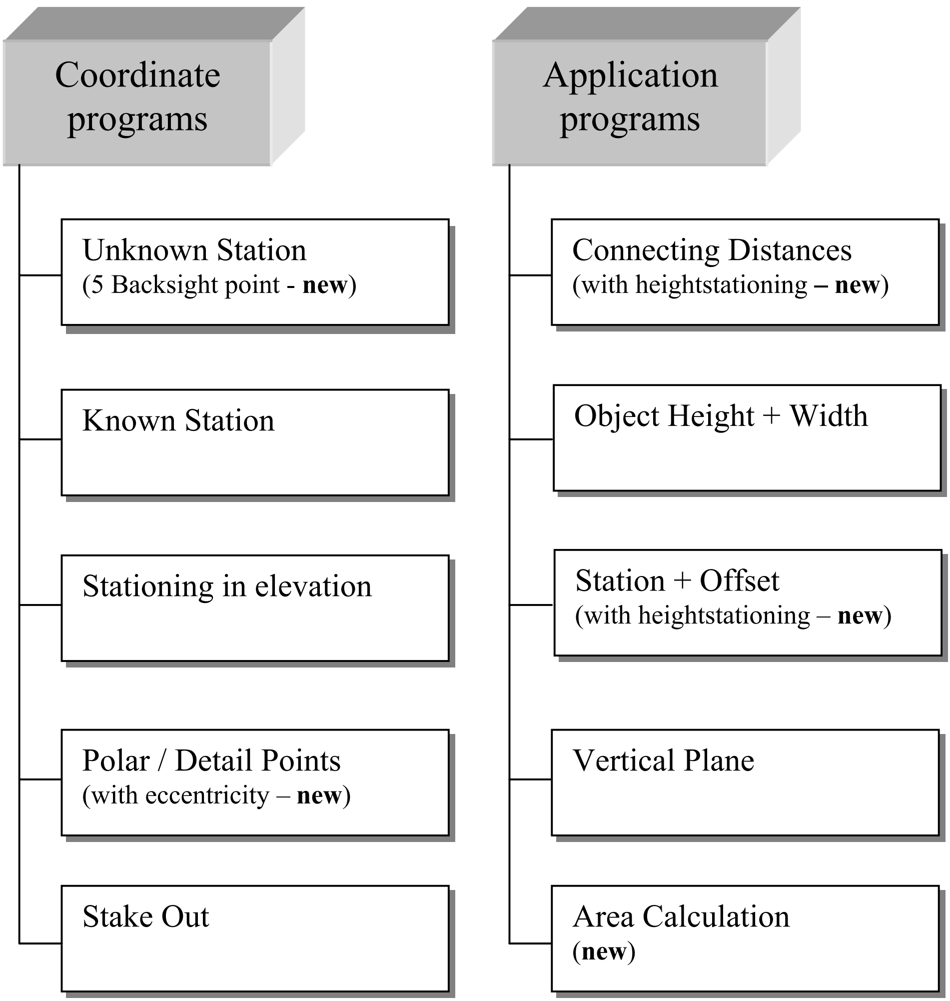
DR – Mode measurement without prism

PR - Mode (Standard) - measurement with prism

This program is available on the delivered instrument.

Overview about software version „Topo“

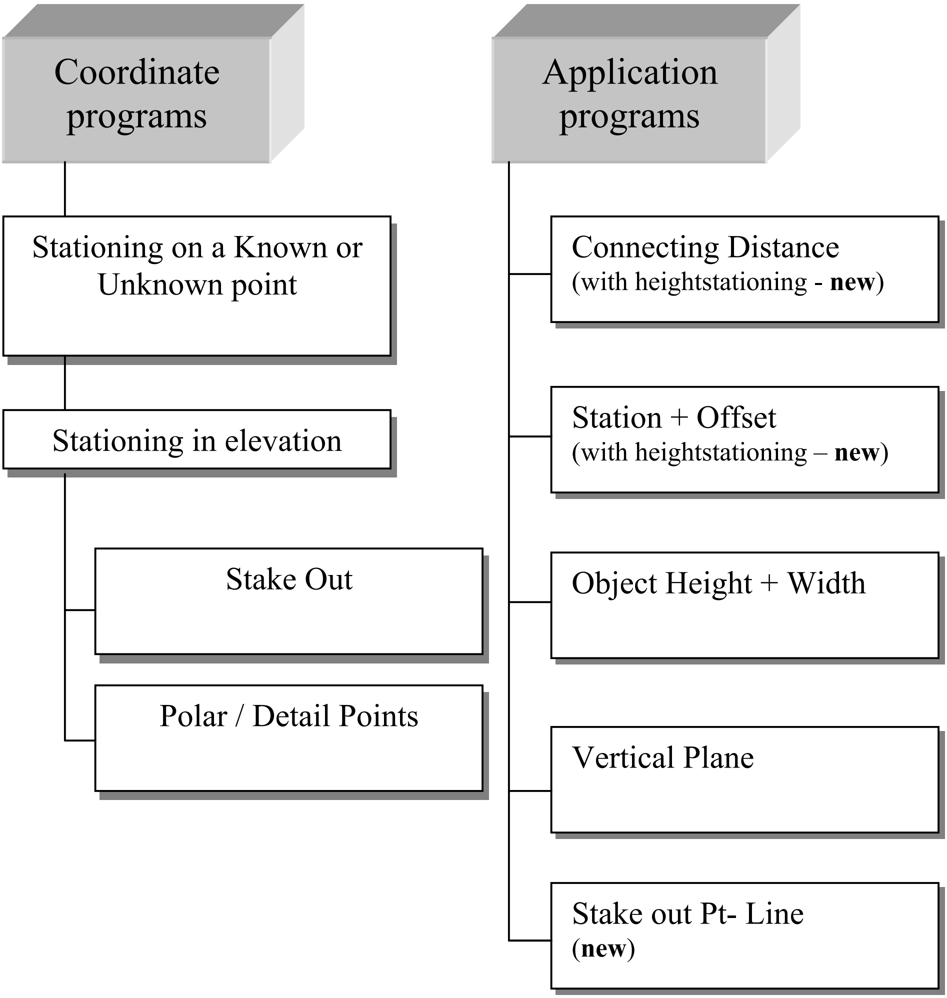
(version > 5.00)



This program version can be selected.

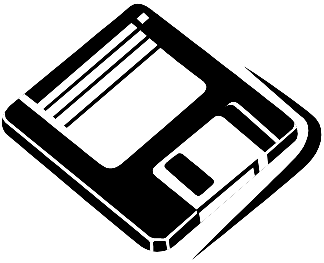
Overwiev about software version „Construction“

(version > 4.00)



Overview about software “Topo”

Menu (ON+MENU)



- Input
  - 1 Prism (prism constant)
  - 2 Scale
  - 3 Temp (temperature)
  - 4 Pressure
- Applications
  - 1 Connecting distance
  - 2 Object height
  - 3 Station + Offset
  - 4 Vertical plane
  - 5 Area Calculation
- Coordinates
  - 1 Unknown Station
  - 2 Known Station
  - 3 Stationing in elevation
  - 4 Polar/Detail Points
  - 5 Stake out
- Setting Instrument
  - 1 Angle (resolution)
  - 2 Distance (resolution)
  - 3 V-Refer
  - 4 Coord.System
  - 5 Coord.Display
  - 6 Temperature
  - 7 Pressure
  - 8 Turn off
  - 9 Sound
  - 10 Angle (Units)
  - 11 Distance (Units)
  - 12 Display Illumination
  - 13 Contrast
- Dset
  - 1 DR-Menue
  - 2 Longe Range
  - 3 Laser Pointer OFF
  - 4 EDM-Time-out

Overview about software “Topo”

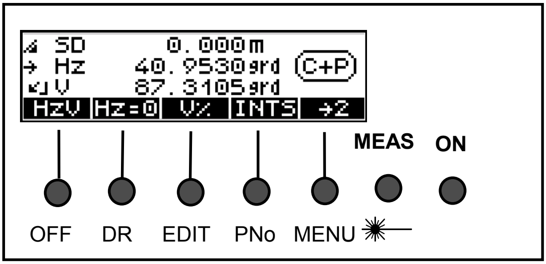
- Interface
  - 0 Recording
  - 1 Record Settings
  - 2 Format
  - 3 Parity
  - 4 Baudrate
  - 5 Protocol
  - 6 Position C
  - 7 Position P
  - 8 Position I
  - 9 T-O Recording
  - 10 PC-Demo
- Data transfer
  - 1 MEM -> Peripherie
  - 2 Peripherie -> MEM
- Update/Service
  - 1 Update
  - 2 Service
  - 3 F0 – EDM

The Keyboard

Two types of keys:

- Hardkeys
  - direct function
    ON and MEAS
  - Key in connection with ON (SHIFT)
- Softkey
  function depending on program, significance explained in display line at the bottom

For operating the Trimble 3300DR, only 7 keys are needed.



Key Functions (Hardkeys)

ON	Switching the instrument on and changing over to hardkey function
MEAS	Starting a single measurement or Tracking mode
ON *OFF*	Switching the instrument off
ON *DR*	Switch between PR and DR measure mode
ON *EDIT*	Calling up the memory
ON *PNo*	Calling up the input of point number and code
ON *MENU*	Going to the main menu
ON ✳—	Switch Laser pointer ON / OFF

Softkeys

📖 Overview softkeys Annex

Function keys defined by the display in dependence on the program.

Using the different EDM Modes DR / PR and Laser Pointer

Direct Reflex Mode

Direct Reflex Mode – DR
When measuring without prisms or any other reflectors. The reflector height is set to Zero (default). If needed this values can be changed in the Menu “INPUT”. The prism constant is set to zero to.

Direct Reflex Mode ON

Measuring Range

70 m to Kodak Gray Card- 18% reflection
100 m to Kodak Gray Card- 90% reflection
(depending on the object surface and light conditions.

Prism Mode

Prism Mode - PR
When measuring to prisms or other reflectors like foil. The prism constant and reflector height can be changed in the Menu.

Prism mode ON

Measuring Range:

1,5 ... 3000 m (for 1 prism, Standard range - SR)
1,5 ... 5000 m (for 3 prisms, SR)
2,5 ... 250 m (for foil reflector 60 x 60 mm^2, SR)

Using the different EDM Modes DR / PR and Laser Pointer

Long Range Mode

Long Range Mode (LR) (DR mode to prisms)
When measuring to prisms or other reflectors at long distances or bad weather conditions. The prism constant and reflector height can be changed in the Menu.”INPUT”

Long Range Mode ON

Measuring Range:

1000	5000 m (for 1 prism, LR)
1000	7500 m (for 3 prisms, LR)
2,5	800 m (for foil reflector 60 x 60 mm^2, LR)

☞ Note

Prisms should be measured in Prism Mode. In this mode the EDM is not so sensitive to disturbing influences and has the highest accuracy.

☝ Attention!

Do not use Direct Reflex Mode on prisms or high reflective surfaces for distances below 1000 m. In that case the prism constant is not taken into consideration.
Error message 042 could appear:
1. doing measurements in DR mode to prisms at distances longer than 300m or distances shorter 1,5m
2. doing measurements in DR mode to non cooperative targets at distances close to the maximum working range in that mode.

Laser Pointer

When aiming to targets or searching targets.

Laser Pointer ON

Direct Reflex Distance Measurement

Appendix
Technical Data

The values given in the technical data concerning accuracy, range and measurement time depend on the following effects:

EDM Modes:

- Atmospheric influences (sight conditions, rain, wavering heat)
- Radiation of the sun at the target
- Disruption of the beam by moving objects

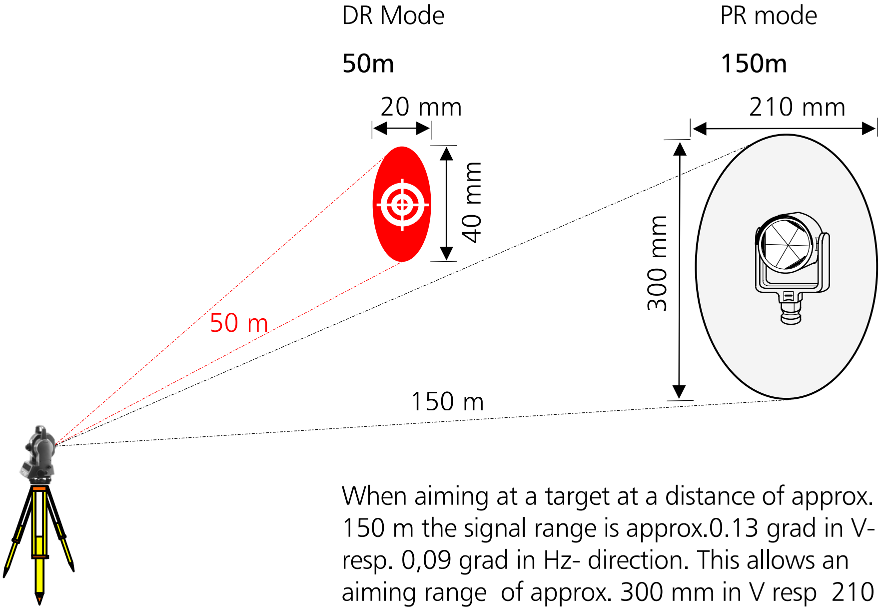
To ensure a maximum result in distance measurement a time out (of the measuring time) has been set to max. 30 sec. This guarantees that even at bad conditions greater distances can measured. However a measurement takes about 2 seconds.

☞ Tip

If there are unfavourable sighting distances or measuring conditions, you should await the time – out of the measurement. Every measurement taken within that time matches the accuracy's guaranteed for this mode of measurement.

The range of unambiguity of an indicated measurement covers up to 9 km using prism mode as well as direct reflex mode.

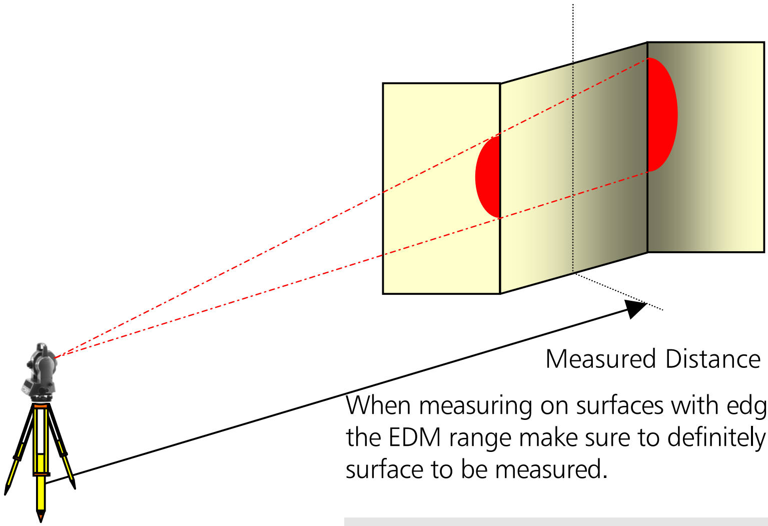
When measuring in direct reflex mode the following measuring area at the target is significant for a measured distance of 50 meters.



When aiming at a target at a distance of approx. 150 m the signal range is approx.0.13 grad in V- resp. 0,09 grad in Hz- direction. This allows an aiming range of approx. 300 mm in V resp 210 mm in Hz to grant a secure distance measurement. To make sure that there is always enough signal no distance measurement should be taken out of this range.

☝ Attention!

When using direct reflex mode avoid any interruptions of the beam. If the beam is interrupted while measuring (e.g. shortly by moving objects) the measured distance has to be checked by remeasuring.



When measuring on surfaces with edges within the EDM range make sure to definitely aim to the surface to be measured.

☞ Tip

To separately measure angle and distance or indirectly determine points use programs „Eccentricity / Intersection“.

When measuring greater distances the accuracy of the distance measurement depends on the correction of the atmospheric influences such as temperature pressure and humidity. In order to restrict the atmospheric correction to exactly 1ppm (mm/km) temperature has to be determined up to 1°C, pressure up to 4hPa and humidity up to 20% along the measuring section.

📖 Appendix

The correction formulas are given in the appendix.

📖 Formulas and constants

☞ Tip

Using direct reflex mode be aware of a minimum distance of 1.5 m. If there are unfavourable conditions you cannot fall short of this minimum distance.

The Basic Concept of the Menu

The total station is able to realise a great variety of functions.

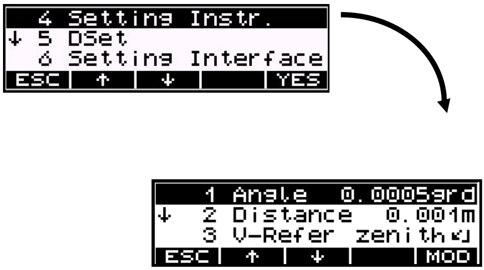
Functions needed directly during the measuring process are accessible through the key functions.

ON MENU

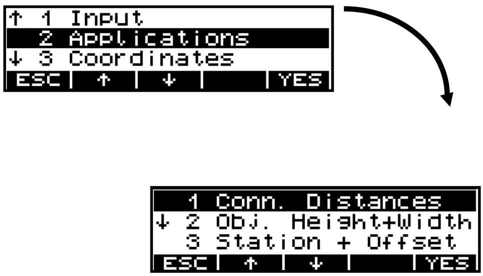
The menu facilitates the access to many other functions.

Having selected the menu, you can go to submenus and you are offered available functions, respectively:

e.g. settings



e.g. measurement programs



Use of this Manual

The manual is divided into 8 main chapters.

The subchapters have not been numbered. Clarity and convenience are provided by a maximum of 3 structural levels, for example:

Chapter — 4 Coordinates

Section — 2 Coordinates Unknown Station

Subsection — Recording

The pages are divided into two columns:

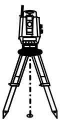
Functional text for calling up programs:

4 Coordinates

3 Stationing in elevation

Mode Softkeys and their functions

📖 Cross references to other chapters



Small graphics

Principal text including

- Description of measuring processes and methods
  - instrument operation and keys
  -Trimble 3300DR display / graphics
  - drawings and large graphics
  - tips, warnings and technical information

☞ Tip

for hints, special aspects and tricks

☝ Attention !

for risks or potential problems

☟ Technical Information

for technical background information

Measuring tasks are defined as follows:

given: : given values
meas.: : measured values
requ.: : required/computed values

You will find a list of terms in the annex (Geodetic Glossary).

Risks in Use

Instruments and original accessories from the manufacturer have to be used only for the intended purpose. Read the manual carefully before the first use and keep it with the instrument so that it will be ready to hand at any time. Be sure to comply with the safety notes.

☝ Attention !

- Don't make any changes or repairs on the instrument and accessories. This is allowed only to the manufacturer or to specialist staff authorised by the same.
- Do not point the telescope directly at the sun.
- Make sure to strictly observe the following instructions regarding the use of the laser devices.
- Do not use the instrument and accessories in rooms with danger of explosion.
- Use the instrument only within the operative ranges and conditions defined in the chapter of technical data.
- Do not operate the battery charger in humid or wet conditions (risk of electrical shock). Make sure the voltage setting is identical on the battery charger and voltage source. Do not use instruments while they are wet.
- Only the service team or authorised specialist staff are allowed to open the instrument and accessories.

Risks in Use (cont.)

☝ Attention !

- Take the necessary precautions at your measuring site in the field, note the relevant traffic rules.
- Check that the instrument has been correctly set up and the accessories are properly secured.
- Limit the time of working when it is raining, cover the instrument with the protective hood during breaks.
- After taking the instrument out of the case, fix it immediately to the tripod with the retaining screw. Do never leave it unfastened on the tripod plate. After loosening the retaining screw again, put the instrument immediately back into the case.
- Prior to starting operation, allow sufficient time for the instrument to adjust to the ambient temperature.
- Tread the tripod legs sufficiently down in the ground in order to keep the instrument in stable position and to avoid its turning over in case of wind pressure.
- Check your instrument at regular intervals in order to avoid faulty measurements, especially after it has been subjected to shock or heavy punishment.
- Remove the battery in case of being discharged or for a longer stop period of the instrument. Recharge the batteries with the charger recommended by the manufacturer.

Risks in use (cont.)

☝ Attention !

- Properly dispose of the batteries and equipment taking into account the applicable national regulations.
- The main cable and plugs of accessories have to be in perfect condition.
- When working with the prism rod near to electrical installations (for example electric railways, aerial lines, transmitting stations and others), there is acute danger to life, independent of the rod material. Inform in these cases the relevant and authorised security offices and follow their instructions. Keep sufficient distance to the electrical installations.

- Avoid surveying during thunderstorms because of lightning danger.

☝ Attention !

It is forbidden to use an instrument with optical plummet in combination with a laser tribrach for zenith sighting.

Laser Beam Safety

If used for the intended purpose, and if correctly operated and properly maintained, the lasers provided in the instruments are not hazardous to the eye.

> ☝ Attention
>
> Repairs must only be performed at a service workshop authorised by Trimble.

Laser Beam Safety

DR - EDM in Direct Reflex Mode Laser pointer

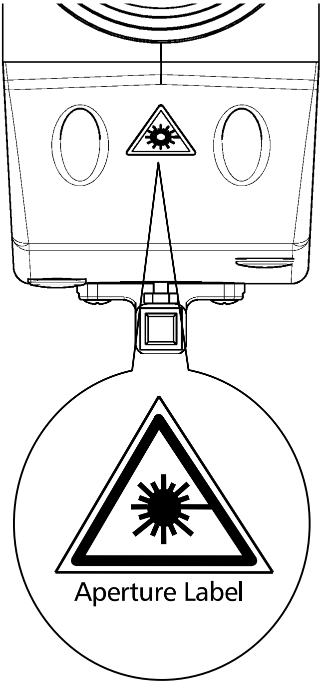
The EDM in Direct Reflex Mode and in Laser pointer mode produces visible Laser light emerging at the center of the telescope objective.

CLASS 2 LASER PRODUCT

This product complies with IEC 60 825 - 1: January 2001 and 21 CFR 1040.10 and 1040.11 except for deviations persuant to Laser Notice no 50, dated July 26, 2001

- Beam divergence:	0,4 mrad
- Modulation frequency:	300 MHz*)
- Max. output power:	1 mW
- Carrier wavelength:	660 nm
- Measuring uncertainty:	± 5 %

*) not valid for Laser pointer



☝ Attention !

Direct viewing into the beam (also with binoculars) must be avoided under all circumstances!
AVOID EXPOSURE -
Laser radiation is emitted from this aperture.
Protection is normally afforded by aversion responses including the blink reflex.
Do not use direct reflex mode on prism or high reflective surfaces for distances below 1000 m.

Emergency switches:
- ESC
- ON + ✳—
- ON + OFF.

Laser Beam Safety

The EDM in Prism Mode produces visible Laser light emerging at the center of the telescope objective. Conforms in this mode to CLASS 1 in acc. with IEC 60 825 - 1: January 2001

This product complies with IEC 60 825 - 1: January 2001 and 21 CFR 1040.10 and 1040.11 except for deviations persuant to Laser Notice no 50, dated July 26, 2001

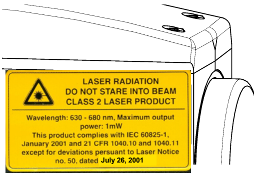
DR - EDM in Prism Mode

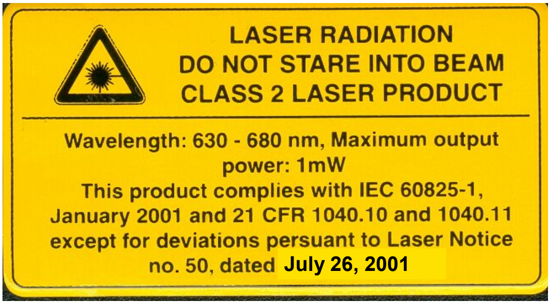
- Beam divergence:	0,4 mrad
- Modulation frequency:	300 MHz
- Max. output power:	17 μW
- Wavelength:	660 nm
- Measuring uncertainty:	± 5 %

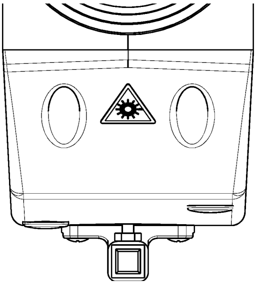
CLASS 1 LASER

Labelling

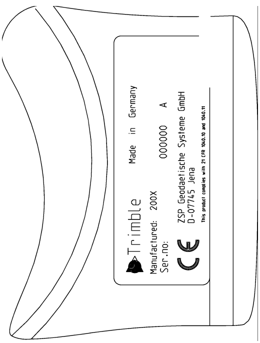
The laser beam safety labels are located at the side and front of the telescope objective. The instrument label is located at bottom of the instrument.



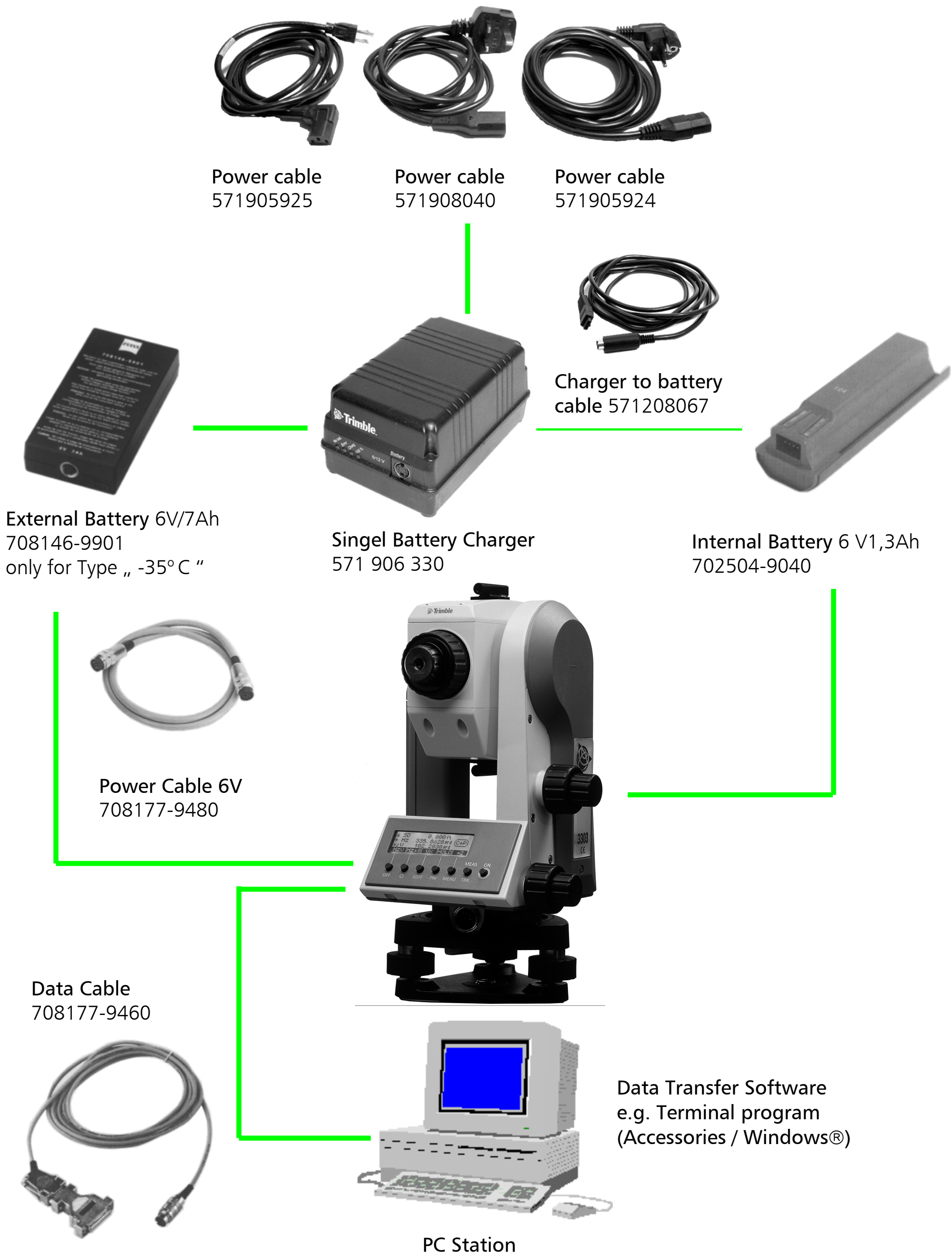




Laser beam safety label



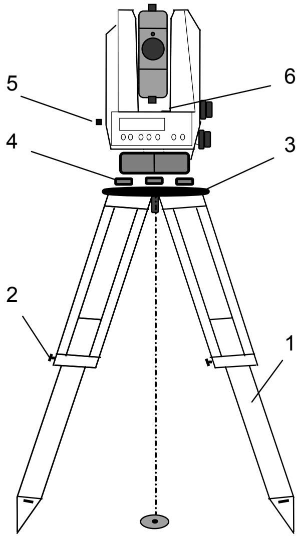
Instrument label


Power cable
571905925
Power cable
571908040
Power cable
571905924
Charger to battery
cable 571208067
External Battery 6V/7Ah
708146-9901
only for Type „ -35° C “
Singel Battery Charger
571 906 330
Internal Battery 6 V1,3Ah
702504-9040
Power Cable 6V
708177-9480
Data Cable
708177-9460
Data Transfer Software
e.g. Terminal program
(Accessories / Windows®)
PC Station

3 First Steps

The *First Steps* cover up the set-up of the instrument, including the explanation of basic inputs and the necessary presettings.
After having set the parameters for saving and entered the point information, you can measure in the start-up menu.

Set-Up and Coarse Centring



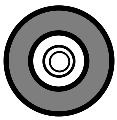
In order to guarantee the stability of measurement we recommend the use of a havy tripod.

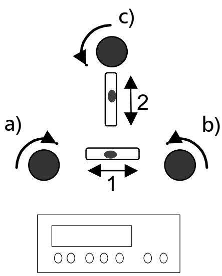
Set-up:
Extend the tripod legs (1) to a comfortable height of observation and fix them using the tripod locking screws (2). Screw the instrument centrally to the tripod head plate (3). The tribrach screws (4) should be in mid-position.

Coarse Centring:
Set up the tripod roughly above the station point (ground mark), the tripod head plate (3) should be approximately horizontal.

Centre the circular mark of the optical plummet (5) above the ground mark using the tribrach screws.
To focus the circle: Turn the eyepiece.
To focus the ground mark: Draw out or push in the eyepiece of the optical plummet.

Levelling and Fine Centring





Coarse Levelling:
Level the circular bubble (6) by adjusting the length of the tripod legs (1).

Precision Levelling:
Align the control unit parallel with the imaginary connecting line between two tribrach screws. Level the instrument by turning the tribrach screws a) and b) in opposite directions. Turn the instrument by 100 grad in Hz and level instrument with tribrach screw c).For checking, turn the instrument round the vertical axis.

After that, check the residual inclination by turning the instrument in both diametric positions of (1) and (2). Take the mean of deviation from centre point of level and adjust, if necessary.

Precision Centring
Shift the tribrach on the tripod head plate until the image of the ground mark is in the centre of the circular mark of the optical plummet; repeat the levelling various times if necessary.

☝ Attention !

It is forbidden to use an instrument with optical plummet in combination with a Laser tribrach for zenith sighting.

Telescope Focusing

Focusing the Crosslines:
Sight a bright, evenly coloured surface and turn the telescope eyepiece until the line pattern is sharply defined.

☝ Attention !

Sighting of the sun or strong light sources must by all means be avoided. This may cause irreparable damage to your eyes.

Focusing the target point:
Turn the telescope focusing control until the target point is sharply defined.

☞ Tip

Check the telescope parallax: If you move your head slightly whilst looking through the eyepiece, there must be no relative movement between the crosslines and the target; otherwise, refocus the crosslines as above.

Switching the Instrument on

ON Press key

Additionally to the company logo, the number of the software version (important for future updates) and the values last set for:
- prism constant
- scale
- temperature
- air pressure

are displayed briefly.

☞ Tip

The compensator is automatically activated when the instrument is switched on.

If levelling of the instrument is insufficient, the digits after the decimal point in the displayed angle readings are replaced by dashes.

Switching the instrument off by pressing the keys

ON + OFF

simultaneously.

Principles of Display

The information
- point *c*ode,
- *p*oint number and
- measured / computed values

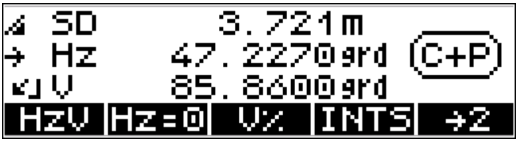
is displayed on two pages.

Toggling between the pages:

→1	to page 1
→2	to page 2

Display page 2:

Display page 1:



☞ Tip

The fields at the bottom of the display are related to the functions of the keys situated below the display.

They indicate the next possible settings - do not mix it up with the current setting.

Principles of Input

Additionally to the setting of predefinitions - as described further down in this chapter - you will have to enter data continually during the measuring process.

These entries are

- the constantly changing instrument, station and reflector heights and
- coordinates of stations or other known backsight points.

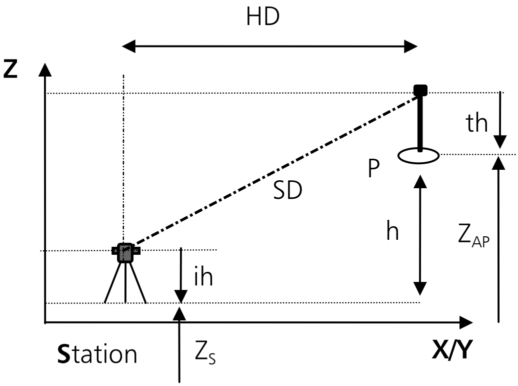
📖 Editor
Data Management

The manual input of coordinates is described in Chapter *6 Data Management*.

📖 Data Transfer
Data Management

If available, it is useful to transfer the values directly from a PC instead of entering them manually.

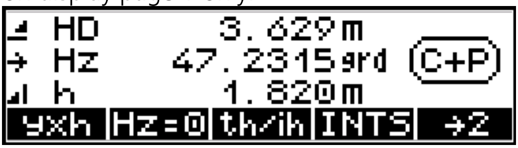
Input of Reflector, Trunnion Axis and Station Heights



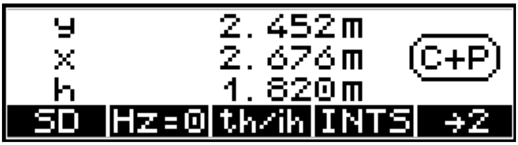
The input of the values of reflector height (th), instrument height (ih) and station height (Zs) (height-stationing) allows you to measure with absolute heights already in the initial menu. If these values have not been entered, only relative height differences will appear in the display (memory). If Zs=0 the height difference "h" is displayed and recorded, otherwise the height "Z".

on display page 1 only:

th/ih in measuring modes **HD** and **yxh** only



Presettings
First Steps



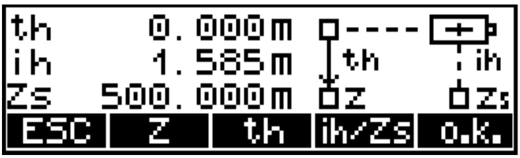
ESC to quit

Z heightstationing

th to enter the reflector height

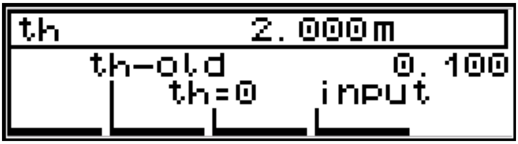
ih/Zs to enter the instrument and station height

o.k. to confirm



Heightstationing: Input of th and ih/Zs

Input of the reflector height:



th 2.000 m
actual refl. hight

th-old 0.100
last refl. hight

th=0
set to zero

input
to enter a value

Set reflector height via input

The current position for input is inverse displayed.

← and → to go to the desired position in the display

\+ - to browse through the digits

o.k. to confirm

☝ Attention !

Default Settings in DR mode:
th=0.000 m
Prism constant=0.000m

Input of the instrument height / station height

📖 Editor
Data Management

to enter values (compare input of th)

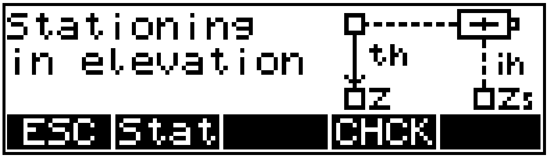
ESC to quit the input routine

Measurement „Stationing in Elevation“

Stat to go to the input menus

CHCK 📖 **Adjusting and checking**

ESC to quit the program



Input one after the other:

Z, ih, th:

└ 📖 Principles **First Steps**

📖 Editor **Data Management**

Measurement to the backsight point

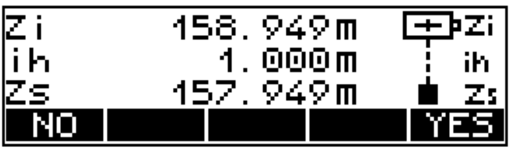
→ sight to the backsight point

ON + *PNo* enter or change of the point number

MEAS

YES to accept the result, to record data, to quit the program

NO to terminate the program, new start



Result and Recording

Input of Point Number and Point Code

(C+P) indicates the possibility to enter point number and code.

ON + *PNo*

← and

→ to go to the desired digit of point number and code

\+ and

\- to browse through the existing character set

The entered values are used with the next measurement.

C 5-digit point code, alphanumeric notation

P 12-digit point number with the special characters #, -, . , .numeric notation

☞ Tip

The toggling between point number and code is realised continuously.

For fast browsing, keep the respective key depressed.

After the measurement, the point number is incremented by one, the code remains unchanged until being modified by the user.

In the application and coordinate programs, the code is provided with fixed characters (A,B,..) responding to the application or coordinate program. In this case, it is not possible to enter the code.

Principles of Distance Measurements

Single measurement

MEAS start measurement in DR mode

Indicates the measurement in progress.

The distance measurement can be cancelled with the softkey ESC.

Presettings **First Steps**

The slope distances and derived values are corrected with regard to the influences of earth curvature / refraction. Additionally, a correction of atmospheric influences (temperature and pressure) is applied.

The correction is zero with T = 20°C and P = 944 hPa.

Distance tracking (continuous measurement of the distance)

MEAS start tracking

END to finish the measurement

yxh to change the measurement mode

To activate the “Distance tracking mode” press the key MEAS twice!

The measuring mode can also be changed during the tracking measurement. For recording data during the tracking measurement use key MEAS.

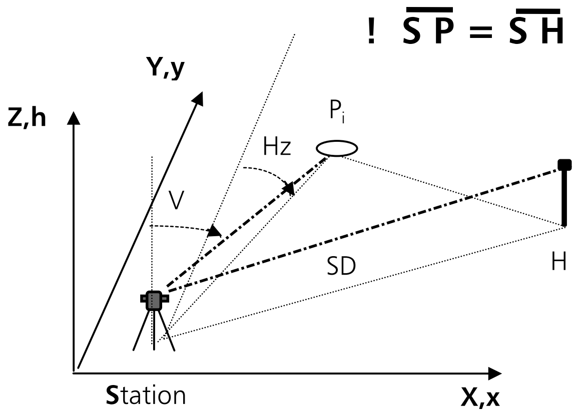
Measurements to inaccessible Points

☞ Tip

Please use this function in the start-up menu only.

In the program “Polar/Detail Points” it is possible to measure with the program “Eccentric Measurement”.

The prism used for the distance measurement cannot be stationed on the desired point P.



Sight towards the point P and trigger the measurement. Then aim to the prism stationed on the auxiliary point H.
Pay attention to the condition of equidistance S-P = S-H.

If data recording is activated, only a data line indicating the angle to P and the distance to H is recorded.
But after the measurement the angle and distance to H are displayed, since the angle value is continuously updated in the Trimble 3300DR display.

Introduction

The required presettings are to be subdivided into three groups:

Settings in the Start-up Menu

- Specify measuring units for angle and distance Short-time setting of V angle in percent
- Toggle between PR and DR mode
- Laser pointer ON / OFF
- Activating and deactivating the compensator
- Orientation of Hz circle
- Activating program "Intersection" (INT)

Frequently used Settings

- Input of pressure and temperature
- Input of scale and prism constant
- DR menu ON

Rarely used Set Instructions

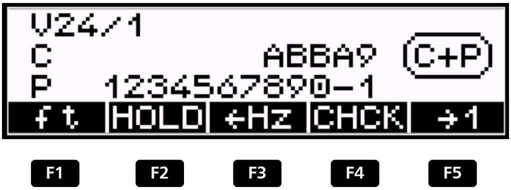
- Display mode for angle and distance
- Vertical reference system
- System of coordinates
- Display of coordinates
- Measuring units of temperature, pressure
- Switching the instrument automatically off
- Switching the acoustic signal on and off
- Regulation of display contrast and brightness of crossline illumination
- Switching the distance measurement off automatically if sighting line interruption
- Long range (LR)

Settings in the Set-Up Menu

Setting the unit of distance measurement

Setting of the units for angle and distance measurement can be done in the menu “Setting Instrument”. Setting the units for distances can also be done in the measurement menu.

Display page 2



F1 to set the distance unit

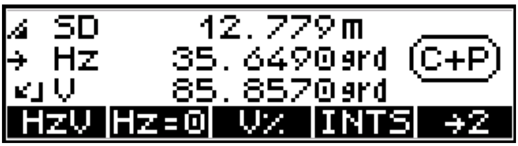
m meters

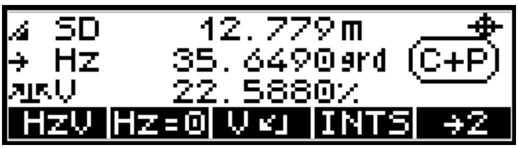
ft feet

☝ Attention !

If the mode is changed after the measurement, the reading will be converted and displayed in the new mode immediately. But results of the measurement in the new mode are recorded after the next measurement.

Display page 1





V% **and**

V to toggle quick between angle in percent / defined measuring unit

Activating and deactivating the compensator

CHCK to go to the menu

c/i and

Comp

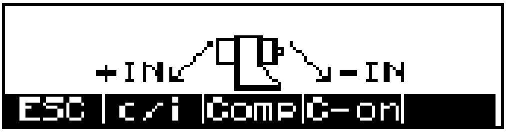
Adjustment and checking

C-on to deactivate the compensator function

C-off to activate the compensator function

Display page 2:

Display compensator menu:



If recording is activated, an information line will be stored indicating compensator function ON or OFF.

☝ Attention !

If the compensator is out of its working range and the function is activated, the digits after the decimal point in the angle readings are replaced by dashes. In this case, the instrument is not sufficiently levelled and a remote release from a PC is not admitted.

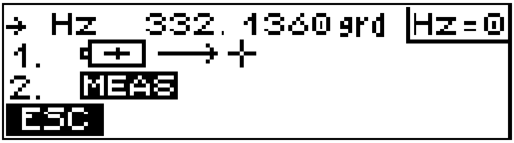
Orientation of Hz circle

Aim: Hz = 0

Hz=0

Sight to target

MEAS



Aim: Hz = xxx,xxx

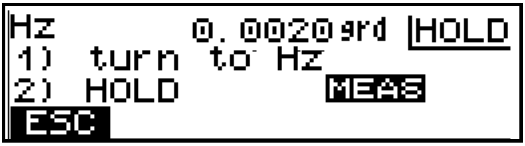
HOLD

Turn the instrument to the desired Hz circle value

MEAS

Sight to target

MEAS



Aim: Change Hz count direction

→Hz Measurement clockwise

←Hz Measurement counterclockwise

Display page 2

☝ Attention !

Setting of the Hz count direction is only possible in the start-up menu.
The Hz count direction is always recorded to clockwise.
After switch ON the instrument and in all selectable programs the default setting of the Hz count direction is always to clockwise.

Frequently used Settings

Alteration of pressure, temperature, scale and prism constant

ON + MENU

1 Input

↑ and

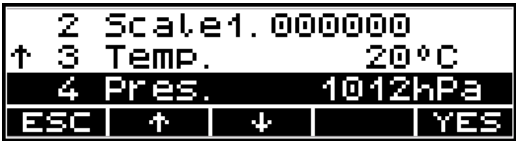
↓ to go to the desired menu point

o.k. to confirm

+ and

- to alter the prism constant (scale, temperature and pressure) step by step

o.k. to confirm



☞ Tip

After switch ON the instrument only temperature and pressure have to be entered.
If a prism with a constant different from -35 mm is used the new prism constant also has to be entered.

📖 Formula and constants **Annex**

Possible ranges:

-30 °C	< Temp.	< 70 °C	with Δ 1 °C
-162mm	< Prism.	< 92mm	with Δ 1 mm
0,995000	< Scale	< 1,005000	with Δ 1 ppm
440hPa	< Press.	< 1460 hPa	with Δ 4 hPa

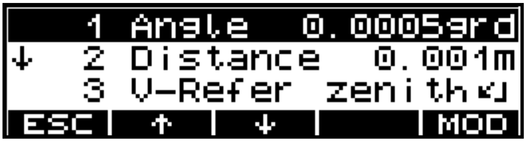
Rarely used Settings

ON + *MENU* Select the main menu.

4 Setting Instrument

YES	to activate menu
↑	and
↓	to select the submenu
MOD	to change setting
ESC	to quit submenu
↑	and
↓	to quit setting / to confirm change

Angle and distance display



Possible settings:

Angle

grad	0,005-0,001-0,0005 (Trimble 3305DR / 3306DR)
grad	0,005-0,001-0,0002 (Trimble 3303DR)
DMS	10" - 5" - 1"
deg	$0{,}005^0$ - $0{,}001^0$ - $0{,}0005^0$
mil	

Distance

m	0,01-0,005-0,001
ft	0,02-0,01-0,001

☝ Attention !

The selected settings of angle and distance accuracy are only related to the display. Measurements are always recorded with the highest possible precision.

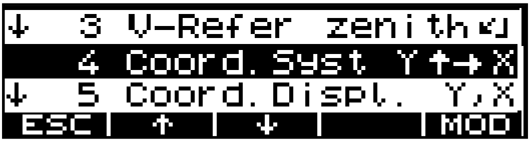
Vertical reference system

MOD to change setting

ESC to quit menu

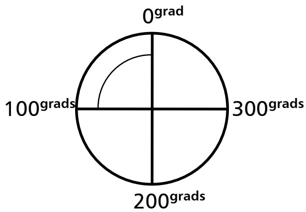
↑ and

↓ to quit setting / to confirm change

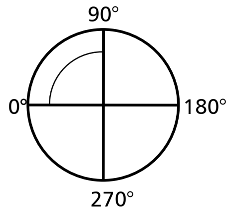


V reference systems:

Zenith angle



Vertical angle

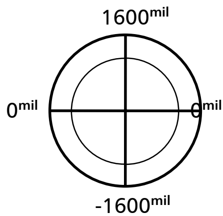


Examples

1: Zenith angle
unit 400 grads

2: Vertical angle
unit 360°

Height angle



Examples

3: Height angle
unit 6400 mil

☞ Tip

The setting of the measuring unit % is done in the set-up menu!

System of coordinates / display order

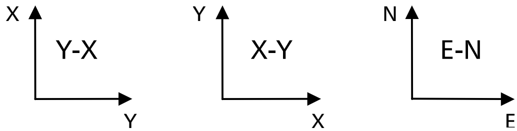
MOD to change setting

ESC to quit menu

↑ and

↓ to quit setting / to confirm change

Assignment of axes of system of coordinates:



Indication sequence: Y-X / X-Y E-N / N-E

☝ Attention !

When the assignment of coordinates is changed, the question for further use of the internal station coordinates appears in the display, calling the user's attention to a possible source of errors.

Measuring units for temperature / pressure

MOD to change setting

ESC to quit menu

↑ and

↓ to quit setting / confirm change

Possible settings:

Temperature	°C	degrees Centigrade
	°F	degrees Fahrenheit
Pressure	hPa	hectopascal (or millibar)
	Torr	
	inHg	inch mercury

MOD to change setting

ESC to quit menu

↑ and

↓ to quit setting / confirm change

Acoustic signal

Possible settings:

Sound	ON- OFF

MOD to change settings

ESC to quit the menu

↑ and

↓ to quit settings / to confirm alterations

Settings of units for angles.

Possible settings:

Angles	Grad	400.0000
	DMS	360° 00′ 00″
	deg	360.0000°
	mil	6400mils

MOD to change settings

ESC to quit the menu

↑ and

↓ to quit settings / to confirm alterations

Settings of units for distances

Possible settings:

Distances	m	Meters
	ft	Feet

> ☞ Tip
>
> It is possible to change the units between meters and feet in the start up menu.

Display illumination / Reticle illumination

MOD to change settings

ESC to quit the menu

↑ and

↓ to quit settings / to confirm alterations

Possible settings:

Disp. Illum.: ON- OFF

☞ Tip

Both illuminations are switched on at the same time. The adjustment of the reticle illumination is only possible with the display illumination switched ON.

Displaycontrast /Reticle illumination variation

MOD to change settings

ESC to quit the menu

↑ and

↓ to quit settings / to confirm alterations

Possible settings:

Contr / Illum: 8 steps

☞ Tip

The adjustment of the display contrast is only possible with the display illumination switched to OFF. The adjustment of the reticle illumination is only possible with the display illumination switched ON. To switch ON the reticle illumination please switch ON the display illumination to

ON + MENU

Select the main menu.

5 Dset

Setting modes and parameters related to the EDM / distance measurement.

```
↑ 4 Setting Instr.
  5 DSet
↓ 6 Setting Interface
ESC | ↑ | ↓ |  | YES
```

YES to activate menu

↑ and

↓ to select the submenu

DR mode (Support programs for DR mode)

```
  1 DR-Menu          NO
↓ 2 Long range       NO
  3 L-Pntr OFF       NO
ESC | ↑ | ↓ |  | MOD
```

Possible modes: Standard->Start
Bearing->Distance
TRK->Start

MOD to activate menu

ESC to quit submenu

↑ and

↓ to quit setting / to confirm change

> ☞ Tip
>
> The modes of the menu appear after pressing the button MEAS !

Long Range (measure long distances).

```
↑ 1 DR-Menu          NO
  2 Long range       NO
↓ 3 L-Pntr OFF       NO
ESC | ↑ | ↓ |  | MOD
```

Maximum ranges: 800m for foil reflector ($60x60$ mm^2)
5000m for 1 prism
7500m for 3 prisms

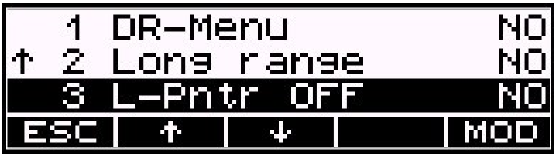
MOD to activate menu

ESC to quit submenu

↑ and

↓ to quit setting / to confirm change

Laser Pointer OFF



MOD to activate menu

ESC to quit submenu

↑ and

↓ to quit setting / to confirm change

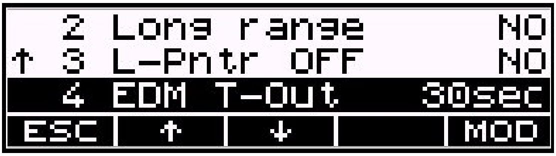
Possible settings:

No	- Laser pointer always ON.
1x	- Laser pointer OFF after measurement or after 2 minutes without measurement.

☞ Tip

This setting controls the time to switch the laser pointer OFF automatically.

Time out distance measurement



YES to activate menu

ESC to quit submenu

↑ and

↓ to quit setting / to confirm change

Possible settings:

OFF	- No Time out EDM
10sec.	- Time out after 10 seconds
30sec.	- Time out after 30 seconds

☞ Tip

This setting controls the time out of the distance meter while the distance measurement is interrupted.

Recording the Measurement

ON + MENU

6 Setting Interface

YES to enter the menu

MOD to toggle between MEM/1, MEM/2, MEM/3
V24/1, V24/2, V24/3
OFF

ESC to return to the higher-order menu

MEM/x - internal saving
(only Trimble 3303DR and Trimble 3305DR)

V24/x - external recording via RS232 interface

Off – no recording

1 - recording of measured values

2 - recording of computed values

3 - 1 and 2 together

☝ Attention !

These settings are valid in the programs „Coordinates“ and „Applications“.

All results in the Start-up menu are interpreted as measured values (1).

Record data lines
Data Management

☞ Tip

The detailed depiction about the relationship of measured dta, recorded type of identifiers and selected recording are described in the chapter Data Management.

📖 Presettings
First Steps

☝ Attention !

Depending on the selection of type of recording and type of measuring mode the type of displayed results and the type of recorded values is given.

Recording default values (Header) and changed settings

ON + *MENU* Select main menu

6 Setting Interface

YES to enter the menu

↑ and

↓ to quit setting / to confirm change

ESC to return to the' higher-order menu

MOD to toggle YES/NO

ESC to quit submenu

↑ and

↓ to quit setting / to confirm change

Possible settings:

YES	- Record settings
NO	- Don't record settings

📖 Record data lines
Data Management

☞ Tip

The detailed depiction about the relationship of measured data, recorded type of identifiers and selected recording are described in the chapter Data Management

ON

YES to activate

NO to deactivate

Record current settings?

☝ Attention !

To start recording switch OFF and ON again the instrument!

Selecting the Measuring Mode (presentation of the results at the display)

F1 to set the following measuring modes

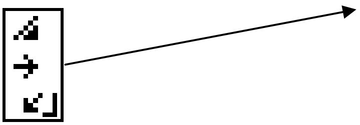
Display page 1:

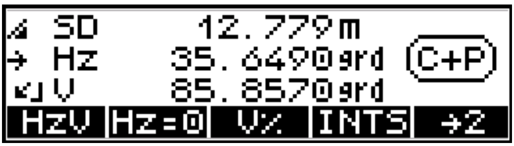
☞ Tip

At the display of softkey 1, always the next selectable measuring mode appears.

SD: Display of the original measurement

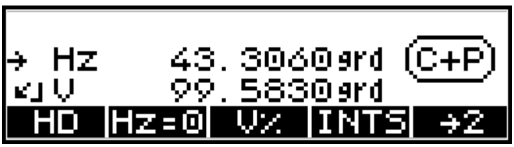
Status display:





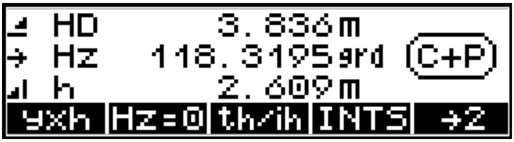
F1 F2 F3 F4 F5

HzV: Display in the theodolite mode
Can be used for alignments and for setting out right angles but
not for distance measurements.

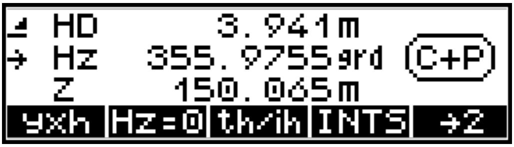


HD,Hz,h: Display of the reduced distance and the height difference

Display of the calculated values
with Z=0

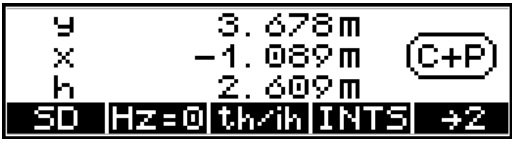


with Z≠0

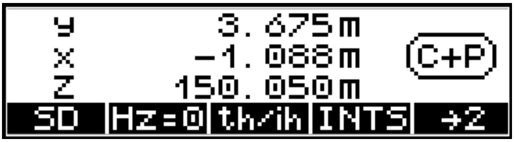


y,x,h: Display of the local rectangular coordinates

Measurement in the local system with station y=x=0
with Z=0



with Z≠0



☞ Tip

The measuring modes can be changed at any time. The results will be displayed immediately in the selected measuring mode but these results are not recorded at the same time. All following measurements are displayed and recorded in the newly selected mode.

In all measuring modes, the angle reading is updated continually.

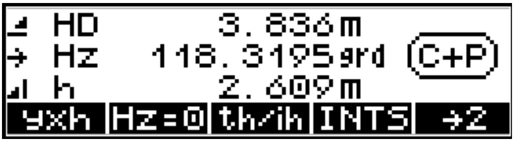
The measured distances or coordinates are updated only after the next measurement.

Measurement

After entering and defining all required parameters the measurement can be started.

MEAS

etc. Measurement to further points



ON + PNo

Input point number and code

MEAS

Measurements in the modes

SD **and** **HzV** are done without entering and recording local or global heights

☞ Tip

After the measurement, the flush right point number is incremented by one within the number of digits displayed up to the special characters (no figure) to the left of it. (According to this picture, counting goes only up to 9, then it will begin again with "0".)

Display with absolute heights, with the heights Zs, ih and th entered.

4 Coordinates

The basic requirement for a measurement in a system of coordinates is a stationing within this system before. That means the position and height of the instrument are determined by measuring to known backsight points.
In the case of an unknown station, the scale and the orientation of the Hz circle in azimuth direction are computed additionally to the station coordinates. In the case of a known station, only the scale and the orientation of the Hz circle in azimuth direction are computed.

After the stationing, the actual measurements - that means Polar/Detail points and Stake out – can be done within this system of coordinates.

The guidance through the menu is very easy to understand and based on a unique schema for all programs.

Principle

Coordinates

Unknown station

Each program flow is demonstrated by a graphics.

A and B are backsight points with known coordinates and S is the station the coordinates of which are to be calculated.

CHCK — **Adjusting and Checking**

A — to call point A

☞ Tip

The function of adjusting and checking is required for measurements to be carried out without/with compensator or for checking the adjustment of the instrument.

Principles
First steps

Editor
Data management

Coordinates are to be entered

B to continue by calling point B

ESC to return to the higher-order menu

A to repeat point A if required

If A has been calculated, measured, defined as station, the symbol for A is filled.

☝ Attention !

If errors or confusions should occur whilst measuring to the points, the measurement to single points can be repeated immediately.

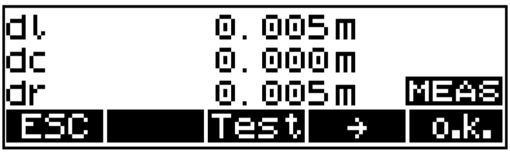
ON + ***PNo*** to enter point number and code

MEAS to trigger measurement

☞ Tip

Prior to each measurement with **MEAS** it is possible to enter a point number and a code for the point to be measured.
In the stationing programs, the codes (A, B, C, D, E, S) have been invariably set. Point numbers can be entered.
The point number is incremented automatically by 1.
The code that has been set is saved with every measurement until being modified by the user.

In the Stake out program, the possibility to measure is indicated additionally by the **MEAS** symbol in the display



Station Point Memory Trimble 3303DR / 3305DR

In a non-volatile instrument memory, the following data are retained after switching the instrument off and overwritten with every new determination:

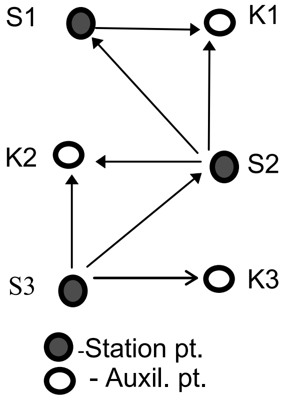
Station coordinates	Y,X,Z
Instrument height	ih
Reflector height	th
Scale	m
Orientation	Om

The coordinates of the station point are calculated or entered by means of the coordination programs.
During the following operations (Stake-out / Polar/Detail points), the user can access this memory at the respective parts of the program and does not have to enter the values again.
After having changed the station, these values have to be calculated or again entered in the course of the program.

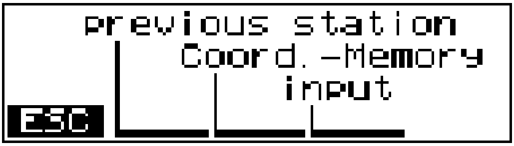
Special Features of Trimble 3306DR

The Trimble 3306DR (the instrument is not fitted out with a data memory) has a memory location for another single point (coor-memory) containing the coordinates of this point (Y;X;Z) in a non-volatile form.
This memory location permits a simple transmission of coordinates (stationing with "Unknown station") with the Trimble 3306DR and spares the user the trouble to take the coordinates down or to enter them twice.

Trimble 3300DR principle
of transmission of coordinates
„Unknown station"

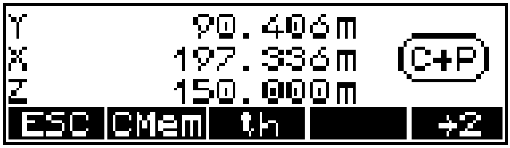


Window of the Trimble 3306DR when calling coordinates



Method:

The station coordinates S1 are known or have been calculated by means of a coordinate program. The coordinates of point K1 will be calculated with the program „Polar/Detail Points" and saved in the „coor-memory" with CMem.



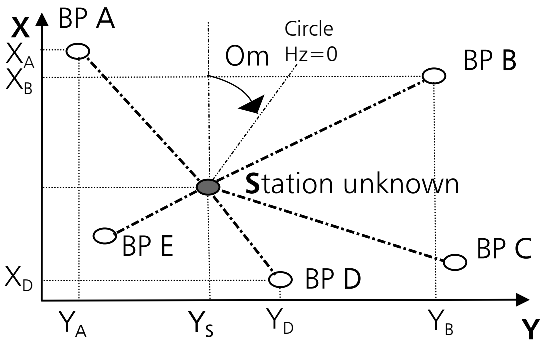
After placing the instrument on S2, the coordinates of the points S1 (last station) and K1 (coor-memory) are called with the stationing program "Unknown station" and used for determining the coordinates of S2.

Now, the coordinates of the point K2 can be calculated with the program "Polar/Detail Points" and stored in the "coor-memory". After changing the position of the instrument to S3, the coordinates of this point will be calculated in analogy to station S2.

Coordinates

Unknown Station

If it is not possible to occupy a point with a known position in order to sight the points to be surveyed or set out, a free stationing can be carried out.
If all backsight points have a known height, the Z coordinate can also be determined simultaneously.
A maximum of 5 points can be measured!
All measurements have to be done in combination with a distance measurement



given: : $(Y,X,Z)_{A....E}$

meas.: : $(SD,Hz,V)_{S-(A-E)}$

requ.: : $(Y,X,Z)_s$, Om , m

By measuring to 2..5 known Backsight Points (A.. E), the instrument will calculate the station coordinates X_S,Y_S,Z_S the Hz circle orientation **Om** and the scale **m**.
The following description is done for a stationing "with stationing in elevation". The procedure without stationing in elevation is almost identical.

Stationing in Elevation

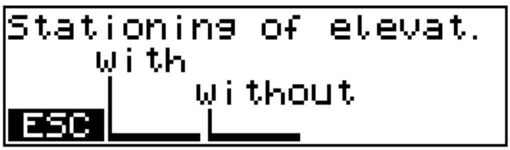
ESC to go to the coordinates menu

with: input of instrument height

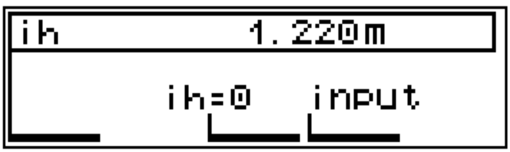
without: no calculation of height

Principles **First steps**

Editor **Data management**



Input of instrument height



☞ Note !

In a free stationing with height determination, all backsight points must have a height coordinate. It is not possible to use individual backsight points separately according to position and height.
The height is calculated by simple averaging.

☞ Tip !

If not all backsight points are provided with a height coordinate, the method **without height** is to be applied. Subsequently, the station height can be determined separately by measurement to <u>one</u> point using the "Stationing in elevation" program.

Measurement „Unknown Station“

A to select BP A

CHCK **Adjusting and checking**

ESC to quit the program

Selecting the coordinates of BP A

└ Principles
First steps

Editor
Data management

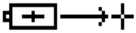
th to enter data for BP A (target hight)

ON + **PNo** Point number of BP A to be changed?

MEAS to measure to BP A

B to select BP B

A Measurement to BP A to be repeated?


- Sight reflector

The operational steps for BP B....E are now carried out in analogy to BP A.

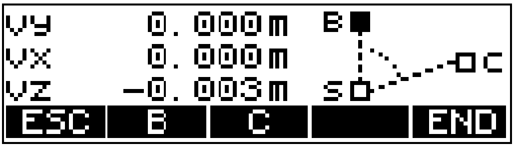
After at least 2 measurements, approximate coordinates are calculated by software and the deviation to the current measurement is displayed.

ESC to quit the program

B Measurement to BP B to be repeated?

C to measure the next point (E=5.)

END to display the residuals



Explanation:
vy: Residual in Y-direction
vx: Residual in X-direction
vz: Residual in Z-direction

☝ Tip !

Consequently, residuals can also be used to "Stake out" (seek) points, because the measurement of point can be repeated immediately.

More to measure additional point

↑, **↓** to select point

Del to delete point

o.k. to display station coordinates

o.k. to display further parameters

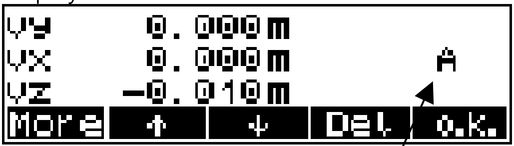
ON + *PNr* to enter the point number of the station

Rept to repeat the complete determination

m to edit the scale

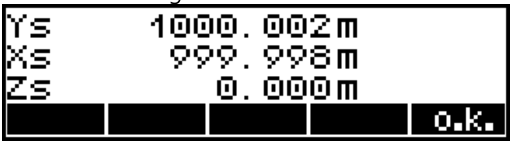
o.k. to accept the coordinates, complete the program and go to the coordinates menu; to record

Display of residuals:

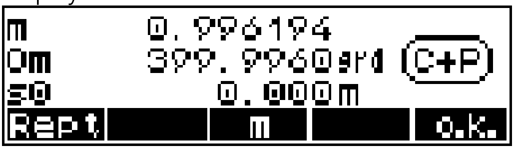


Point to which the residuals belong

After confirming the residuals:



Display of the station coordinates:



Explanation:

m: calculated scale

Om: orientation unknown

s0: standard deviation of the weighting unit (mean point error)

☞ Note !

It is possible to go backwards and re-measure the corresponding points, whereby the intermediary points get lost.
But it is more recommendable to complete the measurement (calling the residuals) after three backsight points, delete and re-measure the corresponding direction. New measurements are added at the end. Consequently, the assignment of the point codes (A, B, etc.) are shifted.

-	scale
+	to edit
o.k.	to accept scale, to go to the residuals menu

Scale menu

If the scale is outside the permissible range, an error message appears.

☞ Note !

After the scale has been confirmed, the station coordinates are recalculated. Then, the residuals can be evaluated once more.

Recording

📖 Presettings
First steps

If recording is activated, the following lines are saved in dependence on the settings:

Designation of the mode

Point numbers and code

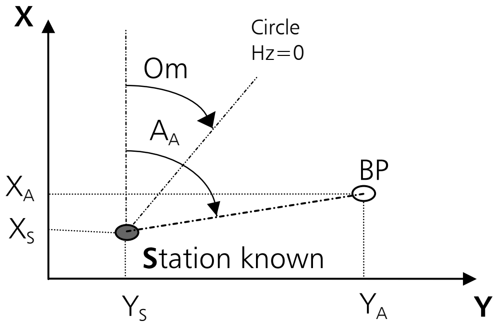
backsight point A, B, C, D, E

Y,X,Z	Coordinates
SD,Hz,V	Readings
vy,vx,vz	backsight point residuals
Y,X,Z	Coordinates of station point S
m,Om	Scale and circle orientation
s0	Standard deviation of the weight unit

Coordinates

Known Station

If it is possible to occupy a point with a known position in order to sight the points to be surveyed or set out, a stationing on a known point can be carried out.



given: : $(Y,X)_{S,A}$

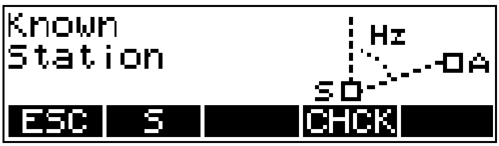
meas.: : $(SD,Hz)_{S\text{-}A}$, or $(Hz,V)_{S\text{-}A}$

requ.: : Om , m or Om

By measuring to a known Backsight Point A, the instrument will calculate the circle orientation **Om** and the scale **m**.

Measurement „Known Station“

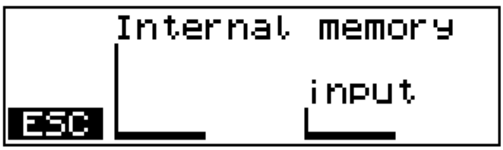
S to call station S



CHCK **Adjusting and checking**

ESC to quit the program

Selecting the coordinates of station S



Principles **First steps**

Editor **Data management**

After defining S:

There are two ways to calculate the orientation.

Hz see below

XY page 4-11

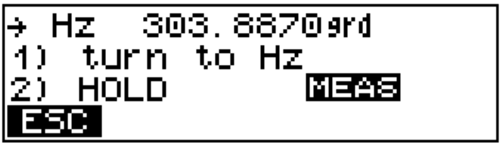
S to repeat station S

Orientation using a known Azimuth

The orientation using a known azimuth will be selected if the bearing angle between the station and the backsight point is known (for example calculated from coordinates) and a distance measurement to the backsight point is impossible.

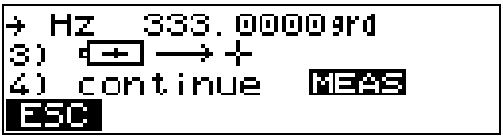
to set the required direction by turning the instrument

MEAS to clamp the Hz set direction



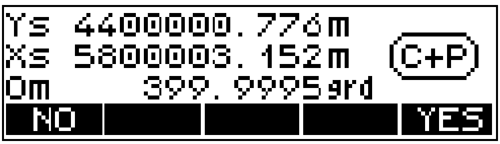
→ to sight the known point

MEAS allocation is completed



YES to confirm, record, quit the program

NO to reject, new start



Display of results and recording

Orientation using known Coordinates

This orientation method will be used if the coordinates of the backsight point are known.

Selecting the coordinates of BP A

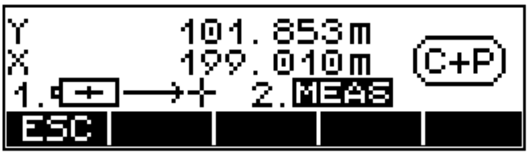
Principles
First steps

Editor
Data management

<u>SD/Hz/V</u>
Distance and bearing measurement
<u>Hz/V</u>
Bearing measurement

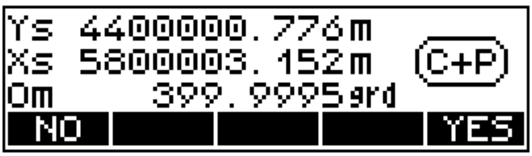
ON + *PNo*
Point number of BP A to be changed?

MEAS to BP A



YES to confirm the orientation, continuation

NO to reject the orientation, new start

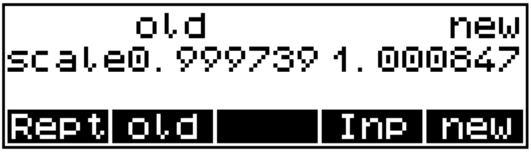


new to accept the new scale

old to transfer the orientation accepting an old scale

Inp to transfer the orientation entering any scale

Rept to repeat the calculation



Display of results and recording

Recording

Presettings
First steps

If recording is activated, the following lines are saved in dependence on the settings:

Designation of the mode

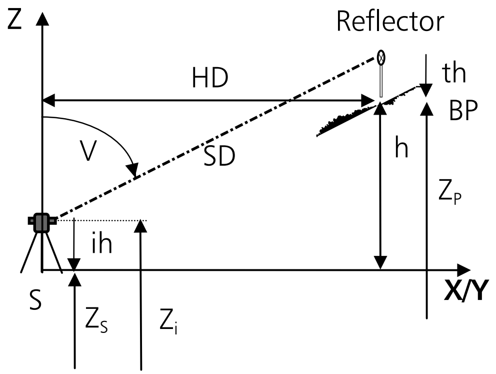
Point numbers and code

Y,X	Coordinates of station point
Y,X	Coordinates of backsight point A
SD,Hz,V	Readings for backsight point A according to selection
m,Om	Scale and circle orientation according to selection
Hz	Hz set direction
V	Vertical angle at Hz

Coordinates

Stationing in elevation

Stationing in elevation permits the determination of the height above **M**ean **S**ea **L**evel independently of planimetric stationing. In programs involving local coordinates, in particular, the absolute height can be included in the measurement.



given.: : Z_P

meas.: : $(SD,V)_{S\text{--}P,}$ ih, th

requ.: : Z_s

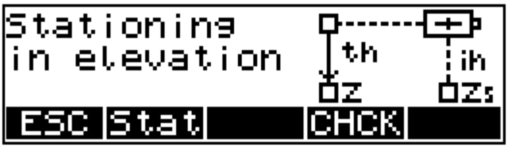
The station height is determined by measurement to a Backsight Point with a known height.

Measurement „Stationing in Elevation"

Stat to go to the input menus

CHCK 📖 **Adjusting and checking**

ESC to quit the program



Enter one after another:

Z, ih, th:

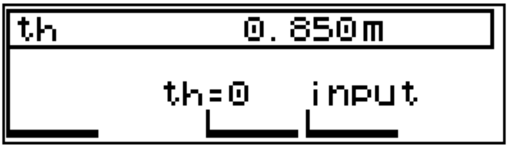
Principles
First steps

Editor
Data management

th 0.850 m
Confirmation of the old value

th=0
Set to zero

Example th:



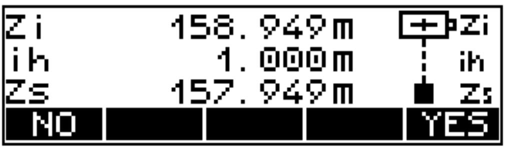
→ Sight backsight point

ON + PNo
Point number to be changed?

MEAS

YES to confirm, record, quit the program

NO to reject, new start



Display of results and recording

Recording

Presettings
First steps

If recording is activated, the following lines are saved in dependence on the settings:

Designation of the mode

Point numbers and code

th	Reflector height at backsight point (only if changed)
ih	Instrument height (only if changed)
Z	Height of backsight point
SD, Hz, V	Readings for backsight point
Zs	New station height
Zi	Hight of sight line (trunning axis)

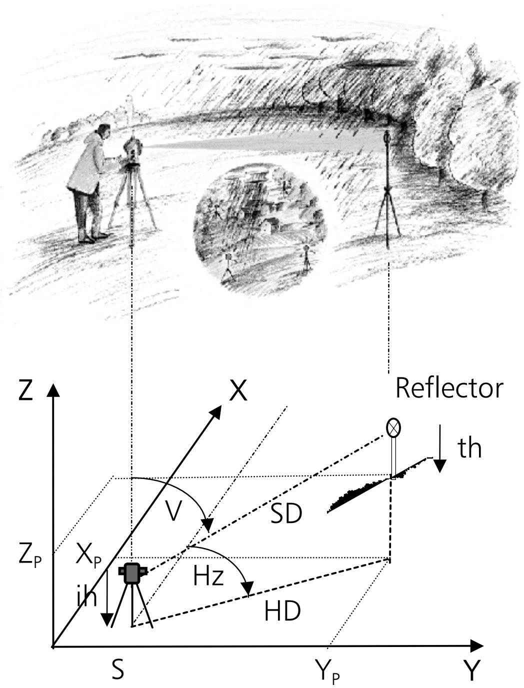
Coordinates

Polar/Detail Points

Determination of the coordinates and heights of new points by distance and direction measurements.

The coordinates can be computed in a higher-order system of coordinates.

Local coordinates can be determined in the standard measurement menu.

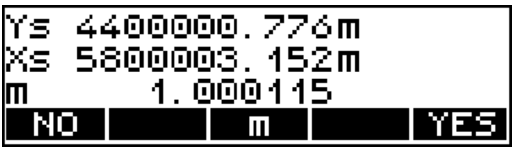


given.: : $(Y,X,Z)_{,S}$, Om, m

meas.: : $(SD,Hz,V)_{S-P}$

requ.: : $(Y,X,Z)_P$

Confirmation of Stationing



YES to confirm the station coordinates and to continue in the program

NO to reject, new start - stationing

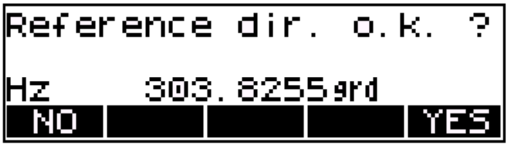
m to change the scale

Scale:

+, **-** to change m

o.k. to confirm

Reference direction:



YES to confirm and continue in the program

NO to reject, restart - stationing

Instrument and station heights:

YES to confirm and continue in the program

NO to reject, new start - height stationing

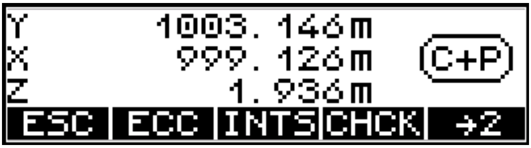
ih/Zs to enter instrument and reflector heights

☝ Attention !

If neither a stationing in elevation has been realised beforehand nor Zs is entered now, all heights Z will be related to the station height Zs=0.
If ih is not entered either, all heights Z will be related to the trunnion axis height Zi=0.

Measurement „Polar/Detail Points“

→1, **→2** to change pages over



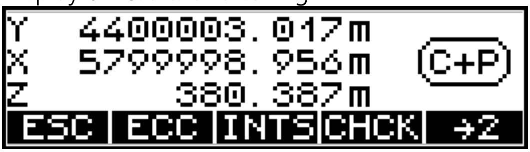
ECC eccentric measurement

INTS to activate software Intersection

th to enter the reflector height of the new point

ON + *PNo* to enter point number and code of the new point

Display of results and saving



CHCK 📖 **Adjusting and checking**

MEAS to start the measurement

☞ Tip

The measurement can be triggered both on display pages 1 and 2.
After the measurement, the program returns to the page where the measurement has been triggered.

Eccentric Measurement

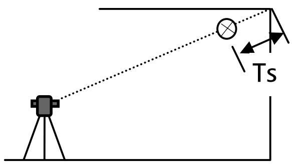
If points cannot be measured directly, the eccentric measurement option can provide the solution. Spatial eccentric target measurements are very helpful especially for indoor surveys.

Inp to enter the length

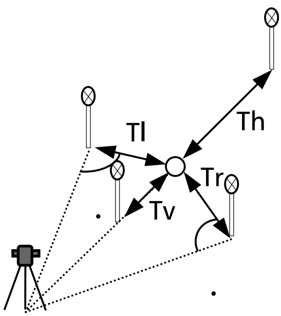
MOD to change the mode

o.k. to accept

ESC to quit the menu



spatial eccentricity



position eccentricities

The graphics does not change !

Type of target eccentricity (softkey **MOD**):

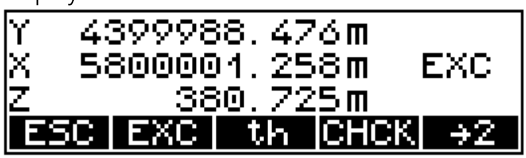
Tv: in front of the centre
Th: behind the centre
Tl: left of the centre
Tr: right of the centre
Ts: spatial relative to the centre

Viewing direction:
Centre of the instrument !

☞ Note !

Height calculation is based on the assumption that centre and eccentricity have the same level. This does of course not apply to the Ts type (spatial) (calculation of the real height of the centre).

Display before eccentric measurement is started

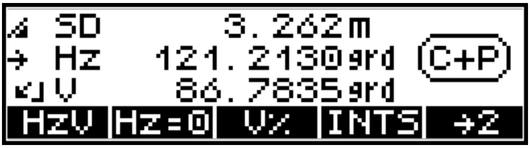


☞ Note !

The eccentricity set is effective only once.

Intersection

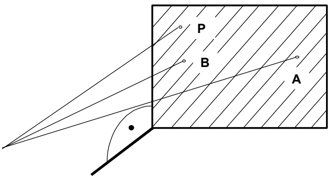
To measure edges and corners in DR mode it is recomended to use the program „Intersection“.



INTS select Intersections

to select / activate
mode – Corner-Angle
mode – Intersection
mode – Eccentric Object

Activate one of three programs to measure edges or corners.



Corner-Angle

A measure points to determine the plane by

B using angle and distance measurement

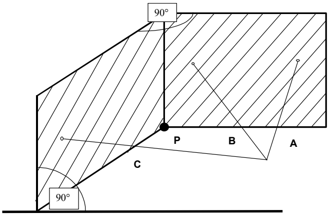
P angle measurement to determine P

MEAS measurement

This method is used to measure points, edges and corners on vertical planes.

Measurements to the points A and B can be repeated.

Any point of the plane can be measured.



Intersection perpendicular

A, B measure points to determine the first plane

C and the second plane

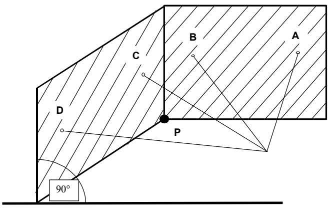
P point of the corner (inner or outer) to be measured

MEAS measurement

This method is used to determine the instersection point of two vertical planes. The planes do intersect under a perpendicular angle.

Measurements to the points A, B and C can be repeated.

Result of the measurement is the coordinate of bottom point of the corner.
In the set of original measurements only the horizontal angle is recorded!



Intersection general

A, B measure point

C, D to determine both planes

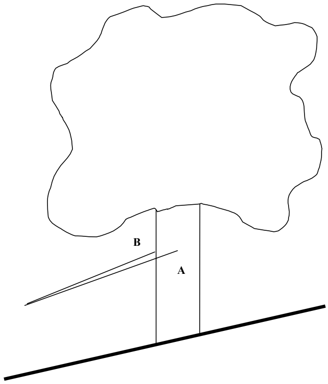
P point of the corner (inner or outer) to be measured

MEAS measurement

This method is used to to determine the instersection point of two vertical planes. The planes do intersect under a general angle.

Measurements to the points A, B, C and D can be repeated.

Result of the measurement is the coordinate of the bottom point of the corner.
In the set of original measurements only the horizontal angle is recorded!



Eccentric Object

A, B measure point of the object
Center point and radius are calculated

MEAS measurement

This method is used to determine the radius and the centre point of a vertical round object.

Measurements to the points A and B can be repeated.

Result of the measurement are the radius and the original measurements / coordinates of the centre point of the round object.

☞ Note ! There is no need anymore to select the point to be measured in the menu before measurement. Just aim to the target and start measurement!

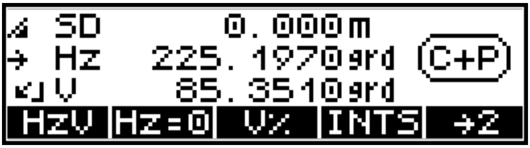
☞ Note ! The DR support programs "INTS"are only accessible for the coordinates program "Polar/Detail Point" and in the measurement menu!

☝ Attention !

Default Settings in DR mode:
th=0.000 m
Prism constant=0.000m

DR-Menu

To activate even more programs to support the DR mode.



DR-Menu

SHIFT + *MENU*

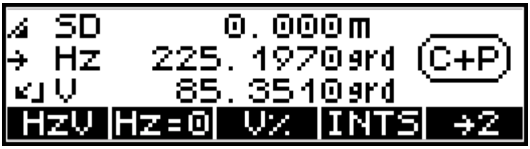
Dset

DR-Menu

YES to select this menu

MEAS to call on menus of DR-Mode

mode – Standard→Start
mode – Bearing-Distance
mode – Tracking→Start

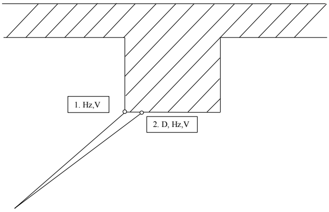


Standard→Start

to select / measure

Direct / standard measurement in DR mode.

☞ Note ! Just aim to the target and start measurement pressing the button "Standard-->Start"!



Bearing-Distance

1. First measurement bearing
2. Second measurement distance

MEAS measurement

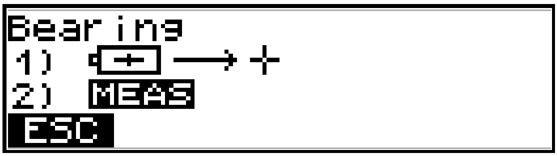
This method is used to determine a corner.

First measurement is done to the corner and second measurement is done close to the corner.

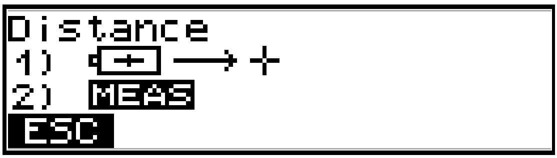
Result of the measurement are the original measurements / coordinates of the corner point.

☞ Note ! There is no need anymore to select the points A and B before to be measured in the menu measurement. Just aim to the target and start measurement!

MEAS measure bearing to the corner



MEAS measure distance close to the corner



TRK→Start

└ to select / measure

MEAS record results

Tracking mode

☞ Note ! Just aim to the target and start measurement pressing the button “TRK-->Start”!

☞ Note ! The modes Standard->Start
Bearing-Distance
are usable in the programs “Coordinates” and “Applications” while the mode
TRK->START
is furthermore usable in the programs “Polar/Detail” point and “Stake out” and in the measurement menu.

Recording

Presettings
First steps

If recording is activated, the following lines are saved in dependence on the settings:

Designation of the mode

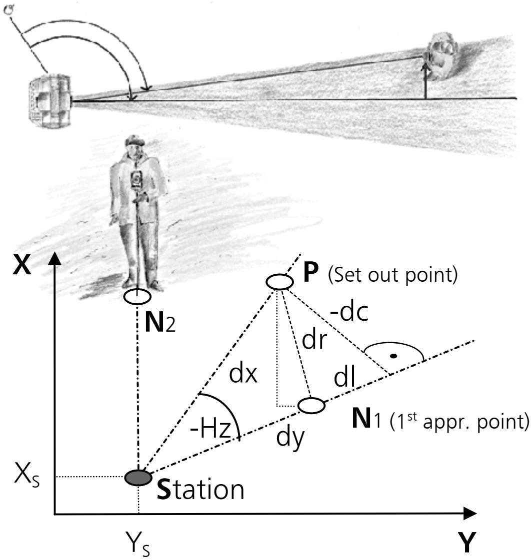
Point numbers and code

m	Scale (only if changed)
ih	Instrument height (only if changed)
Zs	Station height (only if changed)
th	Reflector height at backsight point (only if changed)
Tv,Th,Tr,Tl,Ts	Eccentricity
SD, Hz, V	Polar coordinates
Y, X, Z	Rectangular coordinates

Coordinates

Stake Out

Search points or stake out points in a given system of coordinates. A stationing is the prerequisite for stake out points on the basis of coordinates.



After having entered the coordinates of the point to be stake out and measured the approximate point, the Trimble 3300DR displays the result in the form of the longitudinal deviation dl, the transverse deviation dc, the angle Hz between the approximate point and the nominal point, the radial deviation dr and the deviations of the coordinates dx, dy and dz.

given.: : $(Y,X)_{S,P}$

comp.: :$(HD,Hz)_{S\text{--}P}$

meas.: : $(HD,Hz,V)_{S\text{-}N}$

comp.: : $(dl,dc,dr)_{P\text{-}N}$

Confirmation of Stationing

YES to confirm the station coordinates /continue program

NO to reject, new start - stationing

m to change scale

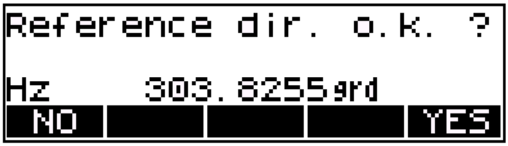
```
Ys 4400000.776m
Xs 5800003.152m
m       1.000115
NO |   | m |   | YES
```

Scale:

+, **-** to change m

o.k. to confirm

Reference direction:



YES to confirm and continue in the program

NO to reject, new start - stationing

Instrument and station heights:

YES to confirm and continue in the program

NO to reject, new start - height stationing

ih/Zs to enter instrument and reflector heights

Measurement „Stake Out“

The following options for the stake out method are available:

or

CHCK **Adjusting and checking**

Z-n, **Z-j** Change with / without height — Stake out with or without height

YXZ, **YX** see below — Stake out using given coordinates

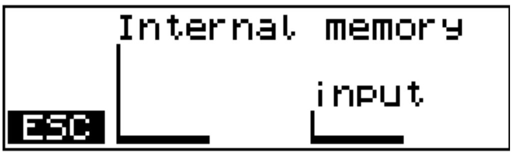
or

HDh, **HD** page 4-32 — using known stake out parameters

Stake Out using known nominal Coordinates

Principles **First steps**

Editor **Data management**



After defining the coordinates:

```
HD          4.152m
Hz    -156.8875grd  (C+P)
1)Hz--->0  2)MEAS
ESC             CHCK
```

to turn the instrument up to Hz=0

th to enter the reflector height

ON + ***PNo*** Point number and code to be corrected?

MEAS to measure the approximate point

to continue see measurement results page 4-33

Stake Out using known Stake Out Parameters

Entering HD:

```
HD              4.152m

          HD=0    input
```

HD 4.152 m
Confirmation of the old value

HD=0
Set to zero

Principles
First steps

Defining the Hz value:

```
Hz      152.5145grd
1)  turn  to  Hz
2)  HOLD         MEAS
ESC
```

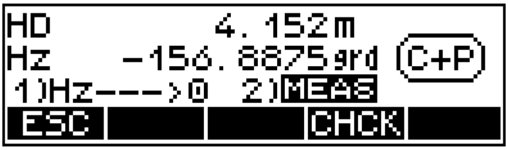
```
Hz      147.1255grd
1)  turn  to  Hz
2)  HOLD         MEAS
ESC
```

to set the desired Hz value

MEAS 1st measurement to the approximate point

ON + **PNo** Point number and code to be corrected?

th to enter reflector height



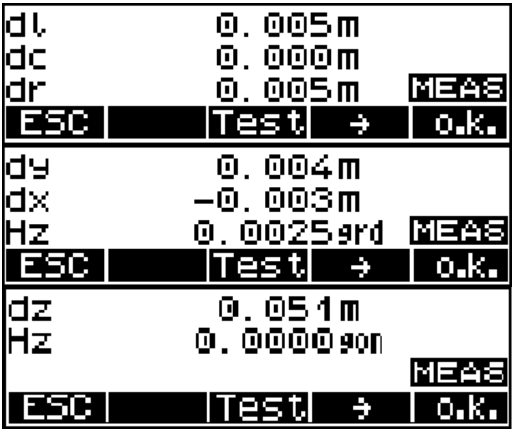
Measurement results see below

Measurement Results

→ to change over the different displays of results

Test see below

o.k. to confirm the stake out and to record; to set out other points



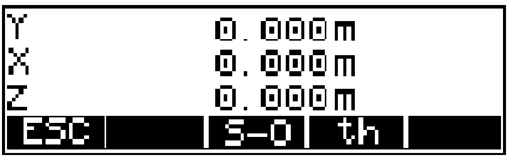
Display of results / recording

MEAS to repeat until the approximate point is close enough to the stake out point!

Additional measurement of the stake out point (**Test**):

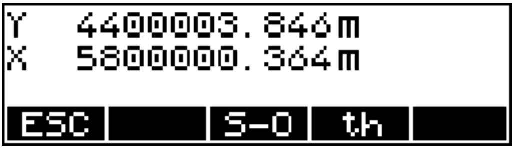
th to enter the reflector height

MEAS to measure



Display of results / recording

S-O Setting out, calling up next point



Display of results and recording

Recording

Presettings
First steps

If recording is activated, the following lines are recorded in dependence on the settings:

Designation of the mode

Point numbers and code

HD,Hz, Z or	Nominal values
Y,X,Z	
SD,Hz,V	Readings for the point
dl, dc, dr	Stake out differences
dy, dx	Stake out differences (only if nominal coordinates are used)
dz	Stake out differences (only if the height is set out)
	or
th	Reflector height (only if changed)
SD,Hz,V	Readings and
Y,X,Z	Actual coordinates of check measurement

5 Applications

The chapter *Applications* describes typical configurations and computations for various measuring methods that are frequently used in practice.

The guidance through the menu is very easy to understand and based on a unique schema for all programs.

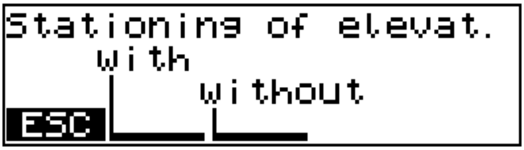
Principle

Applications

Conn. Distances

In the Connecting Distance and Station + Offset programs, the height reference can be established by a stationing in elevation (with) or by a measurement to the first point (without).
The Object Height and Vertical Plane programs have own modes for a height reference.

<u>with</u>
Coordinates Stationing in Elevation
see page 4-15
<u>without</u>
to start the program

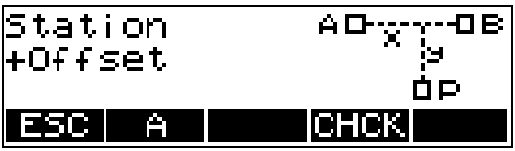


ESC to quit the program

After calling the respective program, a graphics appears with a detailed explanation of the program.

CHCK **Adjusting and checking**

A to start the program by calling point A



☞ Tip

The function of adjusting and checking is required for measurements to be carried out without/with compensator or for checking the adjustment of the instrument.

The display of A in negative type indicates the possibility to measure to point A.

ON + *PNo* to enter the point number and code

MEAS to trigger measurement

☞ Tip

Prior to each measurement triggered with MEAS it is possible to enter a point number and a code for the point to be measured. The point number is incremented automatically by 1 without any need to lift a finger.

In the programs, the codes for defined points are invariably set (A, B, C, S) and cannot be changed.

B to continue in the program by calling point B

ESC to return to the higher-order menu

A to repeat point A if required

If A has been calculated, measured or defined as station, the symbol for A (square) is filled. Now, the point B or P can be treated exactly the same way.

☞ Tip

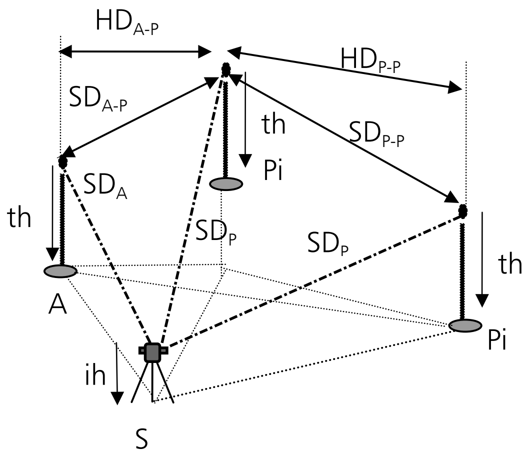
If errors or confusions should occur whilst measuring to the points, the measurement to single points can be repeated immediately.

Applications

Connecting Distance

If it is not possible to measure a distance between two points directly, the measurement to these points has to be started at a station point S. Then, the program calculates the distances SD,HD and the height difference h between the points.

Examples for application:
Measurement of cross sections, checking the distances between points, boundaries and buildings



meas.: : $(SD,Hz,V)_{A,Pi}$, th

requ.: : $(SD,HD,h)_{A-P}$, $(SD,HD,h)_{P-P}$, Z_p

Measurement „Connecting Distance“

CHCK

Adjusting and checking

A to start by calling point A

th to enter the reflector height of A

ON + *PNo*

MEAS to measure to point A

In measurements with stationing in elevation, the height Z of the point is additionally displayed.

A Measurement to point A to be repeated?

P to call point P

th to enter the reflector height of P

ON + ***PNo***

MEAS to measure to point P

☞ Tip

After completing the determination of the first connecting distance, there are two different methods for continuing the measurement:

polygonal measurement	P-P or
radial measurement	A-P.

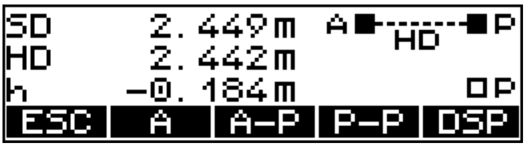
The method can be changed at any time after returning to the higher-order menu and selecting again.

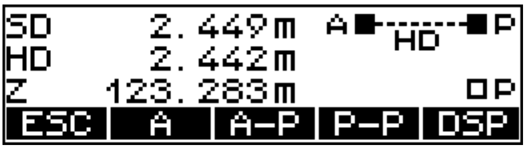
P-P page 5-7

A-P page 5-8

A to repeat measurement to point A

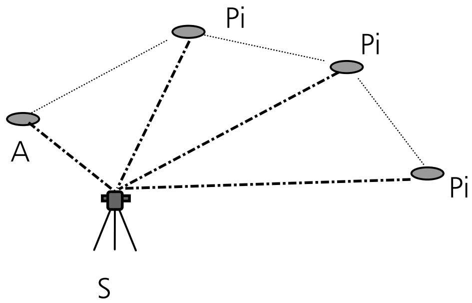
DSP to change over the different displays of results





Display of results and saving

Polygonal Connecting Distance P - P



The results are always related to the last two points measured.

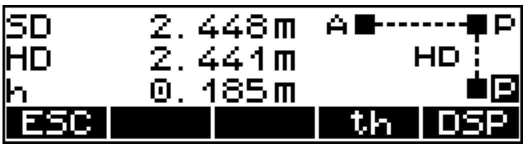
th to enter the reflector height of the next point P

ON + *PNo*

MEAS to measure to point P

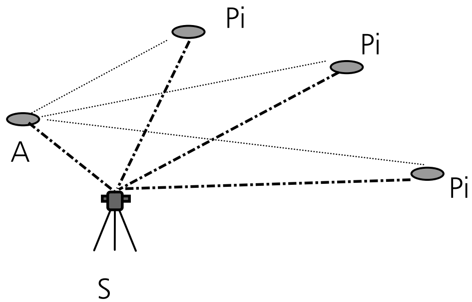
Further points P:

th, ON + *PNo*, MEAS



Display of results and saving

Radial Connecting Distance A - P

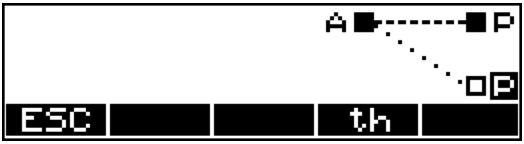


The results are always related to point A.

th to enter the reflector height of the next point P

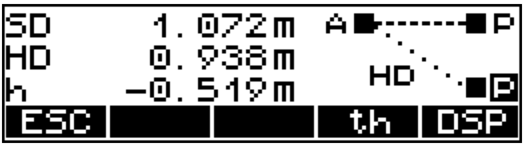
ON + *PNo*

MEAS to measure to point P



Further points P:

th, ON + *PNo*, MEAS



Display of results and saving

Recording

Presettings
First steps

If recording is activated, the following lines are saved in dependence on the settings:

Designation of the mode

Point numbers and code

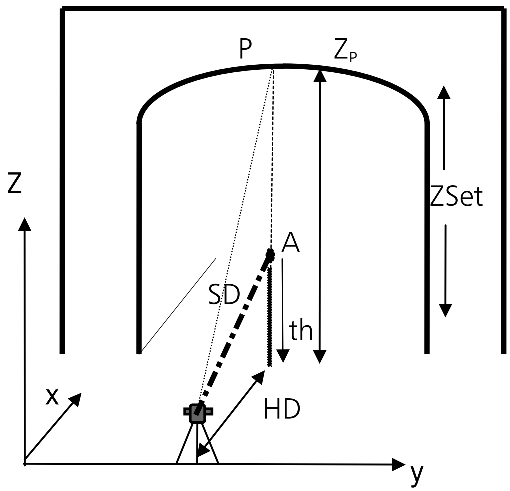
SD, Hz, V	Polar coordinates A,P
th, ih	Reflector height, instrument height (only if changed)
SD, HD, h	Connecting distance A-P or
SD, HD, Z	Connecting distance A-P or
SD, HD, h	Connecting distance P-P or
SD, HD, Z	Connecting distance P-P

Applications

Object Height

Heights of inaccessible points are determined by measuring SD,V to an accessible point in the plumb line. Only the angle V is measured to the inaccessible point.

Examples for application:
Determination of tree heights,
widths of tree tops and trunk diameters,
power lines,
passageways and bridge profiles,
setting out of heights on vertical objects



meas.: : $(SD,V,th)_A$, V_P

requ.: : Z, HD, (O)

Measurement „Object Height“

CHCK **Adjusting and checking**

A to start by calling point A

th to enter the reflector height of A

ON + *PNo*

MEAS to measure to point A

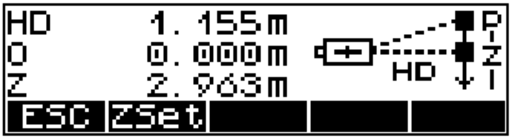
Measurement to point P

P to call point P

ON + *PNo*,

→ to sight point P

MEAS to measure to point P / further points P

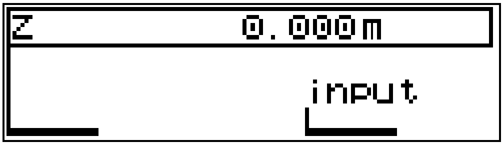


Display of results and saving

Definition of a Reference Height ZSet

With **ZSet**, a horizon with a given height can be defined.

Z 0.000 m
Confirming the old reference height (in this case 0)



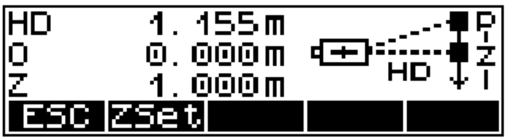
Principles
First steps

ON + *PNo*

MEAS to measure to the reference height

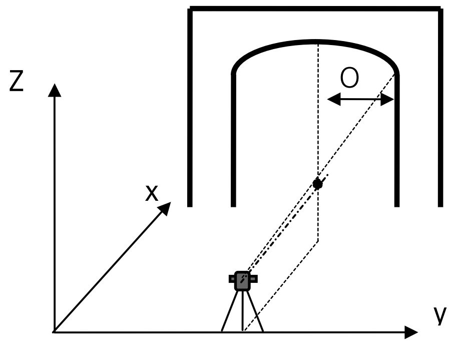
Further points:

ON + *PNo*, MEAS



Display of results and saving

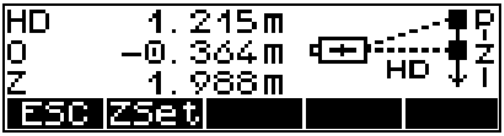
Measurement beside the Plumb Line



Further points:

ON + PNo, MEAS

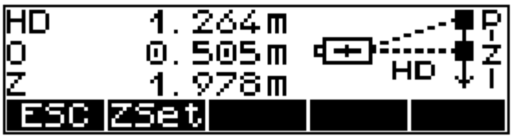
to the left of the plumb line



Further points:

ON + PNo, MEAS

to the right of the plumb line



Recording

Presettings
First steps

If recording is activated, the following lines are saved in dependence on the settings:

Designation of the mode

Point numbers and code

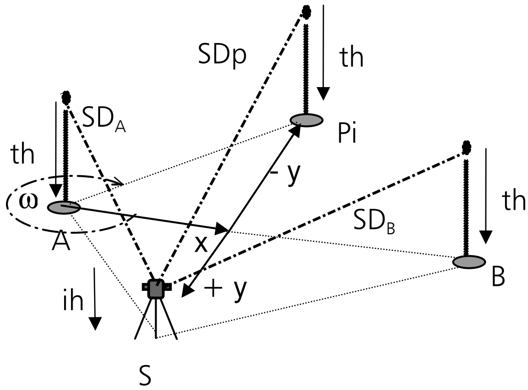
SD, Hz, V	Polar coordinates A
Hz, V	Measuring point P
HD,O,Z	Measuring point P
Z	Set value Z

Applications

Station + Offset

Determination of the rectangular coordinates of any point in relation to a reference line defined by the points A and B.

Examples for application:
Checking of point distances from a reference line,
checking of boundaries,
intersection of sight rails,
determination of the distances of buildings from boundaries, footpaths or streets,
alignment of long straight lines in the event of visual obstacles on the line,
surveying of supply lines and channel routes referred to roads and buildings,
free stationing in a local system



meas.: : $(SD,Hz,V)_{A,B,P}$, th

requ.: : $(x,y,\omega)_P$, referred to line A-B

$h_{A\text{-}B}$, $h_{A\text{-}P}$

Measurement „Station + Offset“

CHCK **Adjusting and checking**

A to start by calling point A

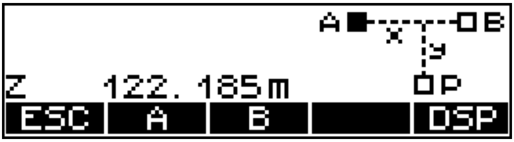
th to enter the reflector height of A

DSP to change over the different displays of results

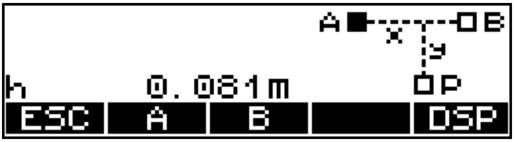
ON + *PNo*

MEAS to measure to point A

A=S page 5-18



Display of absolute altitude Z (only with stationing in elevation carried out)



Display of height difference h

B to call point B

A Measurement to point A to be repeated?

th to enter the reflector height of B

ON + *PNo*

MEAS to measure to point B

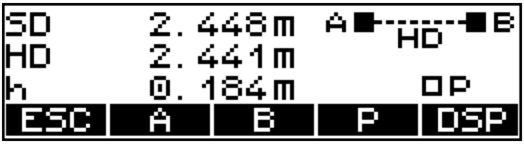
B=S page 5-19

The results refer to points A and B

P to call point P

B B to be repeated?

A A to be repeated?



Display of results and saving

Measurement to point P

th to enter the reflector height of P

ON + *PNo*

MEAS to measure to point P

P=S page 5-19

DISP to change over the different displays of results

CONS to enter constants for x and y page 5-20

The result can now be displayed in three different modes.

further points P

th to enter the reflector height of P

ON + *PNo*

MEAS

Display of results and saving y, x, h

DSP to change over the different displays of results

Display of results and saving x, y, Z

DSP to change over the different displays of results

Display of results and saving x, y, ω

☝ Attention !

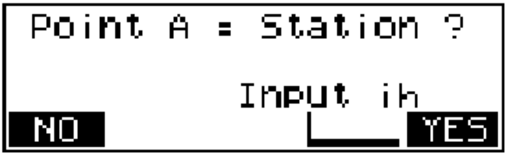
If the mode is changed after the measurement, the values will be converted and displayed in the new mode, but saved in this form only after the next measurement.

☞ Tip

Change the mode before the measurement.

The Station equals Point A A = S

Principles
First steps



YES to confirm

NO to reject

B to continue in the main program

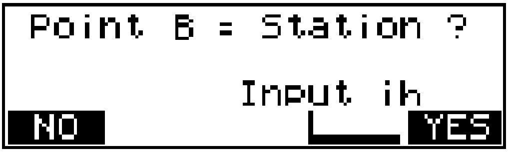
Saving

The Station equals Point B B =S

Principles
First steps

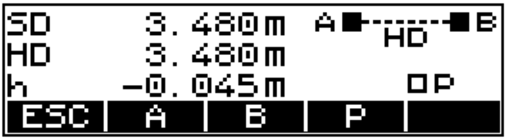
YES to confirm

NO to reject



The results refer to points A and B(S)

P to continue in the main program



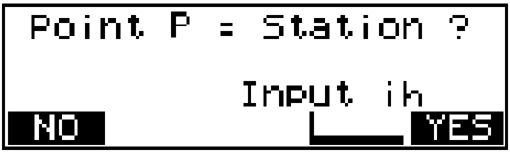
Display of results and saving

The Station equals Point P P = S (checking)

Principles
First steps

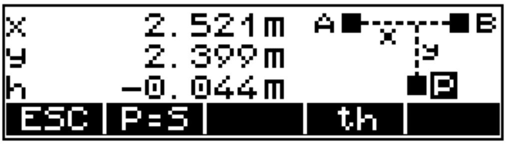
YES to confirm

NO to reject



To continue in the main program:

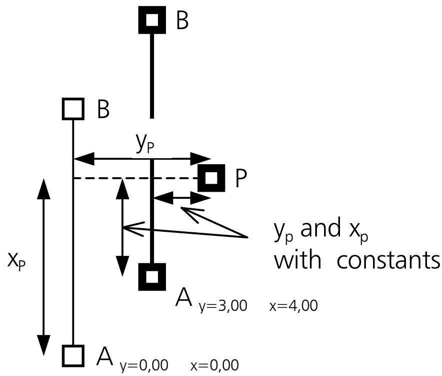
th, ON + PNo, MEAS



Display of results and saving

Shifting the Coordinate Axes y, x

If a line does not begin with the coordinate x=0,00, the corresponding value can be entered after having measured the line. If it is a parallel line, the parallel distance y can be entered in the same way. Consequently, the computation is always related to the new and parallel line.



CONS to call the menu for defining axes

The result of a measurement to a point P is displayed as follows:

Input of shift values for y and x axes

📖 Principles
First steps

Example: x=5,000 m

o.k. to confirm input

The change is recorded

MEAS to measure

Display of result after changing the origin of coordinates

☝ Tip

The input of constants for y and x allows to set out parallel and rectangular lines in an elegant fashion making additional computations superfluous. This applies especially to the intersection of sight rails and setting out of axes.

Recording

Presettings
First steps

If recording is activated, the following lines are saved in dependence on the settings:

Designation of the mode

Point numbers and code

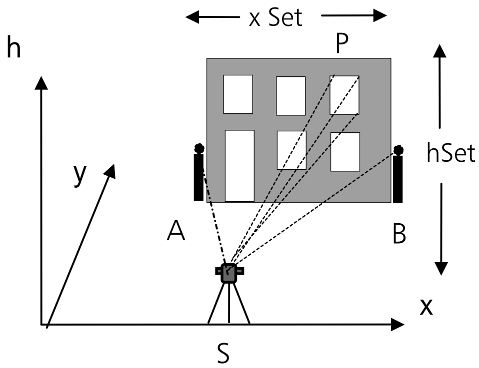
SD, Hz, V	Polar coordinates A,B
th,ih	Reflector height, instrument height (only if changed)
SD, HD, h	Basis A-B
SD, Hz, V	Polar coordinates P
y,x,h	Coordinates P or
y,x,Z	Coordinates P or
y,x,ω	Coordinates P and angle ω
A=S, B=S	
and P=S	Information lines
Y,X,h	P=S
y,x	constants for y and x

Applications

Vertical Plane

A vertical plane is defined by angle and distance measurements to two points. The coordinates of further points in this plane are determined by an angle measurement only.

Examples for application:
Surveying of building façades, heights of passageways, bridges or motorway signs,
determination of coordinates in a vertical plane for the determination of heights and volume computations,
setting out of sectional planes (planimetry and height) for façade construction



meas.: : $(SD,Hz,V)_{A,B}$, th, $(Hz,V)_P$

requ.: : $(y,x,h)_P$

Measurement „Vertical Plane“

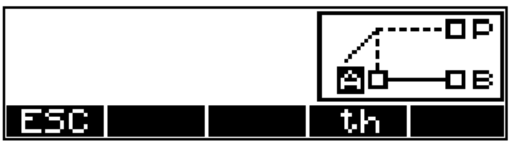
CHCK **Adjusting and checking**

A to start by calling point A

th to enter the reflector height of A

ON + *PNo*

MEAS to measure to point A

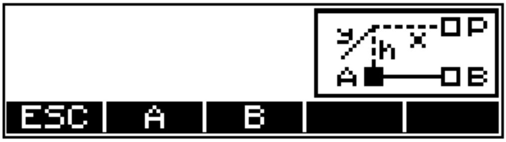


B to call point B

th to enter the reflector height of B

ON + *PNo*

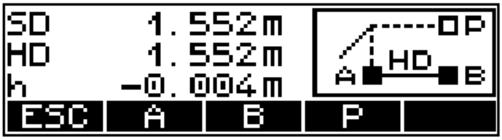
MEAS to measure to point B



P to call point P

ON + *PNo*

MEAS to measure Hz and V to point P



Display of results and saving

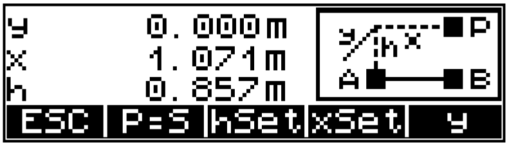
To measure to further points

hSet see below

xSet page 5-25

y page 5-26

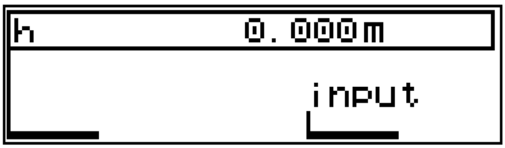
P=S page 5-27



Display of results and saving

hSet - Determination of the Height Coordinate

Definition of the horizon:



└ <u>h 0.000 m</u>
Confirm the old reference height (in this case 0)

└ Principles
First steps

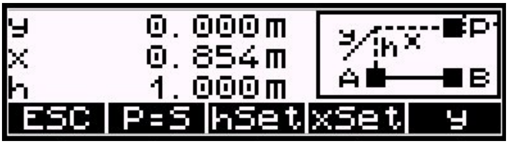
Input h=1,00m

ON + PNo

MEAS to measure Hz and V to point P

The results refer to the new height

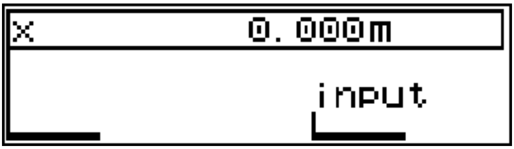
To measure further points



Display of results and saving

xSet - Definition of the x - Axis

x 0.000 m
Confirm the old reference height (in this case 0)



Principles
First steps

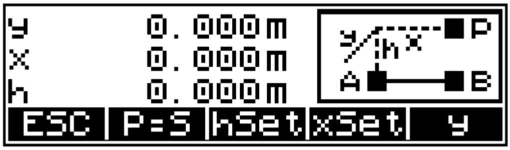
Input x=1,00m

ON + PNo

MEAS to measure Hz and V to the desired point P

The results refer to the new x - axis
(in this case, the desired and set zero point of coordinates has been measured)

To measure further points

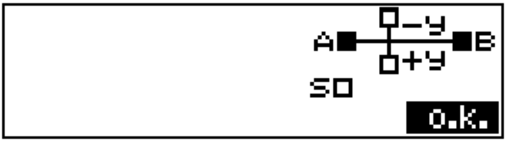


Display of results and saving

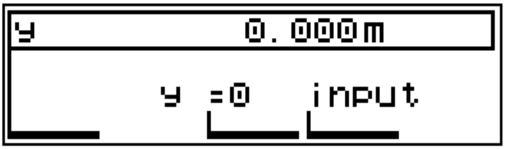
y - Points in front or behind the Plane

Definition of preceding sign

o.k. to confirm



y 0.000 m
Confirm the old value
(in this case 0)



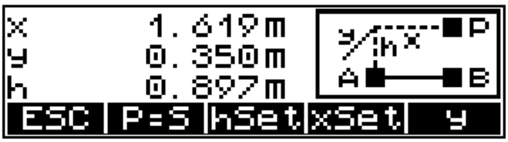
y = 0
Set to zero

Principles
First steps

After entering y=0,350m:

ON + *PNo*

MEAS to measure Hz and V to point P



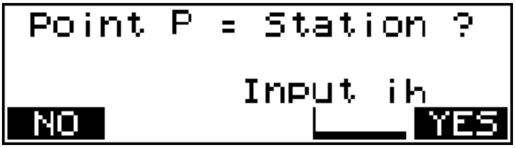
Display of results and recording

The Station equals Point P P=S

Principles
First steps

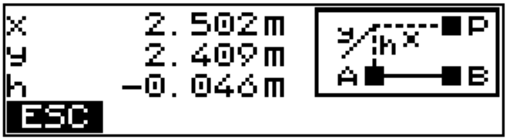
YES to confirm

NO to reject



ESC further points

Coordinates of S with reference to plane A-B



Display of results and recording

Recording

Presettings
First steps

If recording is activated, the following lines are saved in dependence on the settings:

Designation of the mode

Point numbers and code

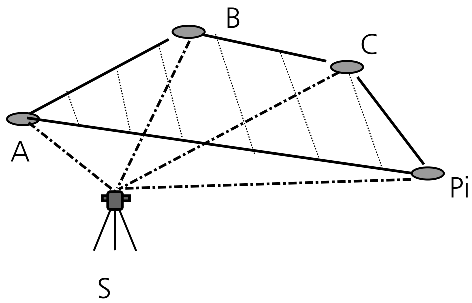
SD, Hz, V	Polar coordinates A,B
th,ih	Reflector height, instrument height (only if changed)
SD, HD, h	Basis
Hz,V	P
y, x, h	P
P=S	Information lines
Y,X,h	P=S

Applications

Area calculation

Area calculation by measurement to the corner points ***or*** input of the corner point coordinates of the area or calling them from the memory. A direct combination of both methods is impossible (see page 5-29).

The area is limited by straight lines. Any number of corner points can be used.



	meas.:	: $(SD,Hz,V)_{A,B,C,Pi}$
or	given.:	: $(y,x)_{A,Pi}$ $(Y,X)_{A,Pi}$
	comp.:	: Fl (A-B-C-Pi)

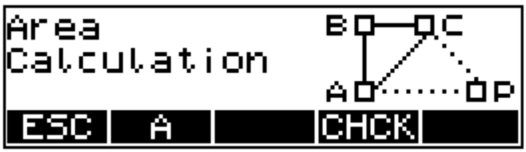
Range:

$0{,}01m^2 \pm 0{,}01m^2 < Fl < 90\,000\,000m^2 + 1m^2$

Measurement „Area Calculation“

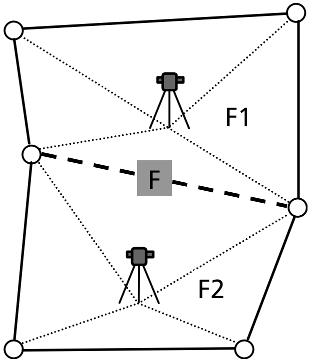
PRUE 📖 **Adjusting and checking**

A to start by calling point A



☝ Attention !

The points of the area are to be measured, called from the memory or entered in proper order. In each case, the last point can be repeated. It is not possible to insert a forgotten point subsequently.



☞ Tip!

If not all points can be seen from one station, the following procedure is recommendable:

Divide the corner points into groups so that all corner points can be seen from two or more stations.

1st corner point group
Determination of corner point coordinates of the area by means of
- stationing in a local or global network and
- polar measurement of the 1st group
  Coordinates of these points are now stored in the instrument memory

2nd corner point group
Move the instrument to another place from where the remaining points of the area can be seen.
- stationing in a local or global network (as for the 1st group) and measurement of the remaining points
- all points are now stored in the memory

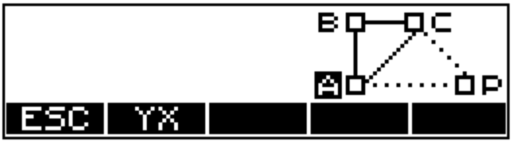
Starting the area calculation
- Call the corner points of the area from the memory considering the order

This method works only in case of instruments with internal memory. The Timble 3306DR allows to measure the points only. It is possible, however, to calculate an area (F) to be covered through various stations. The subareas (F1+F2) are arranged in such a way that they can be assembled to a total area. A stationing is not necessary for this purpose.

F = F1 + F2

MEAS to measure to point A or

YX Input or select memory coordinates of point A



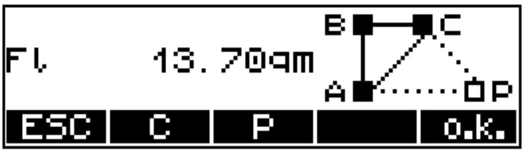
Principles **First steps**

Editor **Data management**

Input coordinates

The operational steps for point B and C are now carried out in analogy to point A.

After measuring to A,B and C, the area is calculated for the first time:



ESC to quit the program

C to repeat measurement to point C

P to continue in the program by calling point P_i

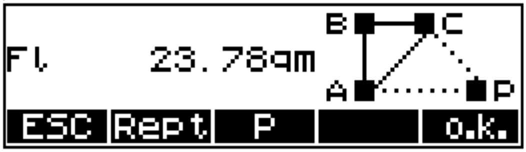
o.k. to quit the area calculation and store the result

Rept to repeat the last point Pi

P to continue in the program by calling point P_{i+1}

o.k. to quit the area calculation and store the result

Display of result after measuring to another point Pi:



☞ Tip!

Any number of corner points can be used.

Recording

📖 Presettings
First steps

If recording is activated, the following lines are saved in dependence on the settings:

Designation of the mode

Point numbers and code

y,x or

Y,X	Coordinates of points A, B, C, P_i
SD,Hz,V	Reading of points A, B, C, P_i
Fl	Area

6 Data Management

Decisive features of an efficient work routine are the saving of the measured and computed values as well as the transfer of measured data to a PC and the transfer of coordinates from the PC to the surveying instrument. This chapter describes all processes necessary to meet these requirements. The section *Editor* only applies to Trimble 3303DR and Trimble 3305DR.

Calling the EDIT Menu

ON *EDIT*

Compensator activated

Indication of battery level

Display of the free data lines and address of the last data line written

Display of Data Lines

Disp to go to memory display

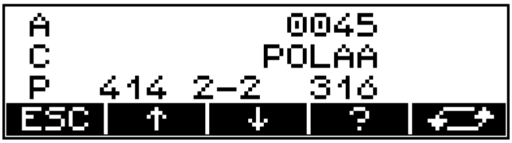
? to call search function

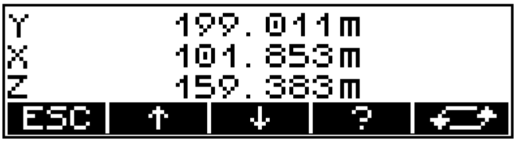
 to change page

↑ to display preceding data line

↓ to display following data line

ON *PNo* allows to change point number and code





☝ Attention !

In the coordinate and application programs, fixed codes are assigned to certain data lines. Such codes can not be modified by the operator.

Searching for Data Lines

?	to call search function
?P	to search for point number
?C	to search for point code
?A	to search for address

Input of the point number, code or address to be searched for

? ↓	to continue search using the same criterion
⇆	to change page
↑	to display preceding data line
↓	to display following data line
ESC	to quit search routine

☞ Tip

If no data line is found to which the search criterion applies, search is followed by an error message.

Deleting Data Lines

Del to call the function "Delete"

☝ Technical Information

This function deletes all data lines or the data lines <u>from</u> a selected line number (address) to the last data line saved.

☝ Attention !

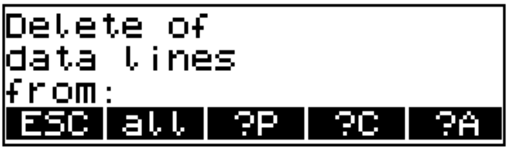
The deletion is definite and irrevocable. To avoid any unintentional loss of data, most care has to be taken over this action!

all to select all lines

?P or from the line with point number xx

?C or from the line with code xx

?A or from the line with address xx



Example: search for point number 2

?↓ to continue search using the same criterion

```
A          0050
C
P             2
ESC | ↑ | ↓ | ?↓ | ⇄
```

⇄ to switch over to the page of readings

```
A          0111
C
P             2
ESC | ↑ | ↓ | ?↓ | ⇄
```

o.k. to confirm the line

```
y        0.273m
x        4.179m
a      95.8546gon
⇄ | ↑ | ↓ | ?↓ | o.k.
```

For another check, the selected data lines are displayed again and have to be confirmed.

YES to confirm the selection

NO to reject the selection / quit the routine

```
Delete all data
from Adr.:    20
to Adr.:      30
NO |  |  |  | YES
```

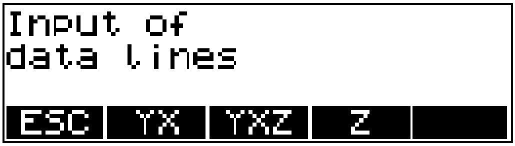
Entering Data Lines

Inpt to call the function "Input"

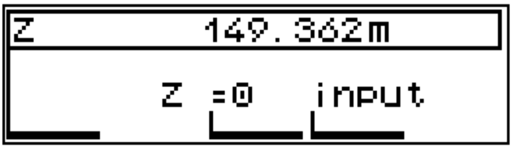
YX to enter the planimetric coordinates

YXZ to enter planimetric coordinates and heights

Z to enter heights



Example of a height input:



Z 149,362 m
Confirmation of the old value (in this case 149,362 m)

Z = 0
Set the height to zero

input
📖 Principles
First steps

← and

→ to go to the desired position

+ and

- to browse through digits

o.k. to confirm

⇆ to switch over to the page for readings

ON *PNo*
to enter point number and code

o.k. to confirm and save

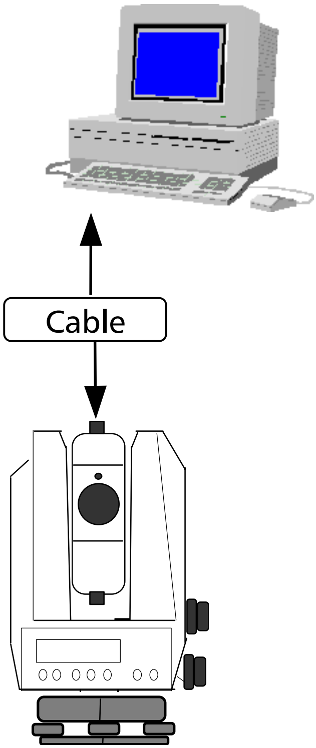
Input of further coordinates and heights with point number and code

Presettings
First steps

☝ Attention !

The sequence and designation of the coordinate axes depend on the selected system of coordinates and the setting of the display of coordinates. The softkey YX and YXZ, respectively, is labelled according to this selection.

Introduction



Data transfer can be performed between **Trimble 3300DR** and **PC** by **cable**

This allows an easy data exchange between instrument and computer.

Preparation on the Instrument

ON + MENU

Main menu.

6 Interface

YES to go to the menu

MOD to change settings

Menu Interface **Trimble 3300DR**

Trimble 3300DR ↔ **PC**
Connect both devices by the serial interface cable and start the necessary programs for data transfer.

Cable for data transfer
Trimble 3300DR ↔ **PC**
with protocol Xon/Xoff:

Order number
708177-9470.000

Interface parameters for transmitting and receiving project files:

Data format: R4, R5, Rec500 or M5

Baud rate:	9600
Parity:	even
Protocol:	Xon/Xoff
Stop bits:	1 (not variable)
Data bits:	7 (not variable)

☞ Tip

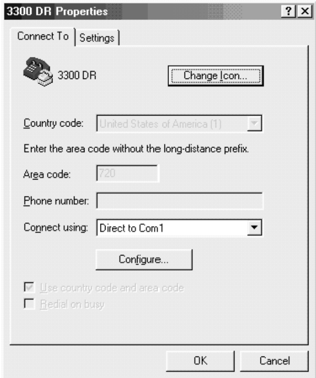
For data transfer to and from the PC, you can use for example the MS-Windows™ 98 Hyperterminal program.

Preparation on the PC - Hyperterminal Settings

Set the PC for data transfer as follows:

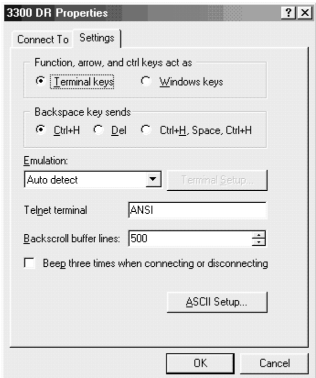
Example for Windows™ 98 Hyperterminal program:

Step 1



Settings: Connect using – Com port

Step2

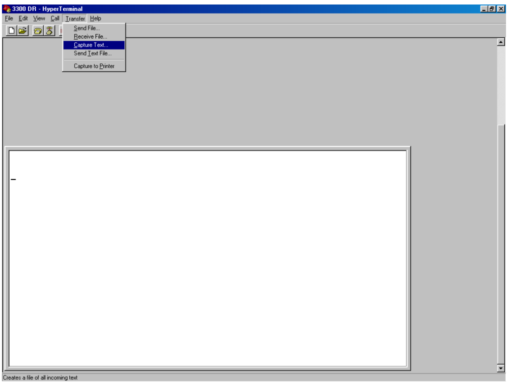


Settings:	Function, ...	– Treminal keys
	Backspace ..	– Ctrl H
	Emulation ...	– Auto detect
	Telnet term.	– ANSI
	Backscroll ...	- 500

Step 3

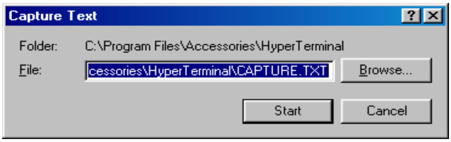
Step 4:

For sending or receiving a project file, select "Transfer"as shown below:



Step 5:

To transmit a project file, select “Send text file” or “Receive text file”.



☞ Tip

The format of the transmitted file is *.txt. For using the file with Trimble sensors, controllers or office software packages like TTC, TGO or TM the format *.dat is required. Therefore the file has to be renamed.

Data Transmission

ON + *MENU*

Main menu:

6 Interface

Scrall until submenu Interface

YES to go to the menu

Data transfer menu between Trimble 3300DR and PC.

1 MEM -----> Periphery

YES to confirm

```
  1 MEM -> Periphery
↓ 2 Periphery -> MEM

ESC | | ↓ | | YES
```

Selection of the required data lines

```
Transfer of
data lines
from:
ESC | all | ?P | ?C | ?A
```

📖 Editor
Data Management

☞ Tip
Now, set the PC to „Receive text file“. The instrument or program at the receiving end must be set to the receive mode before you can transmit the project file.

YES to start

```
Transfer all data
from Adr.:     1
to Adr.:      32
NO | | | | YES
```

The data lines are transferred to the PC.

ESC to end data transfer

```
data lines
selected:         32
transferred:      32
ESC
```

Data Reception

ON + MENU

Main menu:

6 Interface

Scrall until submenu Interface

YES to go to the menu

Data transfer menu between PC and Trimble 3300DR.

2 Periphery -----> MEM

YES to confirm

```
   1 MEM -> Periphery
↓ 2 Periphery -> MEM
ESC        ↓        YES
```

Enter the name of the source file into the PC

Start the transfer from the PC

The data lines are transferred to the Trimble 3300DR.

```
     Transferring
ESC
```

☝ Attention !

The instrument only accepts coordinates.

ESC to end data reception

```
data lines
received:        207
accepted:        207
ESC
```

☞ Tip

Time Out occurs after 30 seconds without data communication.

The message „Time Out“ indicates a data error. After that, the program returns to the data transfer menu.

Introduction

Trimble surveying instruments are used for measurement functions with different data processing requirements.

The Trimble 3300DR series allow densely packed internal measurement and result data lines to be output in various formats.

M5, R4, R5, Rec500 record format

Four data formats which have grown historically are subject to on-site revision service for compatibility with customer instruments. Currently, M5 is the format to provide most comprehensiveness in definitions. It should be used preferentially for any other tasks.

This chapter describes the structure of data format and the type identifier of measured and calculated values.

📖 Data transfer
Data management

📖 User interface
Data management

Technical

All instruments have a serial interface which ensures the data exchange.

Attention!

Instead of the usual marks within the 27 digit point identification, the M5 data format of Trimble 3300DR is limited to a 12 digit point number and a 5 digit code.

Description of M5 data format

„M5“ -> **5 Measuring data blocks** per data line:

1 Address block
1 Information block
3 numerical data blocks

The original Zeiss M5 data format is the common standard for all former Elta®surveying systems and current Trimble 3000 systems

All 5 data blocks are preceded by a type identifier. The 3 numerical data blocks have a standard layout comprising 14 digits. In addition to the decimal point and sign, they accept numeric values with the specified number of decimal places.
The information block is defined by 27 characters. It is used for point identification (PI) and text information (TI e.g.).
The address block is comprised of 5 digits (from address 1 to 99999).

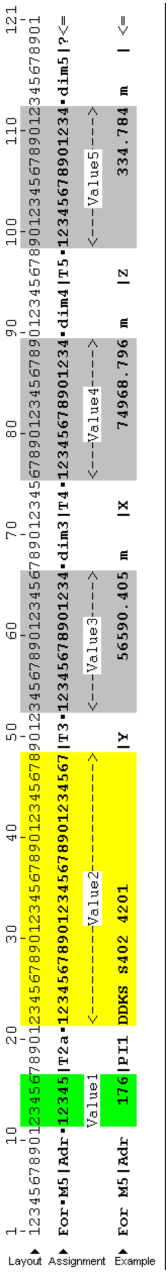
The M5 data line

The data line of the M5 format consists of 121 characters (bytes). The multiplication of this figure by the number of addresses (lines) stored shows the size of the project file in bytes.

Blanks are significant characters in the M5 file and must not be deleted.

The example describes an M5 data line at address 176 with coordinates (YXZ) recorded in unit **m**. The point identification of marking 1 is **DDKS S402 4201**. Column 119 includes a blank (no error code).

The end of the line has CR, LF (columns 120 and 121, shown here as **<=**).



Col. 120-121:	Carriage Return <, Line Feed
Column 119:	Blank field, in case of error „e“
Col. 114-117:	Unit for block5
Column 99-112:	Block5 value block
Column 96-97:	Type identifier5 for block5
Column 91-94:	Unit for block4
Column 76-89:	Block4 value block
Column 73-74:	Type identifier4 for Block4
Column 68-71:	Unit for block3
Column 53-66:	Block3 value block
Column 50-51:	Type identifier3 for block3
Column 22-48:	Information block PI or TI (point identification PI or text information TI, TO etc.)
Column 18-20:	Type identification2 PIa (a=1-0, for 10 Markings) or TI
Column 12-16:	Memory address of data line
Column 8-10:	Type identifier1 *Adr* for address
Column 1-6:	Defines M5 format

■ blank | separator

Explanations to the data line

Abbr.	Description	Digits	Characters	Meaning
For	Format identifier	3	alpha	Trimble 3300DR Format
M5	Format type	2	alpha	5 meas. data blocks
Adr	Address identifier	3	alpha	Value1
	Value1	5	numeric	Memory address
T2	Type identifier	2	alpha	Value2 (PIa ,TI, TO...)
a	Marking Value2	1	numeric	a=1, 2, 3 ,..., 9, 0
		27	alpha	PI or TI
T3	Type identifier	2	alpha	Value3
	Value3	14	numeric	14-digit value
dim3	Unit	4	alpha	4-digit unit
T4	Type identifier	2	alpha	Value4
	Value4	14	numeric	14-digit value
dim4	Unit	4	alpha	4-digit unit
T5	Type identifier	2	alpha	Value5
	Value5	14	numeric	14-digit value
dim5	Unit	4	alpha	4-digit unit
?	Identifier	1	alpha	Error message, or ■

<table>
<tr><th colspan="2">Special characters</th><th></th><th>ASCII code</th><th>Hex code</th></tr>
<tr><td>|</td><td>Separator</td><td>1</td><td>ASCII 124</td><td>Hex 7C</td></tr>
<tr><td>■</td><td>Blank</td><td>1</td><td>ASCII 32</td><td>Hex 20</td></tr>
<tr><td><</td><td>CR (Carriage Return)</td><td>1</td><td>ASCII 13</td><td>Hex 0D</td></tr>
<tr><td>=</td><td>LF (Line Feed)</td><td>1</td><td>ASCII 10</td><td>Hex 0A</td></tr>
</table>

Additional data lines of M5 data format–Header/changed setting

```
For M5|Adr 00001|TI START   |01     3305         |02     900005       |03     562          |
For M5|Adr 00002|TI         |04     30           |                    |                    |
For M5|Adr 00003|TI         |05     1            |06     1            |                    |
For M5|Adr 00004|TI         |20     1            |21     11           |22     16           |
For M5|Adr 00005|TI         |th     1.900 m      |ih     1.600 m      |                    |
For M5|Adr 00006|TI         |i      0.0005 grd   |c      0.0025 grd   |SZ     0.0060 grd   |
For M5|Adr 00007|TI         |T      20 C         |P      1012 hPa     |PC     0.035 m      |
For M5|Adr 00008|TI END     |m      1.000000     |                    |                    |
```

The additional M5 data lines are implemented to optimize the datatransfer (Import / Export) from and to the Trimble office software like TTC, TGO and TM.

☝ Tip: Beginning with software version >5.61 the additional data lines are implemented in the M5 data format.

Header

The Header is recorded after switch ON the instrument and begins with START and end up with END.

The new identifier in the M5 Format - Header

Abbr.	Description	Digits	Characters
01	Type instrument	2	numeric
02	# instrument	6	numeric
03	Version software	3	numeric
04*	Language	2	numeric
05	Coord. System	1	numeric
06	Oder Coord.Syst	1	numeric
20	Position I	1	numeric
21	Position C	2	numeric
22	Position P	2	numeric

* Each language is coded with two numbers (see next page)!

Coding of languages

Code	Language
23	German
30	English
31	Czech
32	Italian
33	Croatian
34	French
35	Dutch
36	Spanish
37	Danish
38	Polish
39	Hungarian
40	Japanese
41	Turkish
42	Russian
43	Finnish
44	Estonian
45	Portuguese

Content of the Header Explanation of the example page 6-19

Abbr.	Description	Meaning of Example
01	Type instrument	Trimble 3305DR
02	# instrument	900005A
03	Version software	6.82
04	Language	30 / English
05	Coord. System	xy
06	Order Coor.Syst.	yx
20	Position I	Start position 1
21	Position C	Start position 11
22	Position P	Start position 16
th	Target hight	1,90m
ih	Instrument hight	1,60m
i	Vertical index cor.	-0,0005 grd
c	Sighting axis cor.	0,0025 grd
SZ	Run Center comp.	0,0060 grd
T	Temperature	20°C
P	Air Pressure	1012 hPa
PC	Prism constant	-0,035m
M	Scale	1,000000

Changed settings

Record changed settings of the instrument

Changed settings of the instrument are recorded permanent while the instrument is in operation. The menu „Record Settings“ has to be activated (see pages 3-27, 3-28).

Record changed settings

The following changed settings and adjustments are recorded while the instrument is ON:

Record	T1	T2	T3	Comment
INPUT	th	ih	-	input th/ih
ADJUST	V1(1)	V1(2)	i	adjustment V-Index/Collim.
ADJUST	Hz(1)	Hz(2)	c	adjustment V-Index/Collim.
ADJUST	-	-	SZ	adjustment V-Index/Collim. or Compensat.
INPUT	T_	P	PC	Input Temp., Air Pressure, Prism constant
INPUT	m	-	-	Input scale
COM-ON-		-	-	Compensator switched ON
COM-OFF-		-	-	Compensator switched OFF
Hz=0	-	Hz(=0)	-	Hz set to 0
HOLD	-	Hz	-	Hz set to desired angle
DR*	-	PC	A	DR mode switched ON
PR**	-	PC	A	PR mode switched ON

* PC=0, A=0

** PC=set, A=calculated

```
For M5|Adr 00009|TI  INPUT          |th          2.000 m    |ih                1.700 m|                      |
For M5|Adr 00010|TI  ADJUST         |                       |                         |SZ          0.0055 grd |
For M5|Adr 00011|TI  ADJUST         |V1        92.4505 grd  |V1        307.5515 grd   |i          -0.0010 grd |
For M5|Adr 00012|TI  ADJUST         |Hz       284.1015 grd  |Hz         84.1060 grd   |c           0.0025 grd |
For M5|Adr 00013|TI  ADJUST         |                       |                         |SZ          0.0055 grd |
For M5|Adr 00014|TI  INPUT          |T_               25 C  |P          1000 hPa      |PC         -0.005 m    |
For M5|Adr 00015|TI  INPUT          |m          1.000005    |                         |                       |
For M5|Adr 00016|TI  COM-OFF        |                       |                         |                       |
For M5|Adr 00017|TI  COM-ON         |                       |                         |                       |
For M5|Adr 00018|TI  Hz=0           |                       |Hz          0.0000 grd   |                       |
For M5|Adr 00019|TI  HOLD           |                       |Hz        300.0000 grd   |                       |
For M5|Adr 00020|TI  DR             |th          0.000 m    |PC          0.000 m      |A           0.000 m    |
For M5|Adr 00021|TI  PR             |th          2.000 m    |PC         -0.005 m      |A           0.030 m    |
For M5|Adr 00024|TI  KN STAT        |                       |                         |                       |
For M5|Adr 00025|TI                 |                       |Hz        300.0035 grd   |V1         92.4435 grd |
For M5|Adr 00026|PI1              S 0|Y       1000.000 m    |X        2000.000 m      |Z           0.000 m    |
For M5|Adr 00027|TI                 |                       |Om        200.0035 grd   |                       |
```

For your information only!
Trimble 3300DR - Page 6-17

The point identification PI in M5 Format

The PI is comprised of 27 characters. It starts in column 22 and terminates in column 48 in the M5 data line. The data structure within the PI is defined by markings. A maximum of 10 markings, marked in the preceding type identifier with PI1 to PI0 (columns 18, 19, 20), can be designated to the PI (depending on the instrument).

For your information only!
Trimble 3300DR - page 6-32

The type identifier in the M5 Format

In the course of the time, requirements on the data format have increased. Therefore, the M5 Format carries most of the type identifiers of all available formats, always based on the preceding format (Rec500).

Type identifiers are defined by two characters (except for Adr). If only one character is necessary, the second character is a blank.

In the M5 Format there are 5 Type identifiers (TK) defined:

TK1:	Adr	Identifier address (Value1)
TK2:	T2	Identifier information (Value2)
TK3:	T3	Identifier 3. Value field (Value3)
TK4:	T4	Identifier 4. Value field (Value4)
TK5:	T5	Identifier 5. Value field (Value5)

Example:

„PI“ for point identification or „TI“ for text information can be used for T2. For T3, T4, T5, „D“, „Hz“, „V“ or „Y“, „X“, „Z“ can be used.

Description of Rec 500 data format

„Rec500“ stands for the description of the electronic field book Rec500.

With the electronic field book **Rec500** a data format was developed which was created for Trimble / CZ instruments years ago and is today the base for the M5 format..

1 Address block
1 Block Information
3 Numeric data blocks

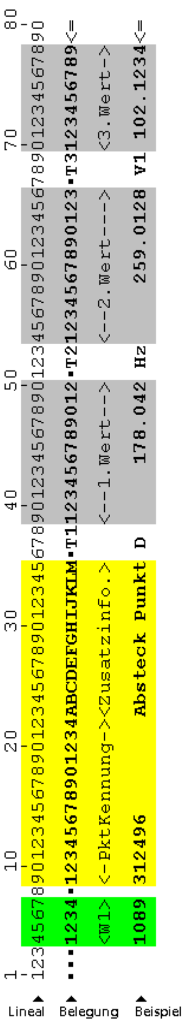
The Rec500 format is divided in 5 marking blocks (analogous the M5 format). These blocks differ in their block length from the M5 format, 80 characters (Bytes) are available on a data line.

The Rec500 Data line

The data line in the Rec500 format is comprised of 80 characters (Bytes).

Abbr.	Description	Digits	Characters	Meaning (w. example)
W1	Address	4	numeric	Memory address
PI	Point identification	27	num / alpha	Point identification (14-digits) and additional information (13 digits)
T1	Type identifier 1. Value	2 12	num / alpha numeric	D = slope distance E = horizontal distance Y = coordinate, etc.
T2	Type identifier 2. Value	2 13	num / alpha numeric	Hz=horizontal direction X = coordinate, etc.
T3	Type identifier 3. Value	2 9	num / alpha numeric	V1=zenith angle Z = coordinate, etc.

Special characters			ASCII code	Hex code
■	Blank	1	ASCII 32	Hex 20
<	CR (Carriage Return)	1	ASCII 13	Hex 0D
=	LF (Line Feed)	1	ASCII 10	Hex 0A



Column 79-80: Carriage Return <, Line Feed =

Column 70-78: 3. Value block

Column 68-69: Type identifier for 3. Value

Column 54-66: 2. Value block

Column 52-53: Type identifier for 2. Value

Column 39-50: 1. Value block

Column 37-38: Type identifier for 1. Value

Column 23-35: additional information of PI (alpha numeric)

Column 9-35: Point identification PI

Column 9-22: Point Number of PI (numeric)

Column 4-7: memory address of data line

Column 1-3: 3 Blanks

■ Blank

For information only!
Trimble 3300DR – page 6-25

The point identification in Rec500 Format

The PI is divided into two areas:

Area 1: numeric area for point marking (point number)

Area 2: alpha numeric area for additional point information

Description of R4 and R5 (M5, Rec 500) format of Trimble 3300DR

„R4“ stands for the data recording format of the Trimble 3300DR instruments containing 4 measuring data blocks:

1 Information
3 numeric Data blocks

„R5“ stands for the data recording format of the Trimble 3300DR instruments containing 5 measuring data blocks:

1 Address block
1 Information block
3 numeric Data blocks

Two data recording formats - R4 and R5 - are available in the Trimble 3300DR total stations. Both formats can be chosen in the instruments. Depending on the setting with or without address, either data record format R5 (with address) or R4 (without address) can be used.

R4 and R5 format data lines

The data line in the R4 format contains 80 characters (Bytes). It is comprised of an information block and 3 numeric value blocks.
The data line in the R5 format contains 89 characters (Bytes). It is comprised of one address block, one information block, 3 numeric value blocks.
Both formats contain the same type identifiers for each block..

Abbr.	Description	Digits	Characters	Meaning
For	Marking format	3	alpha	Trimble 3300DR Format
R4,R5	format type R4, R5	2	alpha	4 or. 5 Data blocks
Adr	Address marking	3	alpha	3 digits for marking
<aa>	Value1	4	numeric	Address in R5 Format
Tk	Type identifier Info	2	alpha	Type identifier TR or KR
<Info>	Info	7	num / alpha	Info for data line
Ti	Type identifier Value	2	num / alpha	Type ID Value block
i <Wi>	Value i (i = 1,2,3)	11	numeric	Value block Value i
dimi	dim i (i = 1,2,3)	4	alpha	Unit block Value i

Special characters M5 Data format

The special characters ■, | , < and = are analogous the M5 format.

```
Lineal     1        10        20        30        40        50        60        70        80
           12345678901234567890123456789012345678901234567890123456789012345678901234567890
Belegung   For▪R4|Tk▪1234567|T1▪12345678901▪dim1|T2▪12345678901▪dim2|T3▪12345678901▪dim3|<=
                     <-Info>   <--Wert1-->        <--Wert2-->        <--Wert3-->        <=
Beispiele  For R4|TR EINGABE|th      0.000 m   |ih      1.650 m   |Z     512.358 m   |<=
           For R4|          |SD     12.323 m   |Hz   399.9710 m   |V1   112.4458 m   |<=
```

The R4 Data line

Column 79-80:	Carriage Return <, Line Feed =
Column 74-77:	Unit for 3. Value block
Column 62-72:	3. Value block
Column 59-60:	Type identifier for 3. Value block
Column 54-57:	Unit for 2. Value block
Column 42-52:	2. Value block
Column 39-40:	Type identifier for 2. Value block
Column 34-37:	Unit for 1. Value block
Column 22-32:	1. Value block
Column 19-20:	Type identifier for 1. Value block
Column 11-17:	Data line information (alpha numeric)
Column 8-9:	Type identifier information
Column 1-6:	Defines R4 format

■ Blank | Separator

The R5 Data line

```
Lineal      1        10        20        30        40        50        60        70        80       89
            12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789
Belegung    For▪R5|Adr▪1234|Tk▪1234567|T1▪12345678901▪dim1|T2▪12345678901▪dim2|T3▪12345678901▪dim3|<=
                       <aa>    <-Info>    <--Wert1-->          <--Wert2-->          <--Wert3-->
Beispiele   For R5|Adr 1234|TR EINGABE|th      0.000 m    |ih      1.650 m    |Z     512.348 m    |<=
            For R5|Adr 1235|KR 001   34|SD     12.323 m    |Hz   399.9710 gon  |V1   112.3448 gon  |<=
```

Column 88-89:	Carriage Return <, Line Feed =
Column 83-86:	Unit for 3. Value block
Column 71-81:	3. Value block
Column 68-69:	Type identifier for 3. Value block
Column 63-66:	Unit for 2. Value block
Column 51-61:	2. Value block
Column 48-49:	Type identifier for 2. Value block
Column 42-46:	Unit for 1. Value block
Column 31-41:	1. Value block
Column 28-29:	Type identifier for 1. Value block
Column 20-26:	Data line information (alpha numeric)
Column 17-18:	Type identifier information
Column 12-15:	Memory address of Data line
Column 8-10:	Type identifier *Adr* for address
Column 1-6:	Defines R5 Format

■ Blank | Separator

The point identification in the R4/R5 Format

For a point identification in the R4 and R5 format are max. 7 digits available.

The PI is controlled by two Type identifiers, TR and KR, which describe the kind of PI.

TR Type identifier for a text information block

KR Type identifier for a PI with code and point number.

Point number: 0...9, right-aligned, 4-digit

Point code: 0...9, Blank, # 3-digit

The 3 digit code can be combined with additional characters. It is suggested to use the character # for marking incorrect measurements.

Trimble 3300DR - Marking in the M5 / Rec 500 Format

The Trimble 3300DR uses a mark which is saved internal in the instrument. This mark consists of 3 blocks with clearly defined block lengths. The user can manipulate the order of the 3 blocks. Examples:

Layout gage:

```
1        10        20    27
123456789012345678901234567
```

Sample Marking: **`PPPPPPPPPPPP CCCCC  IIIIIII`**

Sample Marking: **`IIIIIII   CCCCCPPPPPPPPPPPP`**

Meaning:

PPPPPPPPPPPP 12-digit point number

CCCCC 5-digit point code

IIIIIII 7-digit information block

☞ Tip

The information block (**I**) is left-aligned, the code (**C**) and point number (**P**) are right-aligned.

Upon data conversion to the R4 / R5 format, the point number and point code will be shortened to 5 and 3 digits, respectively. The right-aligned digits remain.

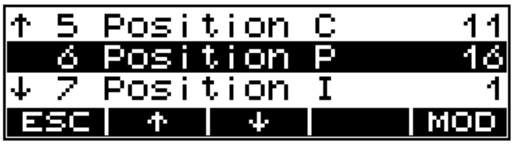
Change settings of Trimble 3300DR – Markings in the M5 / Rec 500 format

ON + *MENU*

6 Interface

YES go to the menu

MOD to change setting



☞ Tip

In case of overlapping information in the blocs, the instrument returns into its initial settings (default).

Trimble 3300DR –Markings in R4/R5 format

In instruments of the Trimble 3300DR series one marking can be used.

In both the R4 and R5 format 7 characters are available for point identification and marking.

The PI is controlled by two type identifiers TR and KR, which mark the kind of the PI.

TR Type identifier for one text information block

KR Type identifier for a PI with code and point number.

Point number: 0...9, right-aligned, 4-digit

Point code: 0...9, Blank, # 3-digit

The 3 digits in the code can be combined with any applicable character. It is sug gested, to use the character # to mark incorrect measurements.

Examples:

Layout gage:	`TI 1234567`
Text information:	**`TR IIIIIII`**
Point number and code:	**`KR CCCPPPP`**

Meaning:

`IIIIIII`	7-digit Text information block
`CCC`	3-digit Code block
`PPPP`	4-digit Point number block

In the M5 / Rec500 Format a 5-digit code and a 12-digit point number are used. In the R4 / R5 Format the established digits (3 and 4, respectively) remain right-aligned.

Definition of type identification

Definition	Type identifiers are assigned to the 5 measuring data blocks of pre-set codes, which show the number or character value of the block.
Type ID´s are defined with two characters.	Type identifiers are (except for **Adr**) defined with two characters. If only one character is necessary, the second character is blank. The code is case sensitive.
	The following table lists all Type identifiers in alphabetical order according to the TR/CZ Data Formats and the possible position of characters after the comma (,????) as well as signs (±):

Type identifiers - CZ Formats M5,R4,R5,Rec500 (Trimble 3300DR)

Type identifier	,????	±	Meaning
A	2,3,4		Distance addition constant
a	6		Horizontal angle of orthogonal line
Adr	-		Address (the only TK with 3 characters)
B			V-angle of control point
c	3,4,5		Collimation correction
c_			Sighting axis error
dl	2,3,4		Longitudinal deviation
dq	2,3,4,5		Transverse deviation
dr	2,3,4		Radial deviation in setting out
dx	2,3,4		Coordinate Difference /Deviation in X direction
dy	2,3,4		Coordinate Difference /Deviation in Y direction
dz	2,3,4		Coordinate Difference /Deviation in Z direction
HD	2,3		Horizontal distance
HV	3,4,5		Hz rotation
Hz	3,4,5	±	Horizontal direction

Type identifier	,????	±	Meaning
h	2,3,4	±	Height difference of a station
i	3,4,5		Index correction
ih	2,3,4		Instrument height
KR			Information Trimble 3300DR with code and point number
m	6		Scale
NZ	3,4,5		Compensator reading, sighting direction
O	2,3,4		Transverse distance (indirect height determination)
Om	3,4,5		Orientation (stationing) Omega
P	0,0,1		Air pressure (in hPa, Torr or InMerc)
PI			Point Identification (general)
pa	2,3,4		Parallel distance in 3-D plane
SD	2,3		Slope distance
SZ	3,4,5		Compensator run center: component in line of sight direction
T			Text ID in Rec500 Format
Tv	2,3,4		Type of target eccentricity
Th	2,3,4		Type of target eccentricity
Tl	2,3,4		Type of target eccentricity
Tr	2,3,4		Type of target eccentricity
Ts	2,3,4		Type of target eccentricity
TI	-		Text information line
TR			Information Trimble 3300DR as text information
T_	-		Temperature (in °C or °F)
th	2,3,4		Reflector height
V1	3,4,5		Vertical angle: zenith angle
V2	3,4,5		Vertical angle: vertical angle

V3	3,4,5	Vertical angle: height angle
V4	3,4,5	Vertical angle: slope in [%]
vy	2,3,4	backsight point residuals
vx	2,3,4	backsight point residuals
vz	2,3,4	backsight point residuals
X	2,3,4	X - Coordinate
x	2,3,4	x - Coordinate (lokal)
y	2,3,4	y - Coordinate (lokal)
Y	2,3,4	Y - Coordinate
y	2,3,4	y - Coordinate (lokal)
Z	2,3,4	Z - Coordinate (Height above MSL)

Description Value blocks

3 Value blocks

In each of the Trimble Elta® formats three value blocks are available whose number of digits depends on the format:

Format	Value1	Value2	Value3	dim
M5	14	14	14	4
R4/R5	11	11	11	4
Rec500	12	13	9	-

🕮 Type identifiers

All value blocks are preceded by a type identifier which specifies the function of the succeeding value.

In the M5 and R4 / R5 Format for the value block exists a unit (dim), which follows , 4-digit (divided by a Blank), the value block.

The values are typed right-aligned in the blocks. Decimal point, digits after the comma and definitions of preceding characters correspond to the internal instrument specifications.

☝ Caution!

If the files of the Trimble Elta® Formats are entered manually, it is important to remember that upon using the data in the instrument the digits after the comma and the units need to be adjusted correspondingly.

The following units are defined:

Angle measurement	gon, DEG, DMS, mil, grad, %
Distances, Coordinates	m, ft
Pressure	Torr, hPa, inHg
Temperature	C, F
Standard, PR etc.	no unit

Trimble Elta® Format ID and address block

Trimble Elta® Format ID in Columns 1-6

In the formats M5, R4 and R5 a marking which corresponds to the format precedes the data line.

`For M5`	Format marking for M5 Format
`For R4`	Format marking for R4 Format
`For R5`	Format marking for R5 Format

„For“ and the marking M5, R4 or R5 are divided by a Blank (ASCII 32).
An exception is the M5 Format for the former GePoS® receiver:

`For_M5` Format marking M5 Format for former GePoS® receiver of software versions less than V3.7:

In this case, „For“ and the marking M5 is divided by a „_“ (ASCII 95).

From V3.7 on, the Format marking is **`For M5`**.

Address blocks

The Formats M5, Rec500 and R5 have an address block which marks the data line with the current memory address. In the M5 and R5 format, a type identifier Adr is activated:

Format	TK	Column	Digit
M5	Adr	12 - 16	5
R5	Adr	12 - 15	4
Rec500	none	4 - 7	4

`Adr 00001` or
`Adr     1` is allowed.

The address entry is right-aligned. Zeros can be used but are usually omitted. The first data line starts with the memory address 1.

Data output on a printer

Direct data output from the instrument to the printer or form the PC:
The R4 data recording format ensures problem-free printout on A4 printers, with each print line comprising one data line. To achieve the same with the R5 data recording format, the following should be noted:

- Direct data transmission to a printer:
  Select condensed font in the printer
  or use A 3 printer

- Printing data from a DOS editor:
  Select condensed font in the printer
  or use A 3 printer

- Printing from a WINDOWS task:
  Do not use true type font or proportionally spaced font, but e.g. Courier
  Select a small type size
  Use landscape print format

☝ Attention!

For printing of data lines from the instrument at a printer is a serial type of printer interface necessary.

Introduction

This charpter decribes the conditions of data transfer, the pin assignment of the interface and key codes and function requests for controlling the instrument by a computer.

What is an Interface?

An interface is the point of contact between two systems or system areas, i.e. the point where information is interchanged. To ensure that it is understood by both the transmitting and receiving unit, specific rules must be defined for the transmission of signals and data.

Hardware interface

This is a physical connection between functional units such as measuring instruments, computers or printers.
Of significance for the user are:

- shape and pin assignment of the connectors on the functional units and connecting cables
- The data transmission method. The parameters and protocols for transmission control

Software interface

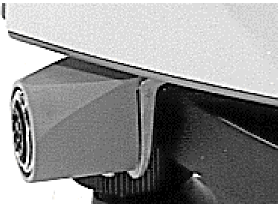
Software interfaces establish the link between programs or program modules. The data to be transmitted must conform to a defined structure: “The record format”.

User interface

This is also called user guidance, important for handling of a system.

Interfaces between the user and the system are the monitor, the keyboard and the options for user guidance provided by the software. In the Trimble 3300DR concept, special emphasis has been placed on the design of the user interface.

Hardware interface



The interface for the peripheral equipment is of the asynchronous, serial type and conforms to DIN 66020 standard (V 24 / RS 232 C).

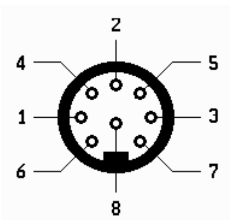
The interface is provided on the slip ring connection.

Interface functions:

(1) Data transfer:
Direct transmission of measured data between Trimble 3300DR and the connected peripheral instrument (computer, printer,...).
A series of transmission parameters are available for the control of this process.
(2) Software updates for the Trimble 3300DR can be loaded via this interface .

Pin assignment of the interface /connecting cable

Pin	Signal	Direction	Designation
1	-	-	
2	Ground	-	Ground ($-U_{batt}$)
3	-	-	
4	SD	Output	Transmitted data
5	ED	Input	Received data
6	Vcc	In	External power supply ($+U_{batt}$)
7	Vcc	In	External power supply ($+U_{batt}$)
8	Ground	-	Ground ($-U_{batt}$)



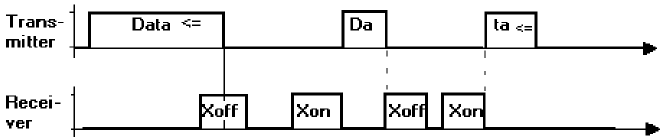
Pin assignment (exterior view of connector), 8-pin female stereo connector

Connecting cables:
Cable 7081779460000 is used for external data recording/remote control (e.g. Map500) and for data transfer to a PC. You can also use cable 7081779470000 (with angled plug) if the Trimble 3300DR is installed on a tripod during data transfer.
For remote control from TSC1/TSCe use cable 7081809001000.

Introduction

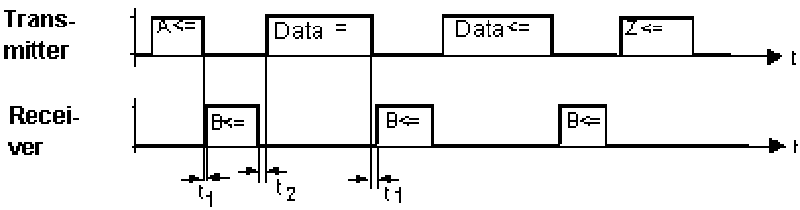
This charpter decribes the conditions of data transfer, data transmission protocols, overviewe about key codes and answers of the PC for the instrument control.

XON/XOFF Control



The XON/XOFF protocol is a very simple, but efficient data transmission protocol. It is preferably employed for so-called terminal programs (e.g. Hyperterminal under Windows or Xtalk) and can be used in data recording from the Trimble 3300DR to a computer.

Rec 500 Software Dialog (Rec 500 Protocol)



Control diagram of the “Rec 500 software dialog”

The following definitions apply to the time values entered in the control diagram:

t_1 : Interval between signal A from Trimble 3300DR and the response from the recording unit with signal B, and interval between the end of data transfer and the acknowledgement with signal B.

$0 > t_1 < t_{(Time\text{-}Out)}$ $t_1 = 20$ s

The recording unit may respond without delay to the recording request from the Trimble 3300DR. However, the selected time-out $t_{(Time\text{-}out)}$ must not be exceeded; otherwise an error message is displayed and external recording is deactivated. The Trimble 3300DR assumes that no external recording unit has been connected.

t_2: Interval between the acknowledgement of the reception of a data line by the connected recording unit with signal B and the transmission of a further data line. Depending on the type of recording line involved, this amounts to

10 ms $> t_2 <$ 100 ms

Rec 500 software dialog is also suited for data transmission to the Trimble 3300DR. The control diagram is identical to the one shown above, with the designations of the transmitted data line and received data line being interchanged, as data is now transmitted by the peripheral unit.

Key Codes and Function Requests

If the Trimble 3300DR is controlled by a computer or external data logger / controller, the keys can be emulated with the following codes:

Key Codes:

Key	Code	Key	Code
F1	T31↵	ON+F1	TB1↵
F2	T32↵	ON+F2	TB2↵
F3	T33↵	ON+F3	TB3↵
F4	T34↵	ON+F4	TB4↵
F5	T35↵	ON+F5	TB5↵
MEAS	T4D↵	ON+MEAS	TCD↵

↵ symbol for CR/LF

The Trimble 3300DR can be controlled either by key pressure or, equally, from a connected computer. Each recognized key code is acknowledged by the Trimble 3300DR with 'Q↵'; in the event of errors such as incorrect syntax of the call or data transmission errors, the response is 'E↵'.

Function requests:

Each function request is answered with a data line in the selected format. The with/without address setting (format setting) is effective. Only the XON/XOFF protocol is used.

Code	Meaning
FKO↵	Compensator reading in sighting direction
FMD↵	Slope distance SD
FMW↵	Angle readings Hz, V
FMS↵	SD, Hz, V
FMR↵	HD, Hz, h reduction
FMK↵	y, x, h local coordinates
FL0↵	Laser Pointer OFF
FL1↵	Laser Pointer ON
FPL↵	Prismen mode (Standard Range – default)
FPH↵	Prismen mode (Long Range)
FDR↵	Direct reflex mode

☝ Attention!

The values entered for scale, addition constant, index and collimation correction are taken into account in all function requests.

Parameters:

```
Reading:    ?KTTT↵
Response:   !KTTT∆∆|1234567890123456∆unit↵
Setting:    !KTTT∆∆|12345678901234∆unit↵
Response:   Q↵

The response to a reading command is identical
with the setting command.
In the event of errors such as incorrect syntax of
the call or data transmission errors, the response
is 'E↵'.
```

Designations:

?K	fixed character string for reading
!K	fixed character string for setting
TTT	type identifier (see examples)
↵	carriage return/line feed
|	separator, ASCII dec. 124
1-6	numerical value, 16 characters
∆	blank, ASCII dec. 32
unit	unit of the associated numerical value, 4 characters or blanks
Q	Acknowledgement

Examples for the parameter calls:

```
?K00A↵  Instrument Identification                                RO
!K00AΔΔ|Δ702718-0000.730ΔΔΔΔ↵

?K00a↵  Serial Number                                            RO
!K00aΔΔ|ΔΔΔΔΔΔΔΔΔΔ209187ΔΔΔΔ↵

?KSND↵  Acoustic Signal                                          RW
!KSNDΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔaΔBitΔ↵       (a=0:aus, a=1:an)

?KAPO↵  Automatic Shutoff                                        RW
!KAPOΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔaΔByte↵       (a=0:aus, a=1:10 min,
                                      a=2:30 min)
?KP20↵  Compensator                                              RW
!KP20ΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔaΔBitΔ↵       (a=0:off, a=1:on)

?KSPR↵  Vertical Angle Display                           RW
!KSPRΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔaΔBitΔ↵       (a=0:Grad, a=1:%)

?KSVR↵  Vertical Reference System                                RW
!KSVRΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔZZZZ↵      (ZZZZ=ZEN□:  zenith angle,
                                      ZZZZ=VERT:  vertical angle,
                                      ZZZZ=HGHT:  height angle)
?KSKO↵  Coordinate System and Display Sequence                   RW
!KSKOΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔabΔΔΔΔΔ↵       (a=1:xy, a=2:yx, a=3:ne
                                      b=1:RW-HW, b=2:HW-RW)

?KSMW↵  Angle Resolution and Unit                                RW
!KSMWΔΔ|ΔΔΔΔΔΔΔΔΔΔ0.0005ΔgonΔ↵       (0.0005/0.001/0.005 gon
                                      0.0001/0.0005/0.0010 DMS
                                      0.0005/0.001/0.005 deg
                                      0.01/0.1/0.5 mil)
?KSMS↵  Distance Resolution and Unit                     RW
!KSMSΔΔ|ΔΔΔΔΔΔΔΔΔΔΔ0.001ΔmΔΔΔ↵       (0.001/0.005/0.01 m
                                      0.001/0.01/0.02 ft)
```

Δ - blank

```
?KSMT↵ Temperature Resolution and Unit                        RW
!KSMTΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔ1ΔCΔΔΔ↵      (1 C/1 F)

?KSMD↵ Pressure Resolution and Unit                    RW
!KSMDΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔ1ΔhPAΔ↵      (1 hPa/1 Torr/0.1 inHg)

?KSZΔ↵ Compensator Run Center in Sighting Direction RW
!KSZΔΔΔ|ΔΔΔΔΔΔΔΔΔ0.00000ΔgonΔ↵

?KBzΔ↵ Compensator Reading in Sighting Direction   RO
!KBzΔΔΔ|ΔΔΔΔΔΔΔΔΔ0.00000ΔgonΔ↵

?KiΔΔ↵ Index Correction                                       RW
!KiΔΔΔΔ|ΔΔΔΔΔΔΔΔΔ0.00000ΔgonΔ↵

?KcΔΔ↵ Collimation Correction                          RW
!KcΔΔΔΔ|ΔΔΔΔΔΔΔΔΔ0.00000ΔgonΔ↵

?KHVΔ↵ Hz Rotational Angle                                    RW
!KHVΔΔΔ|ΔΔΔΔΔΔΔΔΔ0.00000ΔgonΔ↵

?KAΔΔ↵ Addition Constant                                      RW
!KAΔΔΔΔ|ΔΔΔΔΔΔΔΔΔΔΔ0.000ΔmΔΔΔ↵

?KmΔΔ↵ Scale                                                  RW
!KmΔΔΔΔ|ΔΔΔΔΔΔΔΔ1.000000ΔΔΔΔΔ↵

?KPΔΔ↵ Air Pressure                                           RW
!KPΔΔΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔ944ΔhPaΔ↵

?KT_Δ↵ Temperature                                            RW
!KTΔΔΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔ20ΔCΔΔΔ↵

?KihΔ↵ Instrument Height                                      RW
!KihΔΔΔ|ΔΔΔΔΔΔΔΔΔΔ0.0000ΔmΔΔΔ↵

?KthΔ↵ Reflector Height                                       RW
!KthΔΔΔ|ΔΔΔΔΔΔΔΔΔΔ0.0000ΔmΔΔΔ↵

?KYΔS↵ Y  Coordinate of the Station                    RW
!KYΔSΔΔ|ΔΔΔΔΔΔΔΔΔΔ0.0000ΔmΔΔΔ↵
```

Δ - blank

```
?KXΔS↵ X  Coordinate of the Station                 RW
!KXΔSΔΔ|ΔΔΔΔΔΔΔΔΔΔ0.0000ΔmΔΔΔ↵

?KN-S↵  N  Coordinate of the Station                RW
!KN-SΔΔ|ΔΔΔΔΔΔΔΔΔΔ0.0000ΔmΔΔΔ↵

?KE-S↵  E  Coordinate of the Station                RW
!KE-SΔΔ|ΔΔΔΔΔΔΔΔΔΔ0.0000ΔmΔΔΔ↵

?KZΔS↵ Station Height                               RW
!KZΔSΔΔ|ΔΔΔΔΔΔΔΔΔΔ0.0000ΔmΔΔΔ↵

?KLN1↵ Request for  Language                        R0
!KLN1ΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔΔD--Δ↵
```

The following parameter Hz0 takes up a special position:

?KHz0↵	the displayed Hz direction is output in the selected format
!KHzΔΔΔ|ΔΔΔΔΔΔΔΔΔ0.00000ΔgonΔ↵	sets the Hz direction to the preset value (here 0.00000 grad)

Designations:

RO	parameter can only be read
RW	parameter can be read and set

All parameters are output in the selected units, resolutions etc. Parameters can be entered irrespective of the parameters currently set. If call or setting commands include errors of syntax or content, the Trimble 3300DR R answers with 'E↵'.

Δ - blank

Trimble 3300DR controlled from Map500 or TSC1/TSCe

Trimble 3300DR and external controllers / dataloggers

Since Trimble 3300DR is the ideal sensor system only the user can control the Total Station from external units supplied by Trimble.

Map500 (Graphical Field Information System) and TSC1/TSCe are optimal controllers for doing Intergated Surveying with the system Trimble 3300DR.

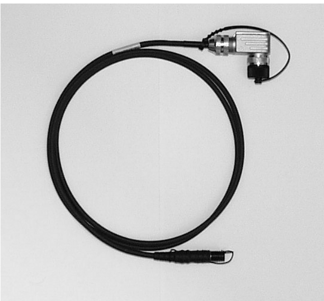
Command and data exchange can be performed

between	and	by
Trimble 3300DR	Map500	**cable**

"Data transfer cable"

Order number: 7081779460000

or



between	and	by
Trimble 3300DR	TSC1/TSCe	**cable**

"Cable TSC1/e to Trimble 3300 / 3600"

Order number: 7081809001000

☝ Attention!

First connect both units, with the recommended cable, start and prepare Trimble 3300DR for remote control and than start and configure Map500 or TSC1/TSCe!

Trimble 3300DR and Map500 (V2.0)

Operation and settings of Trimble 3300DR

Each instrumenttype of the series Trimble 3300DR (Trimble 3303DR, / 305DR / 3306DR) can be used to be remote controlled.
This is as well valid for the instruments with extended temperature range
Trimble 3303 x-treme and Trimble 3305 x-treme.

Start and setup Trimble 3300DR

Preparing the instrument for remote control

ON Press key

Switch ON the instrument.

ON MENU

Select the main menu.

6 Setting Interface

YES to go to the menu
ESC to quit menu
↑ and
↓ to quit setting / to confirm change

MOD to change setting
ESC to quit menu
↑ and
↓ to quit setting / to confirm change

Interface parameters

Interface parameters

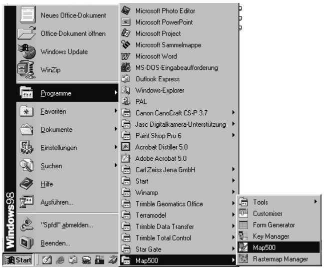
Interface parameters for remote control:

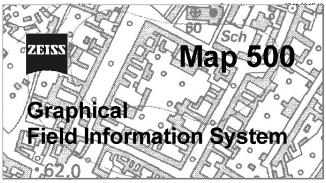
Recording:	V24/1
Data format:	R4
Parity:	even
Baud rate:	9600
Protocol:	Xon/Xoff
Stop bits:	2 (not variable)
Data bits:	7 (not variable)

Operation and settings of Map500

Map 500 can be opreated on any Field PC or on the PC in the office.

Start Map500 at Field PC or PC
Select icon „Map500“





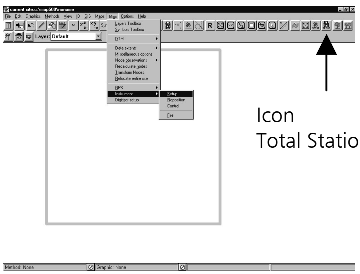
Start screen Map500

Select „Setup Total Station“

via icon:
„Setup Total Station“

or

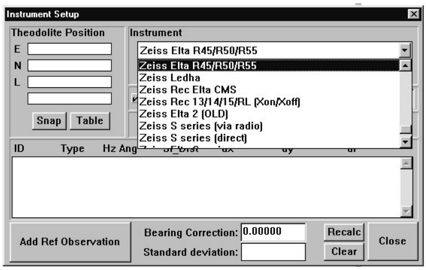
via pull down menu:
Miscellanious → Instrument → Setup



Icon
Total Station

Select type of instrument, interface parameters and instrument settings

Instrument:	Trimble 3300DR
COM-port:	COM1 – COM4
Setup status:	DR mode
	Laser pointer
for stationing:	th= Theo ht: , ih= Staff ht:



☞ Tip

Switch between DR mode and PR mode and switch ON / OFF the laser pointer can be applied from Map500.
Press button „Setup status“ in menu „Instrument Setup“.

These functions can also be applied at the Trimble 3300DR Total Station.

ON DR	Switch between DR and PR mode
ON	Switch Laser pointer ON / OFF

Trimble 3300DR and
TSC1 (V7.70) / TSCe (V10.0)

Operation and settings of Trimble 3300DR

Each instrumenttype of the series Trimble 3300DR (Trimble 3303DR, / 305DR / 3306DR) can be used to be remote controlled.
This is as well validfor the instruments with extended temperature range
Trimble 3303 x-treme and Trimble 3305 x-treme.

Start and setup Trimble 3300DR

Preparing the instrument for remote control

ON Press key

Switch ON the instrument.

ON MENU

Select the main menu.

6 Setting Interface

YES to go to the menu

ESC to quit menu

↑ and

↓ to quit setting / to confirm change

Interface parameters

MOD to change setting

ESC to quit menu

↑ and

↓ to quit setting / to confirm change

Interface parameters

Interface parameters for remote control:

Recording:	V24/1
Data format:	M5
Parity:	none
Baud rate:	9600
Protocol:	Xon/Xoff or Rec500
Stop bits:	2 (not variable)
Data bits:	7 (not variable)
PC-Demo:	OFF

4 Setting Instrument

YES to go to the menu

ESC to quit menu

↑ and

↓ to quit setting / to confirm change

MOD to change setting

ESC to quit menu

↑ and

↓ to quit setting / to confirm change

Angle measurement unit

Accuracy of displayed angle reading

5 Dset

MOD to change setting

ESC to quit menu

↑ and

↓ to quit setting / to confirm change

EDM / distance measurement parameters

Laser pointer

Laser pointer OFF: OFF

1 Input

YES to go to the menu

ESC to quit menu

↑ and

↓ to quit setting / to confirm change

Input PC, m, T, P

Input Prism constant

Use the same methodology for setting the Prism Constant to change the temperature and pressure settings.

☝ Attention!

It is recommended that the prism constant is set in the Trimble 3300DR, not in the Trimble Survey Controller. However, if you choose to set the prism constant to zero in the
Trimble 3300DR you should apply a prism constant in the TSC1/TSCe.

Furthermore it is recommended to set the scale to 1.000 and if a scale is to be applied, it is done in the TSC1/TSCe, using the coordinate settings available.

☝ Attention!

Even though the correction values have been set in the 3300 Total Station, the information will not be passed to the TSC1/TSCe because the distances passed to the TSC1/TSCe already have the corrections applied.

Operation and settings of TSCe

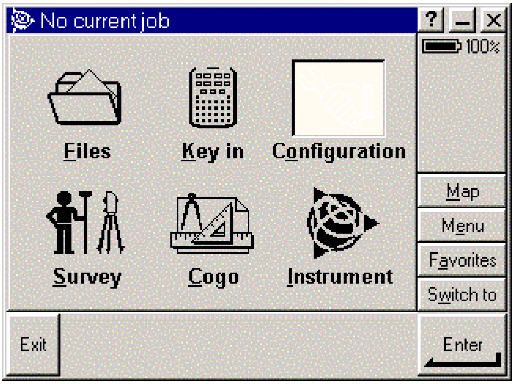
☝ Attention!

The screen shots are based on the Trimble Survey Controller TSCe. However, the same screens and settings can be followed though in the Trimble Survey Controller TSC1.

Start TSC1/TSCe

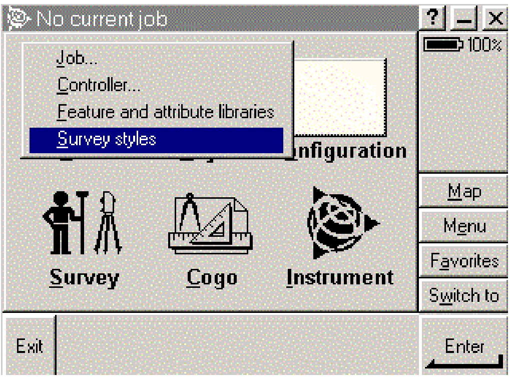
Select „Configuration“ from the main menu

Main menu



Configuration

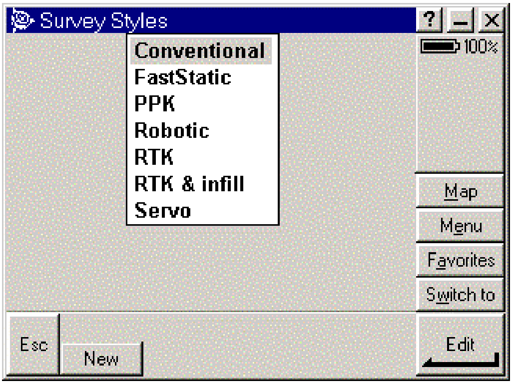
Select „Survey styles“



Survey styles

Select function key „New“

Create Survey style Trimble 3300DR

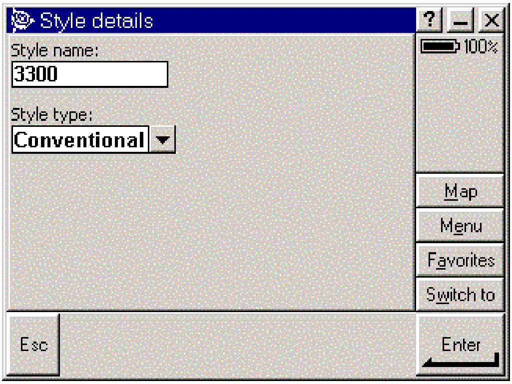


Survey style Trimble 3300DR

Select „Survey“ style name and „Survey“ style type

Enter to confirm settings /change and quit / enter next submenu

Enter Survey new style name and style type

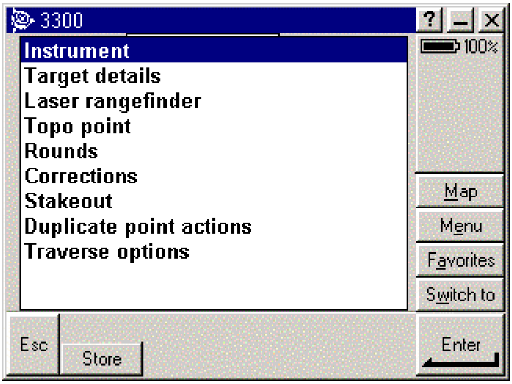


Style name e.g. Trimble 3300DR.
For style type choose „Conventional“.

Confirm / change settings in submenus, e.g. „Instrument“, „Target details“ and „Corrections“.

Select „Instrument“

Submenu „Instrument“

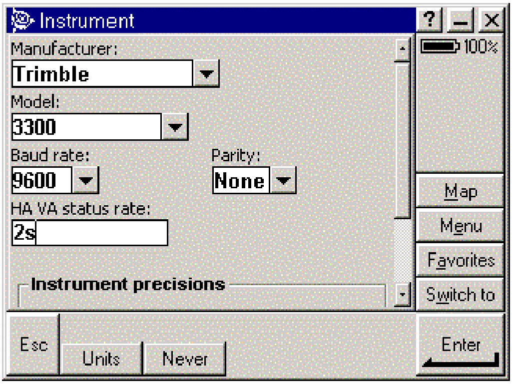


Selection setting „Instrument“

Submenu „Instrument“

Change / confirm settings of instrument

Enter to confirm settings /change and quit / return to higher level menu



Set manufacturer, model, interface parameters, update rate and precision of instrument.

Instrument parameters

Instrument parameters for remote control:

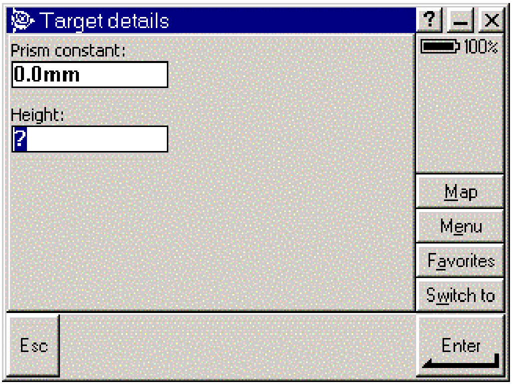
Manufacturer:	Trimble
Model:	Trimble 33000DR
Baud rate:	9600
Parity:	none
HA VA status rate:	2s / (1s)[1]
Instrument prec.:	no setting needed

[1]HA=Hz, VA=V

Submenu „Target details“

Change / confirm setting of target details

Enter to confirm settings /change and quit / return to higher level menu



Set prism constant and target hight.

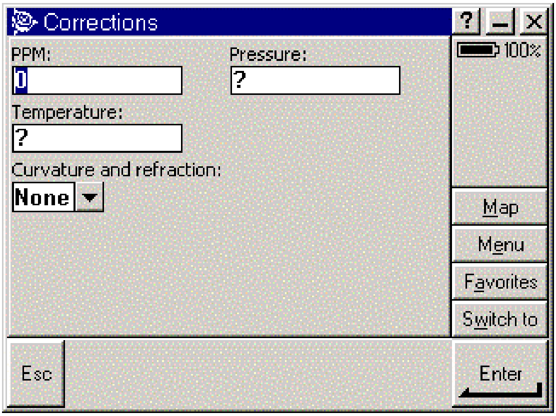
☝ Attention!

Ensure that the prism constant is set to 0.0mm. Unless it has been set to 0.0mm in the Trimble 3300DR Total Station.

See also page 6-56!

Submenu „Target details“

Change / confirm setting of environmental factors activate / deactivate corrections of earht curvature and refraction



Enter to confirm settings /change and quit / return to higher level menu (Trimble Survey style menu)

Set ppm, air pressure and temperature.

Corrections

Enviromental corrections for remote control:

PPM:	0
Pressure:	do not enter a value
Temperature:	do not enter a value
Curvature and refraction:	none

☝ Attention!

Air pressure and temperature they have already been applied by the Trimble 3300DR total station.

See also page 6-56!

The Trimble 3300DR Total Station automatically applies a earth curvature and refraction coefficient.

OK (TSC1) or **Store** (TSCe) to confirm settings and quit / return to higher level menu

Accept the changes and close the Trimble 3300DR Survey style menu.

☝ Attention!

Switch between DR mode and PR mode and switch ON / OFF the laser pointer can not be applied from the TSC1/ TSCe.

This has to be done at the Trimble 3300DR Total Station.

ON DR	Switch between DR and PR mode
ON	Switch Laser pointer ON / OFF

Recording data lines

See Data Formats

Mode	Rec. 1	Mode 2	Content of Record	T1	T2	T3	Comments
	1	2	P,C,I	T1	T2	T3	
Single meas.	x		CCCCC PPPPPPPPPPPP		Hz	Vk	HzV mode,k=1,2,3,4 dep. on V syst.
	x		CCCCC PPPPPPPPPPPP	HD	Hz	h;Z	horizontal distance mode
	x		CCCCC PPPPPPPPPPPP	SD	Hz	Vk	slope distance mode
	x		CCCCC PPPPPPPPPPPP	y	x	h/Z	coordinates mode, sequence y,x
	x		CCCCC PPPPPPPPPPPP	x	y	h/Z	coordinates mode, sequence x,y
	x		CCCCC PPPPPPPPPPPP	n	e	h/Z	coordinates mode, sequence n,e
	x		CCCCC PPPPPPPPPPPP	e	n	h/Z	coordinates mode, sequence e,n
Adjustment c/i	x	x	ADJUST	Vk	Vk	I	k=1,2,3,4 depending on V system
	x	x	ADJUST	Hz	Hz	C	
	x	x	ADJUST			SZ	
Adjust. comp.	x	x	ADJUST			SZ	
Input values	x	x	INPUT	th	ih		
	x	x	INPUT	T_	P	A	
	x	x	INPUT	m			
	x	x	S PPPPPPPPPPPP			Z	Z...station height
Compensator	x	x	COM-ON				compensator activated
	x	x	COM-OFF				compensator deactivated

Rec. mode:

1: MEM/1, V24/1
2: MEM/2, V24/2
3: 1+2

Mode	Rec. mode 1	Rec. mode 2	Content of Record		T1	T2	T3	Comments
	1	2	P,C,I		T1	T2	T3	
Point to line	x	x	STA+OFF					point to line
(Station +	x		A	PPPPPPPPPPPP		SD	Hz	Vk
Offset)	x		B	PPPPPPPPPPPP	SD	Hz	Vk	reference point B
	x		A=S					if station is defined as A
	x		B=S					if station is defined as P
		x	A-B		SD	HD	h	base length
	x		CCCCC	PPPPPPPPPPPP	SD	Hz	Vk	meas. pt. P
		x	CCCCC	PPPPPPPPPPPP	y	x	h/Z/ω	meas.pt. P;y,x,e,n dep.on coor.sys.
	x		P=S					if station is defined as P
		x			Y	X	h/Z/ω	
Connect.distance	x		CON.DST					
	x		A	PPPPPPPPPPPP	SD	Hz	Vk	reference point A
	x		CCCCC	PPPPPPPPPPPP	SD	Hz	Vk	meas. pt. P
		x	A-P		SD	HD	h/Z	connecting distance A-P
	x		P-P		SD	HD	h/Z	connecting distance P-P
	x		A=S					if station is defined as A
			P=S					if station is defined as P
Object height	x	x	OBJ. HT					
	x		A	PPPPPPPPPPPP	SD	Hz	Vk	reference point A
	x		CCCCC	PPPPPPPPPPPP		Hz	Vk	meas. pt. P, k=1..4 dep. on V syst.
		x	CCCCC	PPPPPPPPPPPP	HD	O	Z	meas. pt. P
	x		!	PPPPPPPPPPPP			Z	Set Z value
	x			PPPPPPPPPPPP		Hz	Vk	k=1,2,3,4 depending on V system

Mode	Rec. mode		Content of Record		T1	T2	T3	Comments
	1	2	P,C,I					
					T1	T2	T3	
Vertical plane	x	x	VERT.PL					
	x		A	PPPPPPPPPPPP	SD	Hz	Vk	reference point A
	x		B	PPPPPPPPPPPP	SD	Hz	Vk	reference point B
		x	A-B		SD	HD	h	base length
	x		CCCCC	PPPPPPPPPPPP		Hz	Vk	meas. pt. P, k=1..4 dep. on V sys.
		x	CCCCC	PPPPPPPPPPPP	y	x	h	meas. pt. P, y,x,e,n dep. on
coord.sys.								
	x		P=S					if station is defined as P
	x	x	!	PPPPPPPPPPPP			X	set value for (y,n)
	x			PPPPPPPPPPPP		Hz	Vk	y, x or n dep. on coord.sys.
	x	x	!	PPPPPPPPPPPP			h	Set value for h
	x			PPPPPPPPPPPP		Hz	Vk	
		x			Y	X	h	
Area Calculation	x	x	AREA					
	x		CCCCC	PPPPPPPPPPPP	SD	Hz	Vk	meas. pt. P
		x	CCCCC	PPPPPPPPPPPP	Y	X	Z	meas. pt. P
		x	CCCCC	PPPPPPPPPPPP	Y	X	Z	Stored P
	x	x	AREA		FL			

Mode	Rec. mode		Content of Record					Comments
	1	2	P,C,I		T1	T2	T3	
Unknown station	x	x	UN STAT					
		x	A	PPPPPPPPPPPP	Y	X		reference point A, B, C, D, E
	x		A	PPPPPPPPPPPP	SD	Hz	Vk	measurement to A, B, C, D, E
		x	A	PPPPPPPPPPPP	vy	vx	Vz	residuals point A, B, C, D, E
	x	x	S	PPPPPPPPPPPP	Y	X		station coordinates
	x	x			m	Om	sO	scale, orient., standard deviation
Known station	x	x	KN STAT					
		x	S	PPPPPPPPPPPP	Y	X		station coordinates
		x	A	PPPPPPPPPPPP	Y	X		reference point A
	x		A	PPPPPPPPPPPP		Hz	Vk	measurement to A (Hz,V mode)
	x		A	PPPPPPPPPPPP	SD	Hz	Vk	measurement to A (SD,Hz,V mode)
	x	x				Om		orientation (Hz,V)
	x	x			m	Om		scale, orientation (SD,Hz,V)
Height stationing	x	x	EL-STAT					
	x	x	!	PPPPPPPPPPPP			Z	Height of A
	x		A	PPPPPPPPPPPP	SD	Hz	Vk	Measurement to A
		x	S	PPPPPPPPPPPP			Z	computed station height
Polar points	x	x	POLAR					
	x		CCCCCPPPPPPPPPPPP		SD	Hz	Vk	original readings
		x	CCCCCPPPPPPPPPPPP		Y	X	Z	coordinates
	x	x	CCCCCPPPPPPPPPPPP		T			Eccentricity Tv,Th,Tl,Tr,Ts

Mode	Rec. mode 1	Rec. mode 2	Content of Record		T1	T2	T3	Comments
	1	2	P,C,I		T1	T2	T3	
Stake out	x	x	S-O					
		x	!	PPPPPPPPPPPP	Y	X	Z	depending on stake-out-method
		x	!	PPPPPPPPPPPP	Y	X		depending on stake-out-method
		x	!	PPPPPPPPPPPP	HD	Hz	Z	depending on stake-out-method
		x	!	PPPPPPPPPPPP	HD	Hz		depending on stake-out-method
	x			PPPPPPPPPPPP	SD	Hz	Vk	reading for backsight point
		x		PPPPPPPPPPPP	dy	dx	Dz	stake-out diff. dep. on meas. method
		x		PPPPPPPPPPPP	dy	dx		stake-out diff. dep. on meas. method
		x		PPPPPPPPPPPP	dl	dq	Dr	stake-out diff. dep. on meas. method
		x		PPPPPPPPPPPP			Dz	stake-out diff. dep. on meas. method
		x		PPPPPPPPPPPP	Y	X	Z	verification
		x		PPPPPPPPPPPP	Y	X		verification measurement

Header

```
For M5|Adr 00001|TI START      |01    3305        |02    900005      |03          562   |
For M5|Adr 00002|TI            |04    30          |                  |                  |
For M5|Adr 00003|TI            |05    1           |06    1           |                  |
For M5|Adr 00004|TI            |20    1           |21    11          |22           16   |
For M5|Adr 00005|TI            |th    1.900 m     |ih    1.600 m     |                  |
For M5|Adr 00006|TI            |i     0.0005 grd  |c     0.0025 grd  |SZ    0.0060 grd  |
For M5|Adr 00007|TI            |T_    20 C        |P     1012 hPa    |PC    0.035 m     |
For M5|Adr 00008|TI END        |m     1.000000    |                  |                  |
```

```
Changed settings and adjustments

For M5|Adr 00009|TI  INPUT          |th        2.000 m       |ih              1.700 m|                          |
For M5|Adr 00010|TI  ADJUST         |                        |                       |SZ        0.0055 grd      |
For M5|Adr 00011|TI  ADJUST         |V1        92.4505 grd   |V1      307.5515 grd   |i         -0.0010 grd     |
For M5|Adr 00012|TI  ADJUST         |Hz        284.1015 grd  |Hz      84.1060 grd    |c         0.0025 grd      |
For M5|Adr 00013|TI  ADJUST         |                        |                       |SZ        0.0055 grd      |
For M5|Adr 00014|TI  INPUT          |T_              25 C    |P       1000 hPa       |PC        -0.005 m        |
For M5|Adr 00015|TI  INPUT          |m         1.000005      |                       |                          |
For M5|Adr 00016|TI  COM-OFF        |                        |                       |                          |
For M5|Adr 00017|TI  COM-ON         |                        |                       |                          |
For M5|Adr 00018|TI  Hz=0           |                        |Hz      0.0000 grd     |                          |
For M5|Adr 00019|TI  HOLD           |                        |Hz      300.0000 grd   |                          |
For M5|Adr 00020|TI  DR             |th        0.000 m       |PC      0.000 m        |A         0.000 m         |
For M5|Adr 00021|TI  PR             |th        2.000 m       |PC      -0.005 m       |A         0.030 m         |
For M5|Adr 00024|TI  KN STAT        |                        |                       |                          |
For M5|Adr 00025|TI                 |                        |Hz      300.0035 grd   |V1        92.4435 grd     |
For M5|Adr 00026|PI1          S    0|Y         1000.000 m    |X       2000.000 m     |Z         0.000 m         |
For M5|Adr 00027|TI                 |                        |Om      200.0035 grd   |                          |
```

Introduction

An update is necessary if you load a new software version or if you want to change between the “Topo” and "Construction" software of the instrument.

Before starting the update, please save your data and use a fully charged accumulator battery.

The simplest way to get an update is via the Internet.

Homepage:

www.trimble.com

Trimble 3300DR ↔ PC
Connect both devices by the serial interface cable and start the necessary update program.

Cable for data transfer
Trimble 3300DR ↔ PC
with protocol Xon/Xoff:

Order number
708177-9470.000

☝ Attention !

Different hardware versions require different update versions. Read all the instructions very careful.

In any case, please pay attention to the correct update - the correct instrument name when selecting the update files.

Once unpacked the files, the instrument type can no longer be concluded from them.

This update procedure describes the update of the former instruments Elta 40R, Elta 50R und Elta 50.

Doing the update with instruments younger generations please check the table below before:

Elta 40R → Elta R45 → Trimble 3303

Elta 50R → Elta R55 → Trimble 3305

Elta 50 → Elta R50 → Trimble 3306

Preparation on the Instrument

ON *MENU*

Select the main menu.

6 Setting Interface

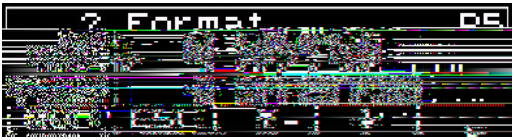
YES to go to the menu

ESC to quit menu

↑ and

↓ to quit setting / to confirm change

Interface paramenters



MOD to change setting

ESC to quit menu

↑ and

↓ to quit setting / to confirm change

Trimble 3300DR ↔ PC
Connect both devices by the serial interface cable and start the necessary update program.

Cable for data transfer **Trimble 3300DR ↔ PC** with protocol Xon/Xoff:

Order number 708177-9470.000

Interface parameters for receiving update files:

Baud rate:	4800
Protocol:	Xon/Xoff
Parity:	none
Stop bits:	1 (not variable)
Data bits:	8

8 Update/Service

YES to go to the menu

ESC to quit menu

↑ and

↓ to quit setting / to confirm change

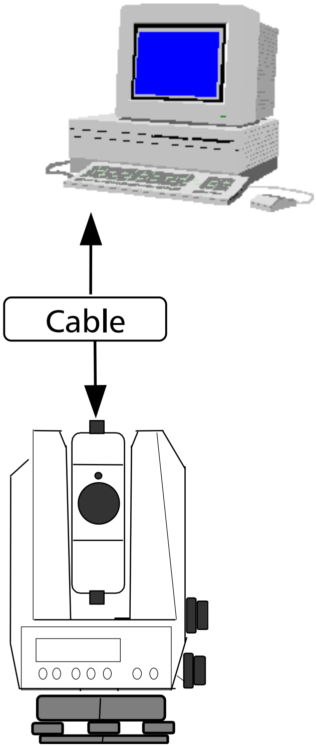
Menu Interface **Trimble 3300DR**

└ to select / activate
Update
Service
EDM

ESC to quit menu

☞ Tip

First configure the interfaces at the instrument and the PC. Then start the program "Update" at the instrument and afterwards run the software update at the PC.



The Update is carried out between Trimble 3300 and **PC** through **cable**

This cable is also used for data transfer. The adapter included in the delivery allows the connection to 9 and 25 channel sockets.

Copy the contents of the diskette into a directory of your choice or start the software from the diskette (default).
Switch the instrument on and select the item Update.

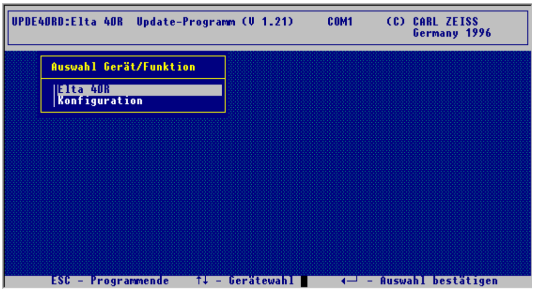
Preparation on the PC

Please follow also the update instructions enclosed

Esc : to end the program

↑ ↓ : to select

↵ : to confirm selection

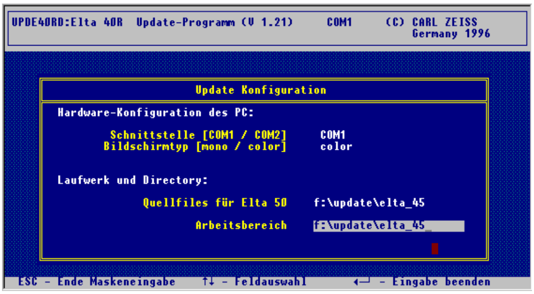


Configuration

Enter your data here.
The configuration can be stored subsequently.

Esc : to end mask input

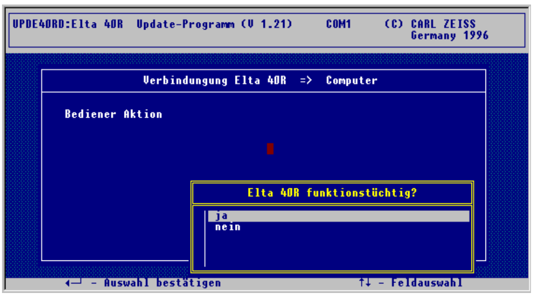
↵ : to end line input



Elta 40R

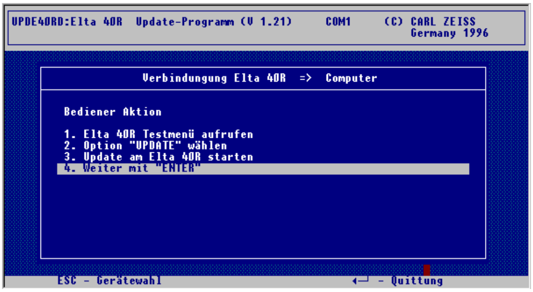
The question whether the Elta is in working order is to be answered in any case with **YES**.

↵ : to confirm



Please follow now exactly the instructions given on the screen.

⏎ : to select the single steps



Trimble 3300DR display:

Update

YES to go to the menu

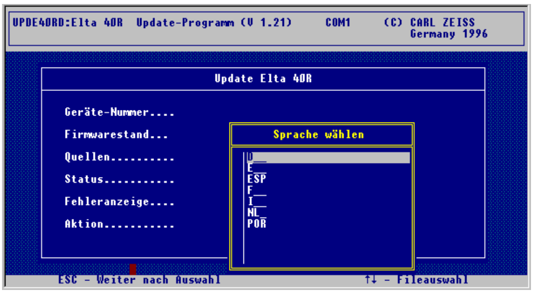
NO to start update

From now on, the PC software controls the instrument.

Update Elta 40R

Selection of the language desired (if available)

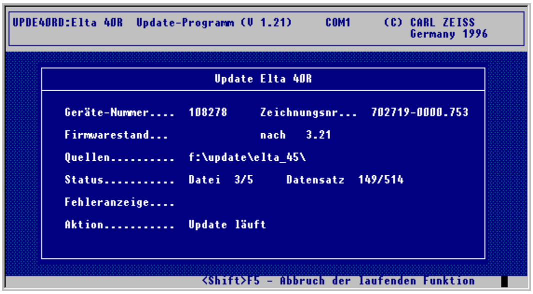
Esc : to end selection of language



Starting Update

Esc to start update

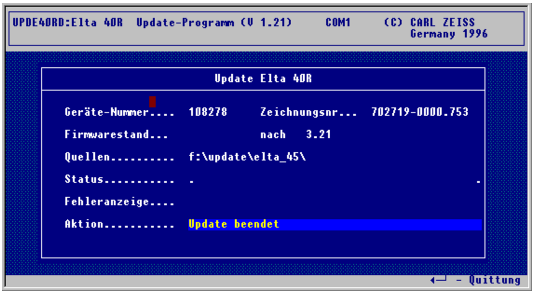
This operation takes some minutes comprising the transfer of one file with 30 and 4 files with 514 data records each.



The end of the update is acknowledged by clear acoustic signals. The instrument is switched off by software. The update has now been completed.

Update completed is flashing

↵ : to go to the start-up menu



☞ Tip

If no connection is achieved, in all probability the wrong interface has been selected or there is an error in the reference.

Please pay also attention to a perfect cable connection.

7 Adjusting and Checking

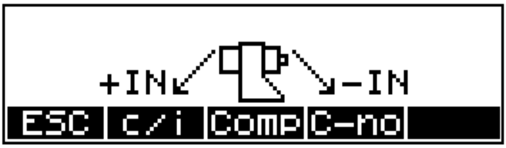
The instrument adjustment defines all corrections and correction values for the Trimble 3300DR that are required to ensure optimum measuring accuracy.

Introduction

Increased strain placed on the instrument by extreme measuring conditions, transportation, prolonged storage and major changes in temperature may lead to misalignment of the instrument and faulty measuring results. Such errors can be eliminated by instrument adjustment or by specific measuring methods.

Display page 2:

CHCK to go to menu "Checking"



📖 Presettings
First steps

Additionally to activating and deactivating the compensator, this menu offers the following functions of checking and adjusting:

c/i Determination of the vertical index correction (V index) and sighting axis correction (Hz collimation).

Comp Determination of the compensator run centre.

> ☝ Attention !
>
> Before starting any adjustment, allow the instrument to adapt to the ambient temperature and make sure it is protected against heating up on one side (sun radiation).

i Vertical Index Correction

The vertical index error is the zero point error of the vertical circle with respect to the vertical shaft.

c Sighting axis correction

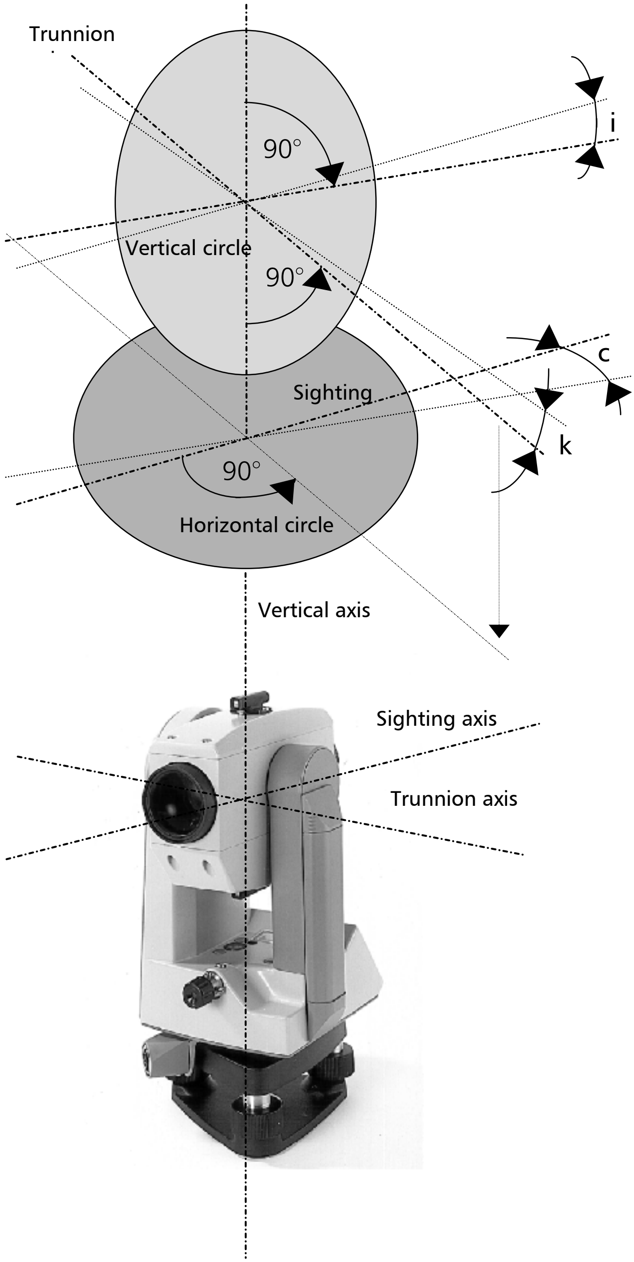
The sighting axis error is the deviation from the right angle between the trunnion axis and sighting axis.

k Trunnion axis correction

The trunnion axis error is the deviation from the right angle between the trunnion axis and vertical shaft (adjusted by the manufacturer).

Another instrument error considered is:

the compensator run centre error



V Index / Hz Collimation

The vertical index and sighting axis corrections should be recomputed after prolonged storage or transportation of the instrument, after major temperature changes and prior to precise height measurements.
These determinations are especially important due to the fact that the measurement is carried out only in the 1st telescope position in order to save time.

☞ Tip

Before starting this procedure, precisely level the instrument using the level.

To determine the corrections, sight a clearly visible target in Hz and V from a distance of approx. 100 m. The sighting point should be close to the horizontal plane
(in the range V = $100^{grads} \pm 10^{grads}$).
Start in the second face!

MEAS to start measurement in the 2nd telescope position

c=0, **i=0** Setting of values c = i = 0.

The current **c** and **i** values are displayed in the readings window.

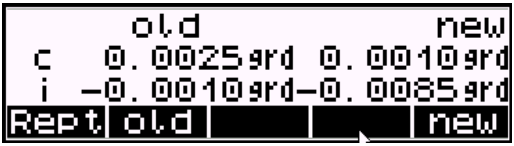
c sighting axis correction

i vertical index correction

MEAS to trigger measurement in the 1st telescope position

new to confirm the new values / to record

old to confirm the old values



Display of results and recording

☝ Attention !

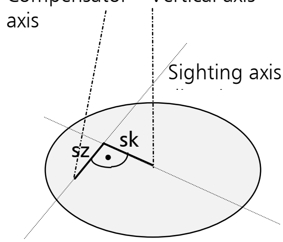
During the computation of the vertical index and sighting axis correction, the program also determines the compensator run centre.

If either the **c** or **i** value exceeds the admissible range of ± 50 mgrads, the error message appears. The values are not saved, and the menu for new calculation is displayed again.

☝ Attention !

If the values remain outside the tolerance range, despite accurate sighting and repeated measurement, you should have the instrument checked by the service team.

Compensator



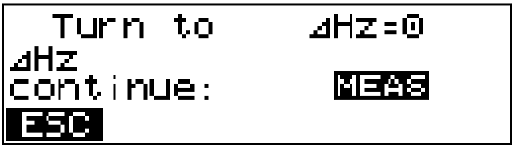
The Trimble 3300DR features a compensator that compensates any vertical shaft inclinations remaining after instrument levelling in the sighting axis direction.
To check the compensator, its run centre should be determined at regular intervals and in particular prior to precise height measurements.

MEAS to start measurement in the 2nd telescope position

sz component in sighting axis direction

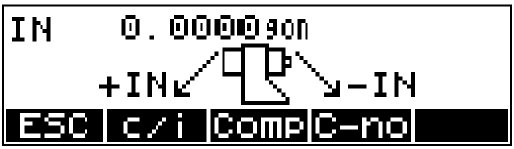
→ to turn Hz = 0

MEAS to trigger measurement in the 1st telescope position



Display of results and recording:

ESC to quit the adjusting menu



☝ Attention !

For the accurate determination of the run centre, it is essential that the liquid in the compensator is allowed to settle, i.e. any vibration of the compensator must be avoided.

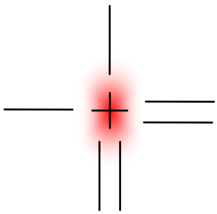
The DR EDM System

The red laser beam used for measuring without reflector is arranged coaxial with the line of sight of the telescope, and emerges from the objective port. If the instrument is well adjusted, the red laser beam will coincide with the visual line of sight. External influences such as shock or large temperature fluctuations can displace the red laser beam relative to the line of sight.

☝ Attention !

Before starting adjustment, allow the instrument to adapt to the ambient temperature.

Inspection of the Laser Beam Direction



Check the system at regular intervals in order to avoid faulty measurements. A reflective target foil is provided. Set it up between 25 and 50 metres away facing the instrument. Move the telescope to face II. Switch on the red laser beam by activating the laser pointer function. Direct the instrument with the centre of the target plate and then inspect the position of the red laser spot with respect to the hair cross of the instrument. If the red laser spot lies outside the limits of the cross, the direction of the beam needs to be adjusted until it coincides with the hair cross.

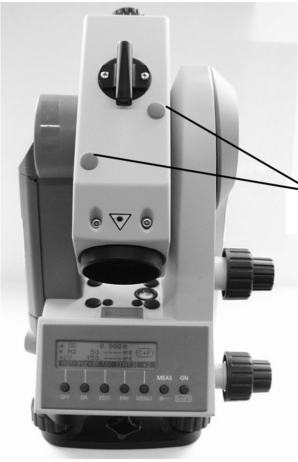
☝ Attention !

For adjustment use reflective foil only!

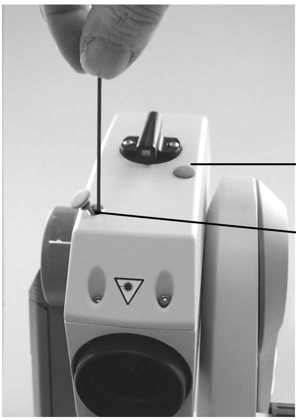
☞ Tip

The direction of the beam should be inspected before precise measurement of distances is attempted, because an excessive deviation of the laser beam from the line of sight can result in imprecise distance measurements.

Adjusting the Laser Beam Direction



Pull the two rubber plugs out of the adjustment ports on the top of the telescope housing. To correct the vertical position of the laser spot, insert the alan key into the adjustment port 1 close to the front lens and turn the key clockwise to move the laser spot down. To correct position of the laser spot laterally, insert the alan key into the adjustment port 2 close to the diopter and turn it clockwise to move the laser spot left. Finally check the coincidence of laser spot and hair cross. Throughout the adjustment procedure, keep the telescope pointing to the reflective target foil.



Technical

At first the adjusting screws are of a high tension as they are self blocking. The screws will tighten automatically after the adjustment.

Attention !

After adjustment, replace the plugs in the adjustment ports to keep out humidity and dust.

8 Annex

The annex contains a compilation of symbols, keys, formulae, constants and error messages as well as explanations of concepts used for the Trimble 3300DR Routine Total Stations.

Furthermore, it gives an overview of the technical data and instructions for maintenance and care of the instrument.

Softkey	Description
HD	Setting the measuring mode: Measurement of reduced distances HD
xyh yxh	Coordinate measurement, sequence X,Y,h Coordinate measurement, sequence Y,X,h
neh enh	Coordinate measurement, sequence N,E Coordinate measurement, sequence E,N
SD HzV	Measurement of slope distances SD Measurement of Hz direction and V angle
Hz=0	Setting the Hz direction to Hz=0
HOLD	Clamping the Hz direction for electronic circle orientation
END	Ending a function
th/ih	Input of reflector, instrument and station heights
th	Input of reflector height
ih/Zs	Input of instrument and station heights
→1 →2	Calling page 1 of the measurement menu Calling page 2 of the measurement menu
m ft	Changing the distance unit: to meters/to feet entry of scale
gon DMS deg mil	Changing the angle unit: to grads (gon) to DMS (degrees, minutes, seconds) to decimal degrees to mils
V %	Display of the height angle in %
V↙⌋	Display of the zenith angle (V=0 at the zenith)
V↗⌋	Display of the vertical angle (V=0 at the horizon, 0 < V < 400 grads)

V↗⊥↖	Display of the height angle (V=0 at the horizon, -100 < V < 100 grads)
→Hz ←Hz	Setting the Hz counting direction to clockwise Setting the Hz counting direction to anticlockwise (only in display)
CHCK	Calling the checking and adjustment menu
ESC	Terminating a function, quitting a submenu
↑ ↓	Selecting the next upper line in the bar menu / in the internal memory Selecting the next lower line in the bar menu / in the internal memory
← →	Setting the cursor one character backward Setting the cursor one character forward
+ -	Incrementing a value Decrementing a value
MOD	Modification of the displayed value
o.k.	Confirmation of an entry
YES NO	Acceptance of an option Rejection of an option
c/i	Calling the function for the determination of the collimation and vertical index correction
Comp	Calling the function for the determination of the compensator run centre correction
C-on C-off	Activating the compensator Deactivating the compensator
old new	Retaining the old value Entering the new value
Rept	Repeating the process
i=0	Setting the vertical index correction to i=0
c=0	Setting the collimation correction to c=0

A B C D	Activating the reference point A, B, C, D
P	Activating the new point P
A=S B=S C=S	Using the station coordinates as reference point coordinates
P=S	Using the station coordinates as the coordinates of the new point
A=P	Using P as the new reference point A (connecting distance)
y x e	Input of a distance/offset (in the Vertical Plane program)
hSet	Setting the reference height (in the Vertical Plane program)
ZSet	Setting the reference height Z (in the Object Height program)
xSet ySet nSet	Setting the reference direction: (in the Vertical Plane program) (in the Vertical Plane program) (in the Vertical Plane program)
A-P P-P	Referring the connecting distance to: the reference point A the last point used
Inp	Input of a value
m	Calling the scale entry (in the Coordinates programs)
YX XY EN NE	Setting out according to nominal coordinates without height or entry in MEM
YXZ XYZ ENZ NEZ	Setting out according to nominal coordinates with height or entry in MEM

HD **HDh**	Stake out using known stake out elements without with height
Z	Input of a height in the internal MEM memory
Z-j **Z-n**	Changing to setting out: with height without height
Test	Calling the measurement of the setting out points
S-O	Calling the stake out of the next point
Stat	Starting stationing in elevation
S	Input of station coordinates for Unknown Station
Inp	Input of scale for planimetric stationing
Hz	Input of Hz for Known Station
Disp **Del** **Edt**	Display of data lines of the memory Deletion of data lines of the memory Changing the point number and point code of a data line
? **?P** **?C**	Search for: data lines in the memory a point number in the memory a point code in the memory
?A	Search for an address in the memory
? ↓	Continue search according to the same criterion
all	Selecting all data lines of the memory
Ecc	Calling the program measure inaccessable points
INT	Calling support programs for DR mode, calling program Intersection of vertical planes.

MEAS	First function Starting a single measurement or Tracking mode
ON	First function Switching the instrument on
ON *OFF*	Second function Switching the instrument off
ON *DR*	Second function Switch between DR and PR measure mode
ON *EDIT*	Second function Calling the memory
ON *PNo*	Second function Calling the input of point number and code
ON *MENU*	Second function Going to the main menu
ON	Second function Switch Laser pointer ON / OFF

A

Addition constant	Addition value for distance measurement, default 0.
Addition correction	Correction of the addition value (''addition constant'') of the distance measuring instrument, e.g. if using prisms of other manufacturers.
Alignment	Application program for the determination of any number of points on the straight line AB.

B

Backsight point BP	A point with known coordinates used for the station point determination and/or for *orientation.*
Bearing angle	Hz bearing orientated to a reference bearing (generally to grid north).
Bearing (Hz)	Value read in the horizontal circle of the instrument, whose accidental orientation is determined by the zero position of the graduated circle.

C

Calibration scale	Influences systematically the distance measurement. Best possible adjustment to 1.0 by the manufacturer. Without influence on all other scale specifications.
Code, code number	Reference number for the point description, characterises certain point types.
Compensation	Automatic mathematical consideration of the *vertical axis inclinations* measured with the *compensator* in the sighting direction, in V angle measurements.
Compensator	Used to determine the current vertical axis inclination in the sighting axis direction, can be deactivated and activated again, as required; a graphical symbol in the information menu displays the activated compensator.

Compensator run centre	Electronic centre of the clinometer in sighting axis direction.
Connecting distance	Spatial distance, plane distance and height difference between 2 target points.
Control point	Point for checking the *orientation* of the instrument. It is defined at the beginning of a measurement and can be measured at any time for checking.
Coordinates	Measuring program for the determination of points in a higher-order coordinate system.
	D
Default	Standard value for an instrument setting.
Direct reflex mode	Distance Measurement mode without prism or reflective foil.
Distance measuring mode	Depending on the purpose of application, the distance measurement is to be selected by pressing the MEAS key in the normal mode or the continuous distance measurement (tracking) is to be selected by pressing the MEAS key twice.
	E
Error limits	Limit values which can be set by the user for certain readings or results.
Eccenticity	Support program to measure inaccessable points.
	F
	G
	H
Hardkeys	See key functions.
Height stationing	The height of the station point is derived from measurements to known height points.
Hz circle orientation	A predefined horizontal bearing value is allocated to the sighting direction to a measurement point.

Hz collimation correction	(also called collimation or sighting axis correction) Correction of the deviation of the sighting axis from its required position right-angled to the trunnion axis. Determination by measurement in two positions, automatic correction in the case of measurements in one position. I
Incrementing	(increment=interval) Automatic counting of the point number (increase by 1) after the measurement.
Instrument height	Height of the telescope trunnion axis above the station height (ground point).
Interface	Contact point between 2 systems or system areas, in which information is interchanged according to defined rules.
Intersection	Support programs for DR mode, Program Intersection of vertical planes.
	K
Key functions	First and second functions; for switching the instrument on, starting the measurement, switching off, illuminating the display, calling the memory, entering PI and going to the main menu, starting of tracking.
	L
Levelling	Vertical adjustment of the vertical axis of the instrument; the levels of the instrument are centred by turning the tribrach screws. The levelling can be checked by means of the digital display of inclinations after pressing the softkey CHCK.
Long Range mode	Extended distance measurement mode to prisms and reflective foil.

M

Measuring mode	In the measurement menu, the following measuring modes can be selected: HzV display in the theodolite mode HD display of reduced distance and height difference yxh local rectangular coordinates SD display of the original readings

O

Object height	Determination of the height of points to which a direct distance measurement is impossible, by means of an angle measurement.
Orientation	When orientating the instrument, the *bearing angle* of the zero of the graduated circle Omega (Om) is calculated. For this purpose, measurements to a *backsight point* can be made or the *bearing angle* of a known point can be entered.
Orthogonal lines	Application program to check lines for orthogonality, setting out right angles and especially for measurements in the case of visual obstacles.

P

Parallel lines	Application program to check the parallelism of straight lines or for setting out parallels with only one point given.
Point identification	Identification of the measured point by a maximum of 12 characters for the point number and up to 5 for the point code.
Point number/Point code	Part of the point identification.
Station + Offset	Application program for the determination of rectangular coordinates of any point in relation to a straight line defined by the points A and B.
Polar/Detail Point determination	Determination of the coordinates and height of new points by distance and bearing measurement.

Q

R

Recording mode	Selectable in the menu Interface/Recording: Off — no recording MEM/1 — Recording of measured data sets in MEM (not for Trimble 3306DR) MEM/2 — Recording of computed data sets in MEM (not for Trimble 3306DR) MEM/3 — Recording of all data sets in MEM (not for Trimble 3306DR) V24/1 — Recording of measured data sets through V24 V24/2 — Recording of computed data sets through V24 V24/3 — Recording of all data sets through V24
Record current settings	Recording of Header and changed settings of instrument
Reference point	Used here as reflector station for the indirect height determination.
Reflector height	Height of the reflector (prism centre) above its station (ground point).
Refraction coefficient	Measure for the light-beam refraction in the atmosphere; can be set by the user.
Run centre	See *Compensator run centre.*

S

Scale	With a *scale,* the measured distance is varied proportionally to the length and can thus be adapted to certain marginal conditions. There exist a series of direct and indirect scale effects: *calibration scale*, *projection reduction*, *height reduction, reticle scale.*
Softkey	Function key which has several functions in dependence on the program.

Standard measurement menu	The determination of points takes place within the local measuring system. The station of the instrument with the coordinates (0,0,0) represents the zero point of this system of coordinates. The *orientation* is determined by the zero direction of the Hz circle. The data are fitted in a given system of coordinates (Trimble 3306DR) only during the further processing (possibly in the office) or a stationing is carried out in order to measure in a given system of coordinates.
Standard settings	Values set by the manufacturer for all configuration parameters.
Stake out	Program to stake out or search points.
Stationing	Precedes any determination of points in a defined system of coordinates. Consists in the station point determination and/or calculation of the orientation of the graduated circle: Stationing on a known or unknown point (free stationing), height stationing (height only).
Stationing on a known point	Given: Station point coordinates / backsight bearing. The *scale* and the *orientation* of the graduated circle are derived from the measurements to known *backsight points.*
	T
Tracking	Continuous measurement of angles and distances. Hz and V values are constantly measured and displayed. Set permanent measurement for distance measurements.
	V
Vertical axis inclination	The inclinations of the vertical axis of the instrument in sighting axis direction are measured with the *compensator*, indicated digitally and can be requested on the display.

Vertical plane

Application program for the determination of points in a vertical plane by means of an angle measurement.

W

Z

	Trimble 3303DR	Trimble 3305DR Trimble 3306DR

Angle measurement

Accuracy as per DIN 18723	1.0 mgrad (3“)	1.5 mgrads (5“)

Angle measurement

Hz and V circles	electronic absolute,	
Measuring units	360° (DMS, DEG), 400 grads, 6400 mils	
Vertical reference systems	zenith, height and vertical angle, slope in percent	
Least display unit (selectable)	1´´/2´´/10´´	
	0.0005°/0.002°0.005°	0.0005°/0.001°0.005°
	0.2 / 1 / 5 mgrads	0.5 / 1 / 5 mgrads
	0.01^{-}/0.1^{-}/0.5^{-}	

Telescope

Magnification	26 x
Aperture	40 mm
Length	193 mm
Field of view at 100 m	2.9 m
Shortest sighting	1.5 m
Special features	variable reticle illumination

	Trimble 3303DR	Trimble 3305DR Trimble 3306DR
Distance measurement		
Method (DR mode)	electro-optical, modulated red laser light 660nm /< 1mW (internal: red laser diode 660nm/<1,1mW)	
Transmitter/Receiver optics	coaxial, in telescope	
Beam divergence	0,4 mrad / 1,5 mrad	
Resolution	0,1mm	
Measuring units	alternate display of results in m/ft	

Distance measurement time		**Prism mode**
Standard		2.0 s
Tracking		1.2 s
		Direct reflex mode
Standard		3 s up to 30m + 1 s / 10m
Tracking		1,6 s
Distance measurement		
Accuracy as per DIN 18723		
Prism	Standard	2mm+2ppm
	Tracking	5mm+2ppm
Reflex Foil	Standard	3mm+2ppm
	Tracking	5mm+2ppm
Direct Reflex	Standard	3mm+2ppm
	Tracking	10mm+2ppm
Distance measurement		
Range [1]		**Standard range**
with 1 prism		1,5m - 3000m
with 3 prisms		1,5m - 5000
with reflective foil 20x20mm		2,5m – 100m
with reflective foil 60x60mm		2,5m – 250m
		Long range
with 1 prism	.	1000m – 5000m
with 3 prisms		1000m – 7500m
with Reflex Foil 20x20mm		2,5m – 200m
with Reflex Foil 60x60mm		2,5m – 800m
Direct reflex measurement[2]	70m(Kodak Gray,18%) / 100m(Kodak Gray,90%)	

	Trimble 3303DR	Trimble 3305DR Trimble 3306DR
Levelling		
Circular level	10'/2 mm	
Tubular level	30"/2 mm	
Compensator		
Type	uniaxial compensator	
Working range	5'/100 mgrads	
Accuracy	1,5"	
Clamps and tangent screws	coaxial, parallel axes	
Optical plummet		
Magnification	2 x	
Shortest sighting distance	0.5 m	
Display screen		
	4 lines with 21 characters each, graphic capabilities (128 x 32 pixels) display illumination, variable contrast setting	
Keyboard		
	7 keys, display oriented, variable key functions	
Measuring menu		
	Hz-V/SD-Hz-V/HD-Hz-h/y-x-h setting, input, adjustment	
Application programs (supported by graphics)		
	Connecting Distances, Object Height + Width, Station + Offset, Vertical Plane, Area Calculation, Stake out Point to Line (orthogonal lines, parallel lines, alignment)	

	Trimble 3303DR	Trimble 3305DR Trimble 3306DR
Coordinates programs (supported by graphics)		
	Unknown Station, Known Station, Stationing in elevation, Polar/Detail Points, Stake Out	
Recording		
	internal data memory[3] (approx. 1900 data lines) externally via RS 232 C/V24 interface switchover in the menu interface/recording, slip ring on stationary base	
Power supply		
	NiMH battery pack 6 V/1.3 Ah; sufficient for approx. 1000 angle and distance measurements	
Operating temperatures		
	-20°C to +50°C	
Dimensions		
Instrument (WxHxD)	173 x 268 x 193 mm	
Trunnion axis height with DIN centring spigot/ Trimble 3-PIN centring	 175 mm 196 mm	
Weights		
Instrument incl. battery and tribrach	3.5 kg	
Case	2.5 kg	

[1] Standard clear: No haze, overcast or moderate sunlight with very light heat shimmer. Range and accuracy are dependent on athmospheric conditions and backround radiation.
[2] typically
[3] Not available for Trimble 3306DR.

Electromagnetic Compatibility (EMV)

Die EU Conformity Declaration confirms the perfect function of the instrument in an electromagnetic environment.

☝ Attention !

Computers connected to the rimble 3300DR which are not part of the Trimble System delivery, have to meet the same EMV requirements in order to ensure that the overall configuration complies with the applicable interference suppression standards.

Interference suppression as per:
EN 55011 class B

Noise immunity:
EN 50082-2

☞ Tip

Strong magnetic fields generated by mid and low voltage transformer stations possibly exceed the check criteria. Make a plausibility check of the results when measuring on such conditions.

Single battery Charger

☝ Attention !

Make sure that the input voltage switch reading matches the mains voltage at your location!
If you connect the charger to 230V when the voltage selector shows 115V an internal fuse will blow.

If you connect the charger to 115V and it is set for 230V the red charge led flashes.

General

This single battery charger is designed for NiCd and NiMH batteries, 5 or 10 cells. Die NiMH Battery of the Trimble 3300DR (6V 1,3 Ah 7025049040000) has 5 cells. The charger changes the charging parameters depending on a code resistor in the battery.
A micro controller measures the code resistor and the NTC resistor in the battery and changes the maximum voltage and charging time accordingly. It uses the peek voltage method to indicate when the battery is almost fully charged.

To complete the charging it applies a constant top charging current of 100 mA until the maximum charging time timer has run out. Thereafter a pulsating trickle charging current will be applied to the battery as long as it is connected to the charger.

To prevent damage to the battery the charger has the following safety functions:

- A maximum charging time timer
- Max and min temperature stop, if the battery becomes to hot or cold. This function requires a NTC resistor in the battery
- Battery over and under voltage detection

Low battery voltage

If the battery voltage is lower than about 3V (the **Error** LED is turned on) the charger starts the charging with 100 mA current until the voltage increase over 3V. Then normal charging starts. Sometimes battery voltage increase rapidly first and then falls slowly for some time. If this goes on for more then 10 min the charger may interpret this as the battery is already fully charged. The charger stops and has to be restarted.

High battery temperature

The battery is equipped with an NTC resistor. The charger monitors the battery temperature with this resistor and stops if the temperature rise above 45 degrees Celsius and the **Error** led will be turned on. The reason for this may be high ambient temperature or the charger has failed to stop charging and the battery temperature rise due to a fully charged condition.

Charged battery

It is not recommended to restart a charging cycle when the charger has indicated 100%. The charger waits about 10 minutes before it senses the battery condition and repeated restarts can cause a heavy overcharge and damage to the battery.

Worn out batteries

Old and well-used battery has a higher voltage when charged. If the voltage becomes to high a protection mechanism stops the charging and error will be indicated.

Continues connection to charger

A battery should not be connected to the charger for a prolonged time.

Disconnect the charger from main supply if it not will be used for a long time.

Technical Data

INPUT

	Nominal	Comments
Voltage	~115 Vac; 50/60 Hz	90V to 127V
	~230 Vac; 50/60 Hz	190V to 250V
Power	20 W	

OUTPUT

Reverse polarity protection	Max 30 V	

CONTROL

High temperature stop	45 °C	The charger must be restarted to continue charging
Low temperature stop		The charger begins charging when tem-perature becomes higher then 0 °C

Charging the battery

Safety Notes

☝ Attention !

Only charge rechargeable Nickel Metal Hydride (NiMH) and Nickel Cadmium (NiCd) chemistry battery packs. Attempts to charge other types of battery may results in explosions.

LED indicator

No bat.	No battery connected
Error	Error see text
Charg	Fast charging
100%	Battery charged

Connect the appropriate power supply cable to the charger and insert it in the power outlet The yellow **No Bat** led will be turned on.
Chose an appropriate battery cable and insert it at the charger's battery connector. Finally connect the cable to the battery. The yellow **No bat** led will now be turned off and the red **Charge** led will be turned on. The charging process has now started and will continue until the charger detects a fully charged battery and the green **100%** led turns on.
The charging time for the DiNi – Battery is approximately 2 hours and 30 minutes. The charger will time out in 4 hours and 15 minutes.

Computational Formulae for Angle Measurements

V angle measurement

$$\mathbf{V_k = V_o + i + SZ_a}$$

V_o = uncorrected V circle reading
i = index correction

SZ_a = current vertical axis inclination in the sighting direction

Hz bearing measurement

$$\mathbf{Hz_k = Hz_o + Hz_1 + A}$$

Hz_o = uncorrected Hz circle reading
$Hz_1 = c/\sin(Vk)$ - collimation correction
A = circle adjustment for orientation

Computational Formulae for Distance Measurements

$$D_k = D_0 \cdot M_i + A$$

D_k = corrected distance
D_0 = uncorrected distance
A = addition constant
M_i = influence of meteorological data

Influence of meteorological data:

$$M_i = (1 + (n_0 - n)\, 10^{-6}) \cdot (1 + (a \cdot T \cdot T)\, 10^{-6})$$

n = current refractive index
= (79.146 · P) / (272.479 + T)
n_0 = reference refractive index = 255
P = air pressure in hPa or torr or in Hg
T = temperature in degrees C or degrees F
a = coefficient of vapour pressure correction
= 0.001

carrier wavelength	0.86 microns
modulation wavelength	20 m
precision scale	10 m

Reduction Formulae

Slope distance SD

Distance between the instrument´s trunnion axis and the prism. It is computed from the measured slope distance and the entered scale:

$$SD = D_k \cdot M$$

SD = displayed slope distance
D_k = basic distance
M = scale

Horizontal distance HD

$$HD = (E_1 + E_2) \cdot M$$

HD = displayed horizontal distance

$E_1 = D_k \cdot \sin(Z + R)$
R = influence of refraction
$= 6.5 \cdot 10^{-7} \cdot D_k \cdot \sin(Z)$
E_2 = influence of earth curvature
$= -1.57\ 10^{-7} \cdot dh \cdot D_k \cdot \sin(Z)$
D_k = corrected slope distance
Z = measured zenith angle [grads]
M = scale

Difference in elevation h

$$h = dh_1 + dh_2$$

h = displayed difference in elevation

$dh_1 = Dk \cdot \cos(Z)$

$dh_2 = (Dk \cdot \sin(Z)) \cdot (Dk \cdot \sin(Z))\ 6.8 \cdot 10^{-8}$

= influence of earth curvature and refraction (k = 0.13)

Distance reduction to MSL

Distances measured at elevation Z can be reduced to MSL by computing the following scale outside the instrument (computation formula applies to all earth radii):

$m = R / R+Z$

$S_2 = S_1 \cdot m$

R	= earth radius (6370 Km)
Z	= elevation above MSL (Km)
S_1	= measured distance at elevation Z
S_2	= reduced distance at MSL

If this scale is entered into the Trimble 3300DR, the computed distances are reduced directly in the instrument.

Verifying on Calibration Distances

Basically, all measured distances are corrected with reference to:
the entered scale,
the entered addition constant,
the influence of pressure and temperature,
internal influencing variables.

☝ Attention!

Prior to the practical realisation of the calibration measurement, the current values of the parameters scale, addition constant, pressure and temperature are to be entered. The scale is to be set to default: 1.000000. This is to secure that all corrections are made completely and perfectly. Furthermore, this allows a direct comparison of nominal and actual values in the case of given distances.

If a weather correction is to be carried out externally, the temperature must be set to 20°C and the air pressure to 944 hPa. Then, the internal correction goes to zero.

Prism and Addition Constants

All Trimble Total Stations of the former Zeiss Elta series, in combination with their reflectors are adjusted with the **addition constant 0.000**.

In case of measurements to reflectors of other manufacturers, a possibly existing addition constant can be determined.

Another possibility consists in calculating an addition constant by means of the known prism constant of the reflector used. This prism constant is calculated as function of the geometric value of the prism, the type of glass and the place of the mechanical reference point. The prism constant for former Zeiss reflectors determined that way is -35 mm.

Relation between the addition constant Acz for former Zeiss instruments, the prism constant Pcz for former Zeiss reflectors and the prism constant P_f for other

manufacturers reflectors:

$$A_{CZ} = P_F - P_{CZ}$$

Example:

Zeiss reflector	prism constant
P_{CZ}	= -35 mm
Foreign reflector	prism constant
P_F	= -30 mm

Addition constant for former Zeiss Elta instruments in connection with this foreign reflector A_{CZ} = + 5 mm

In this case, in the Trimble 3300DR the addition constant is computed: + 0.005 m.

Error Message		What to do?
001	ROM error	It is not advisable to continue the measurement as all basic settings of the instrument may have been changed.
002	RAM error	
003	Data EEPROM was initialised	
005	Data EEPROM error	
040	Error in	If this error occurs repeatedly, please inform the service. 042 – Ambiguity [1]
059	dist. measuring unit	
201	No Compensator	Time Out in contact with the Compensator Call the service
202	Compensator oper. range exceeded	Compensator range of 5' exceeded
203	No Compensator-Value	No measurement possible – instrument inclination to big
204	No Angle Sensor	Time Out in contact with the angle sensor Call the service
205	No Initialisation Angle Sensor	No Initialisation of the angle sensor Call the service
206	No Angle Value	No angle measurement possible, to fast movement in angle tracking The digits are replaced by dashes
207	Data-EEPROM Error in writing	Error in reading or writing EEPROM of the angle sensor or compensator It is possible that there are changed important settings Call the service
208	Data-EEPROM Error in writing	
209	Data-EEPROM Error in reading	
210	Daten-EEPROM Error in reading	

Error	Remedy
211 Error Communication **212** Error Communication	Error in communication with the angle sensor or compensator, call the service
410 MEM not initialised!	Initialisation can only be performed by service staff
411/ 412 Defect in system area	Work with the data memory is not possible, call the service
413 Defect in system area, reading is possible **415** MEM reading error **416** MEM writing error	In the event of error messages 413...416, try to save the content of the data memory by transmission to the PC. If the error occurs again when recording is repeated, call the service. .
417 MEM is full	Read out the memory content, delete the memory.
418 **419** Pointcode or Point-number not found	Correct the entry.
581 Transmission error (in data transmission) **584** Transmission time out (in XON/XOFF protocol) **586** Transmission time out (in XON/XOFF Rec 500 protocol) **587** I/O time out, Rec 500 protocol **588** REC 500 protocol error	If the general recording errors 518...588 occur, first try to repeat recording. If the error occurs again, check the interface parameters, the cable and the recording program at the other end. [1] Warning could appear while target is moving during measurement or doing measurment at distances longer than 300m and shorter than 1,5m in DR mode to prisms or high reflective surfaces.

☞Tip

If the warning "inadequate geometrical conditions" is ignored in the application programs, the last digit of the displayed values is replaced by 3 dots.
If a recording error occurs, the last data line has usually not been transmitted.

Before you call the service

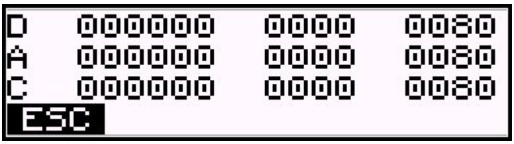
Before you contact the service please notice the following service menu information. This information is very important to analyse the instrument errors.

ON MENU

Update/Service

YES Go to Menu

Service



Instructions for Maintenance and Care

Instrument	Allow sufficient time for the instrument to adjust to the ambient temperature. Use a soft cloth to remove dirt and dust from the instrument. When working in wet weather or rain, cover the instrument during longer breaks with the protective hood.
Object lens and eyepiece	Clean the optics with special care using a clean and soft cloth, cotton wool or a soft brush, do not use any liquid except pure alcohol. Do not touch the optical surface with the fingers.
Prisms	Steamed prisms must have sufficient time to adjust to the ambient temperature. Remove afterwards the moisture using a clean and soft cloth.
Transportation	For transportation over long distances, the instrument should be stored in its case. When working in wet weather, wipe the instrument and case dry in the field and let it dry completely indoors, with the case open. If, for the purpose of changing the station, the instrument with the tripod is transported on the shoulder, please make sure that instrument and person will not be damaged or injured.
Storage	Let wet instruments and accessories dry before packing them up. After a long storage, check the adjustment of the instrument prior to use. Observe the boundary values for the temperature of storing, especially in the summer (interior of the vehicle).

Keeping the Measurement System in the Case

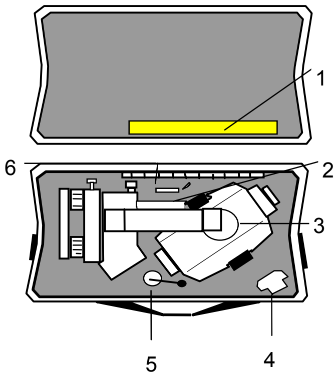


Fig. 1: Instrument case

1	Protective hood
2	Adjusting tools: Pin for adjusting the optical plummet, Pin for adjusting the clamping power of the tripod legs
3	Instrument
4	Battery
5	Plumb line
6	Operating instructions

Trimble 3303 / 3305 xtreme Extended Temperature Range

For surveying in extreme climatic conditions, a special version of the instrument series Trimble 3300 suitable for an extended temperature range to -35° is available, broadening the operative range of the Routine Total Stations considerably as far as seasons and geographical features are concerned.

Due to the heated display, the instrument works just as in the normal temperature range. The required heating energy is provided by the external battery.

For operation in low temperatures run the instrument from the external battery.

The instrument is automatic power from the external battery after connecting to the instrument. Disconnecting the external battery the instrument does switch over automatically to the internal battery.

The heating switches on automatically at about -10°C.if the instrument is connected with the external battery.

The external battery provides energy for about 8 hours at -35°C.

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