DiNi

DIGITAL LEVEL

USER GUIDE

Trimble

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Release Notice

This is the September 2017 release of the Trimble DiNi Digital Level User Guide, part number 57345002, version 6.0

Product Warranty Information

For applicable product warranty information, please refer to the Warranty Card included with this Trimble product, or consult your Trimble dealer.

Notices

Europe

This product has been tested and found to comply with relevant requirements pursuant to European Council directives, thereby satisfying the requirements for CE marking and sale within the European Economic Area (EEA).

Applicable directives:

– EMC Directive 2014/30/EU

– RoHS Directive 2011/65/EU

Australia and New Zealand

This product conforms with the regulatory requirements of the Australian Communications and Media Authority (ACMA) EMC framework, thus satisfying the requirements for RCM-Marking and sale within Australia and New Zealand.

Taiwan – Battery Recycling Requirements

The product contains a removable Lithium-ion battery. Taiwanese regulations require that waste batteries are recycled.

Notice to Our European Union Customers

For product recycling instructions and more information, please go to: www.trimble.com/Corporate/Environmental_Compliance.aspx.

Recycling in Europe: To recycle Trimble WEEE (Waste Electrical and Electronic Equipment, products that run on electrical power.), Call +31 497 53 24 30, and ask for the "WEEE Associate". Or, mail a request for recycling instructions to:
Trimble Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL

Important Information

Carefully read the manual before the first use. Be sure to comply with the safety information.

Safety Information

Instruments and original accessories from Trimble must only be used for the intended purpose.

⚠ **WARNING –** Operate the instrument only in the compliance with the operating conditions specified.
– Do not point the telescope directly at the sun.
– Do not use the instrument and accessories in rooms with danger of explosion.
– When you work with staves in the vicinity of electric plants (e.g. electric railways, aerial lines, transmitting stations, etc.) your life is acutely endangered. This risk exists independent of the material (e.g. aluminum or wood). In such cases it is necessary to inform the competent and authorised safety authorities and observe their instructions.
– Protect operator and instrument sufficiently at the site of measurement (e.g. construction site, roads, etc.). Observe any relevant national regulations and the Road Traffic Act.
– Do not carry out surveying work in a thunderstorm to avoid being struck by a lightning.

Battery Safety

⚠ **WARNING –** Do not damage the rechargeable Lithium-ion battery. A damaged battery can cause an explosion or fire, and can result in personal injury and/or property damage. To prevent injury or damage:
– Do not use or charge the battery if it appears to be damaged. Signs of damage include, but are not limited to, discoloration, warping, and leaking battery fluid.
– Do not expose the battery to fire, high temperature, or direct sunlight.
– Do not immerse the battery in water.
– Do not use or store the battery inside a vehicle during hot weather.
– Do not drop or puncture the battery.
– Do not open the battery or short-circuit its contacts.

⚠ **WARNING –** Avoid contact with the rechargeable Lithium-ion battery if it appears to be leaking. Battery fluid is corrosive, and contact with it can result in personal injury and/or property damage. To prevent injury or damage:
– If the battery leaks, avoid contact with the battery fluid.
– If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!
– If battery fluid gets onto your skin or clothing, immediately use clean water to wash off the battery fluid.

⚠ **WARNING –** Charge and use the rechargeable Lithium-ion battery only in strict accordance with the instructions. Charging or using the battery in unauthorized equipment can cause an explosion or fire, and can result in personal injury and/or equipment damage. To prevent injury or damage:
– Do not charge or use the battery if it appears to be damaged or leaking.
– Charge the Lithium-ion battery only in a Trimble product that is specified to charge it. Be sure to follow all instructions that are provided with the battery charger.
– Discontinue charging a battery that gives off extreme heat or a burning odor.
– Use the battery only in Trimble equipment that is specified to use it.
– Use the battery only for its intended use and according to the instructions in the product documentation.

Environmental Information

NOTICE FOR TRIMBLE'S EUROPEAN UNION CUSTOMERS

Trimble is pleased to announce a new recycling program for our European Union customers. At Trimble, we recognize the importance of minimizing the environmental impacts of our products. We endeavor to meet your needs, not only when you purchase and use our products, but also when you are ready to dispose of them. That is why Trimble is actively pursuing, and will continue to pursue, the expanded use of environmentally friendly materials in all its products, and why we have established a convenient and environmentally friendly recycling program.

As Trimble makes additional recycling facilities available for your use, we will post their locations and contact information to our Recycling Instructions web page.

For product recycling instructions and more information, please go to

www.trimble.com/environment/summary.html

Recycling in Europe:
To recycle Trimble WEEE,
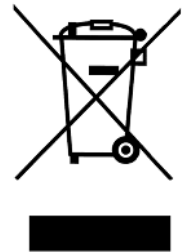Call +31 497 53 2430, and ask for the "WEEE Associate"

Or

Mail a request for recycling instructions to:

Trimble Europe BV
c/o Menlo Worldwide Logistics
Meerheide 45
5521 DZ Eersel, NL

Equipment Information

⚠ **CAUTION –** Do not make any changes or repairs on the instrument and accessories. This must be done only by a service team or by authorised technical staff.
– Do not initialize the data memory without making a back up of the stored data, as the initialization will delete all stored data.
– Do tread tripod legs firmly into the ground to prevent sinking in and falling over of the instrument by wind pressure.
– Do mount the instrument to the tripod using the tripod screw immediately after you take the instrument from its case.
– Do not leave the instrument placed loosely on the tripod head. After loosening the tripod screw, immediately store the instrument in its case.
– Do check your instrument at regular intervals in order to avoid faulty measurements, especially after it has been subjected to shock or heavy punishment.
– Do not use the instrument too long when it is raining. During breaks, cover the instrument with the protective hood. Wipe the instrument and case dry in the field and let it dry completely indoors, with the case open.
– Do remove the batteries in case of unloading or a longer time without using the instrument.
– Do only recharge the batteries with the intended Trimble charger.
– Do properly dispose of the batteries and equipment taking into account the applicable national regulations. Prevent improper use of the disposed instrument by proper disposal
– Do verify before every use of the instrument, that it is in perfect condition, particularly after longer transportation, fall or any other improper use. Systematically check measurements particularly before and after extensive surveying projects will help to avoid erroneous measurements.
– Do not use destroyed plugs and cables for accessories with the instrument

Contents

1

Introduction

▶ Welcome

▶ About the Trimble DiNi Digital Level

▶ Related Information

▶ Technical Assistance

▶ Your Comments

▶ Registration

Welcome

This manual describes how to set up and use the Trimble® DiNi® Digital Level.

Even if you have used other Digital Level products before, Trimble recommends that you spend some time reading this manual to learn about the special features of this product.

About the Trimble DiNi Digital Level

Although the principle of leveling has not changed, surveying today is no longer confined to the measurement of height differences. A demand now exists for complex measuring systems, which not only meet the increasing requirements for automatization, digital data processing and last but not least efficiency in everyday surveying, but which also set new standards in technology and operating convenience.

The DiNi fits excellently in the complete line of the measuring equipment from Trimble: Data interchange between all the instruments is ensured by a common data format and by the use of the USB Memory Stick.

Related Information

Sources of related information include the following:

• Trimble training courses – Consider a training course to help you use your Trimble Dini to its fullest potential. For more information, go to the Trimble website at www.trimble.com/training.html.

Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, *contact your local dealer*.

Your Comments

Your feedback about the supporting documentation helps us to improve it with each revision. Email your comments to ReaderFeedback@trimble.com.

Registration

To receive information regarding updates and new products please register on the Trimble website.

www.trimble.com/register

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Inspection, Care and Maintenance

► Inspecting the Container

► Instrument Case

► Care and Maintenance

► Transporting the Instrument

► Servicing

Inspecting the Container

Inspect the shipping container. If the container arrives in poor condition, examine the equipment for visible damage. If damage is found, immediately notify the carrier and your Trimble sales representative. Keep the container and the packing material for the carrier to inspect.

Instrument Case

When unpacking the instrument, check that all ordered items are received. Below is an example of where all items can be placed in the instrument case.

NOTE – Some of the items in the picture below are optional.
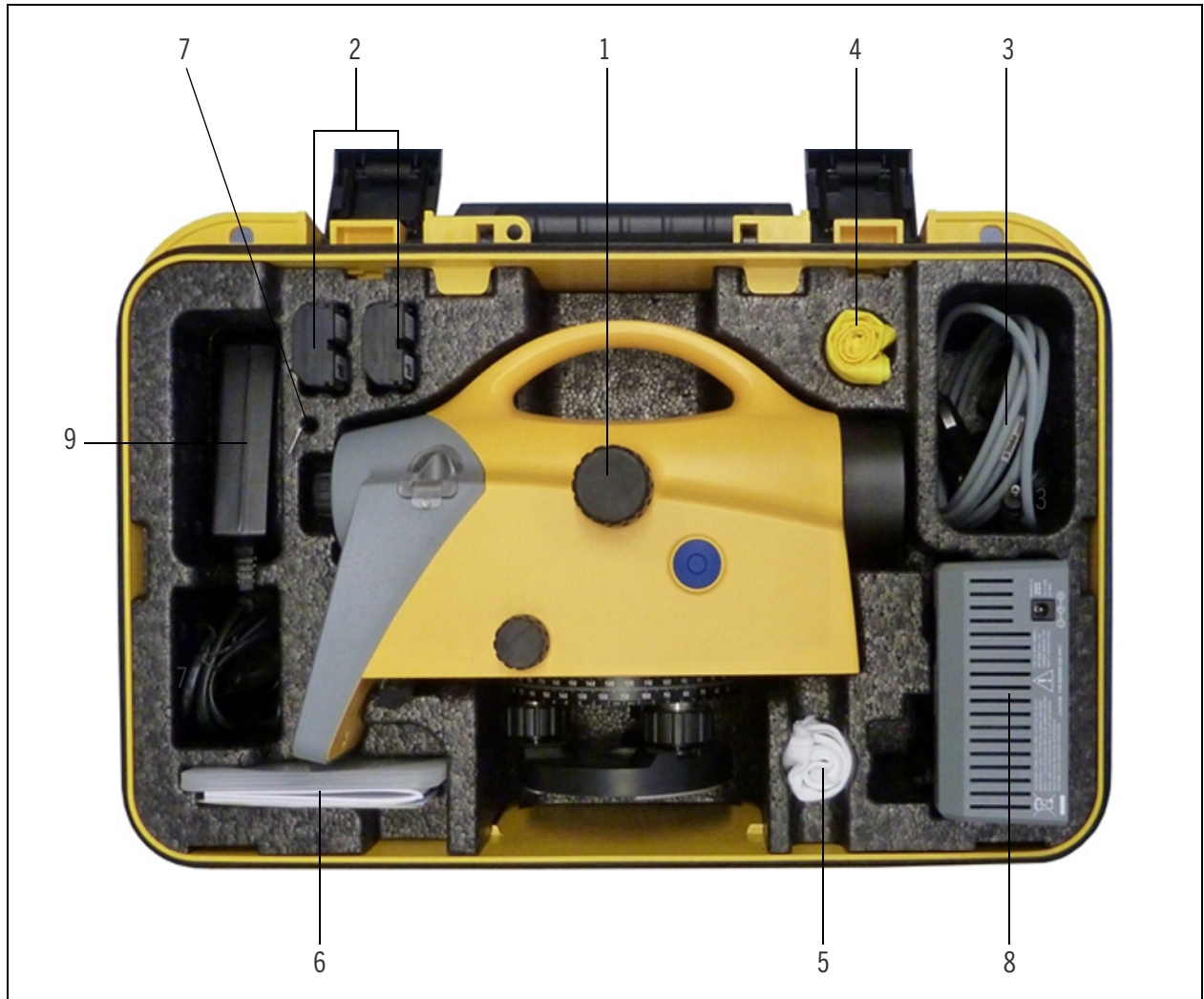
Item	Description
1	Trimble DiNi
2	Battery (One battery standard)
3	Cable (DiNi to PC)
4	Rain cover
5	Cleaning cloth
6	Manual CD, Quick User guide, certificate
7	Allen key for cross hair adjustment
8	Battery charger (optional)
9	Power supply for battery charger (optional)

Care and Maintenance

⚠ **WARNING –** Do not remove the instrument cover from the instrument. Trimble DiNi is designed to withstand normal electromagnetic disturbance from the environment but it contains circuits that are sensitive to static electricity. If an unauthorized person opens the instrument cover, the function of the instrument is not guaranteed and the warranty invalidated.

The Trimble DiNi is designed and tested to withstand field conditions, but like all precision instruments, it requires care and maintenance. Take the following steps to get the best results from the instrument:

- Do not subject the equipment to rough jolts or careless treatment.
- Keep the lenses clean. Use only lens paper or other material that is designed for cleaning optical equipment.
- When not in use, keep the instrument in the instrument case.
- Carry the instrument by the handle.
- When you need extremely precise measurements, make sure that the instrument has adapted to the surrounding temperature. Significant variations in instrument temperature can affect precision.

Cleaning

⚠ **CAUTION –** Never use strong detergents such as benzine or thinners on the instrument or the instrument case.

Be very careful when cleaning the instrument, especially when removing sand or dust from lenses and reflectors. Never use coarse or dirty cloth or hard paper. Trimble recommends that you use anti-static lens wad, a cotton wad, or a lens brush.

Getting rid of moisture

If the instrument has been used in damp weather, take the instrument indoors and remove the instrument from the instrument case. Leave the instrument to dry naturally. If condensation forms on the lenses, allow the moisture to evaporate naturally.

Transporting the Instrument

Always transport the instrument in a locked instrument case. For longer trips, transport the instrument in the instrument case and inside the original shipping container.

Servicing

NOTE – There are no user-serviceable parts in the Trimble DiNi

Trimble recommends that you take the instrument to an authorized Trimble service workshop for service and calibration once a year. This is to guarantee that the specified accuracies are maintained.

When you send the instrument to a service center, clearly write the name of the sender and the receiver on the instrument case. If repairs are required, enclose a note in the instrument case. The note should clearly describe any fault or symptoms, and indicate that servicing is required.

3

Instrument Description

Battery

Before charging or using a battery it is important that you read and understand the battery safety and environment information.

Battery Safety and Environmental Information

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– Do not expose the battery to fire, high temperature, or direct sunlight.
– Do not immerse the battery in water.
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– If battery fluid gets into your eyes, immediately rinse your eyes with clean water and seek medical attention. Do not rub your eyes!
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– Do not charge or use the battery if it appears to be damaged or leaking.
– Charge the Lithium-ion battery only in a Trimble product that is specified to charge it. Be sure to follow all instructions that are provided with the battery charger.
– Discontinue charging a battery that gives off extreme heat or a burning odor.
– Use the battery only in Trimble equipment that is specified to use it.
– Use the battery only for its intended use and according to the instructions in the product documentation.

Disposal

- Before disposal, discharge the battery.

- Dispose of the used battery in an environmentally sensitive manner, according to local and national regulations, see Environmental Information, page 4.

Charging the Li-Ion Battery

The battery is supplied partially charged. Charge the battery completely before using it for the first time.

- To charge the battery, use only a charger that is recommended by Trimble for charging the Lithium-ion battery.

- Charge the battery before using the Trimble DiNi if the equipment has been stored for longer than six months.

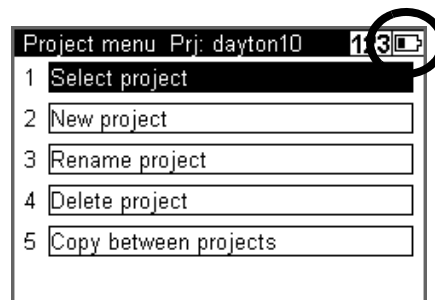For more information refer to the Trimble Charger user guide.

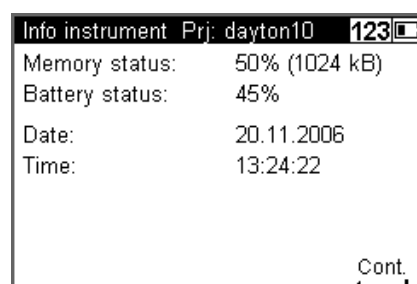# Instrument Battery Handling

Battery Capacity

Due to the implemented power management and the liquid-crystal graphic display, the DiNi uses very little energy. Depending on the age and condition of the battery, a charged Li-Ion 7.4 V 2.4 Ah battery lasts for about three days working time without illumination.

Call up the Battery Capacity

The current battery capacity is shown in the bar symbol on the top right of the display in a rough manner.

```
Project menu  Prj: dayton10    123▭
 1  Select project
 2  New project
 3  Rename project
 4  Delete project
 5  Copy between projects
```

The precise condition of the battery can be called up in every measurement menu with the Function Field "Info".

```
Info instrument  Prj: dayton10    123▭
Memory status:      50% (1024 kB)
Battery status:     45%

Date:               20.11.2006
Time:               13:24:22



                                  Cont.
```

Battery Low

When the battery has run down, the message **Battery power is below 10%** appears in the display.

If this message is confirmed by pressing any key, several measurements can still be performed. As a reminder, the display briefly turns inverse with short intervals.

After this warning, a charged battery should be inserted as soon as possible. Make sure to switch off the instrument for the replacement. No data will be lost in this case.

If the battery is not changed the instrument will shut off automatically, without loosing any data, when the battery has reached its lowest limit.

Connecting the Internal Battery

1. Open the battery compartment by releasing the lock.
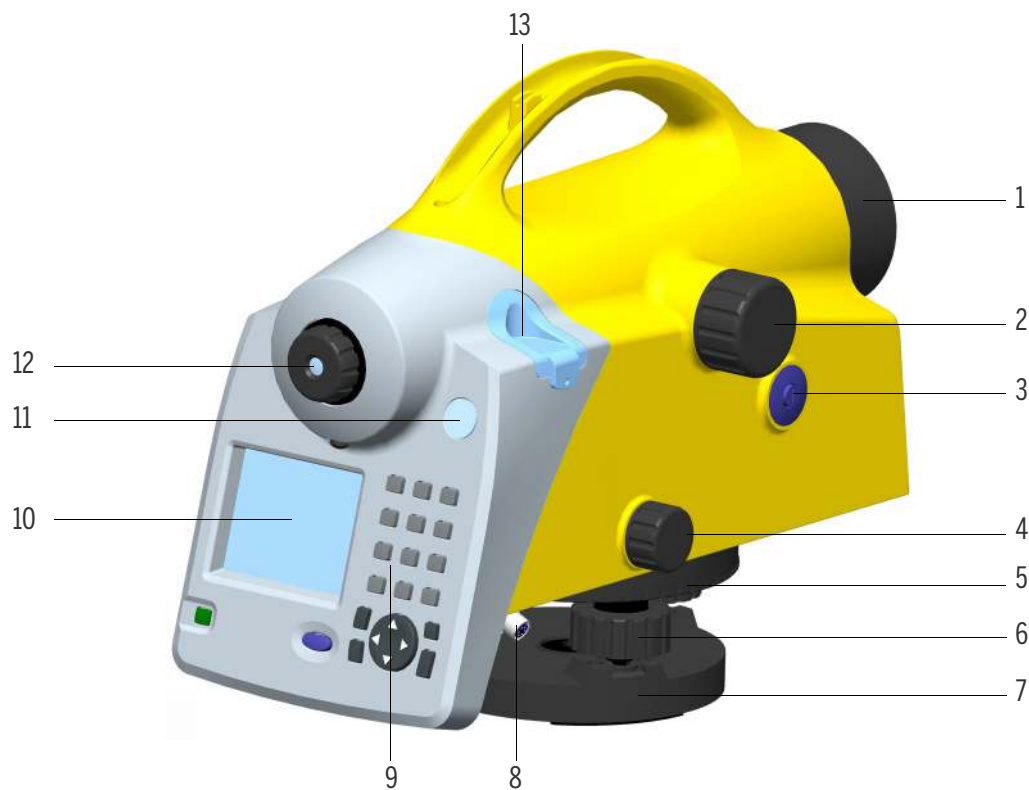2. Turn the compartment open.
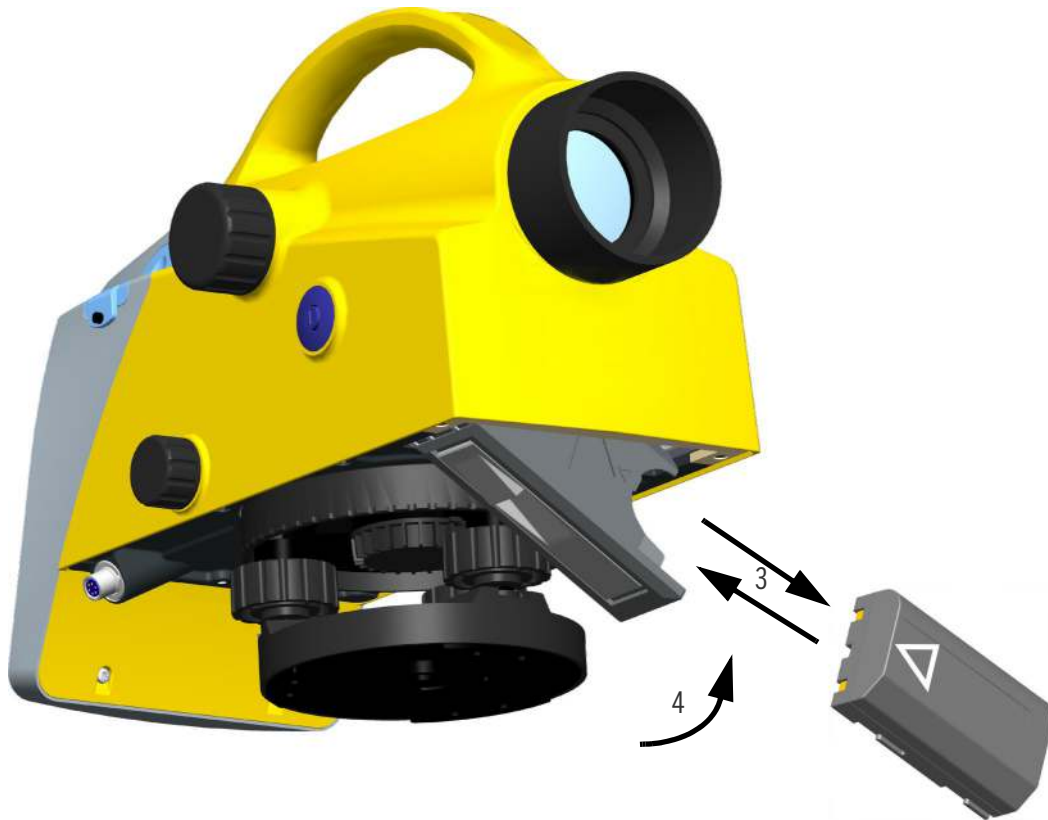
3. The battery can now be removed or inserted.

4. Close the battery compartment until the lock clicks in place.

When changing the battery, take care that the battery does not fall down when you open the lock of the battery compartment (2).

Instrument Description

Hardware Overview

1. Telescope objective with integrated sun-shield

2. Telescope focusing knob

3. Trigger key

4. Horizontal tangent screw (endless slow motion drive)

5. Graduated circle

6. Footscrews

7. Tribrach

8. Power/Communication connector

9. Keyboard

10. Display

11. Window for circular bubble

12. Reticle

13. Cap, to be removed for adjustment of circular bubble

14

14. Battery compartment
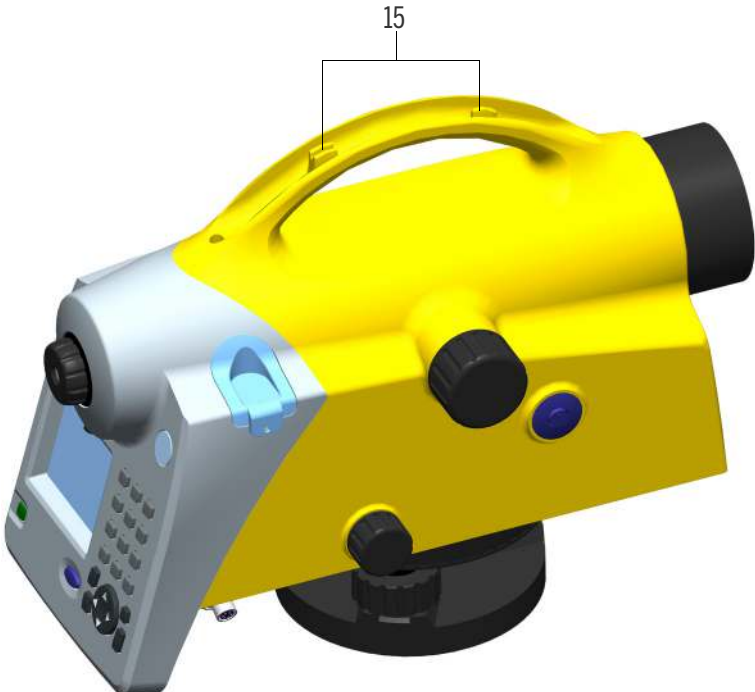
15

15. Sight vane (notch and bead sights)

Software Overview DiNi

Main Menu DiNi:

NOTE – *)Only Trimble DiNi 0.3mm/km

Main Menu	Sub Menu	Sub Menu	Description
1 Files	Project Menu	Select Project	Select from a list of stored projects
		New Project	Start a new project
		Rename Project	Change the name of a stored project
		Delete Project	Delete a stored project
		Copy Between Projects	Copy information between two projects
	Editor		Edit stored data, enter and view data and enter and change code lists
	Data Im/ Export	DiNi to USB	Transfer data from the DiNi to a USB Memory Stick
		USB to DiNi	Transfer data from a USB Memory Stick to the DiNi
	Memory		Internal memory. Total memory space, free memory space and format internal memory
2 Configuration	Input		Input of Refraction coeff., Addition const. (R), Date and Time
	Limits/Tests		Input of different Limits and control settings.
	Adjustment	Förstner Method	Line of sight adjustment.
		Nähbauer Method	Line of sight adjustment.
		Kukkamäki Method	Line of sight adjustment.
		Japanese Method	Line of sight adjustment.
	Instrument Settings		Settings for units in display and input, displayed last count, sound and language, date*) and time*).
	Settings of recordings		Settings of recording, type of recording (RMR or R-M), additional data (time*) or temperature*)) and point number increment.

Main Menu	Sub Menu	Sub Menu	Description
3 Survey	Single Point Measurement		Single Point Measurement
	Line leveling		Line leveling
	Intermediate Sights		Single point measurement with height stationing.
	Stake out		Stake out
	Continuous measurements		Continuous measurements
4 Calculation	Line Adjustment		Line Adjustment*)

⚠ **CAUTION –** When formatting the USB Memory Stick and internal memory all stored data will be lost.

Keyboard and Display Description
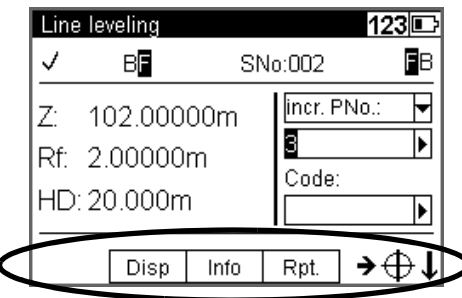
Keyboard

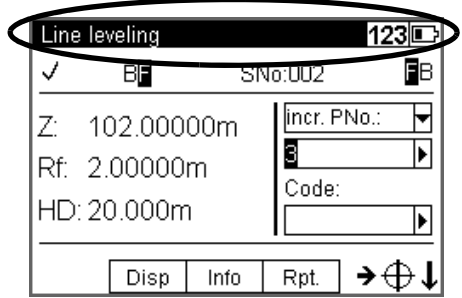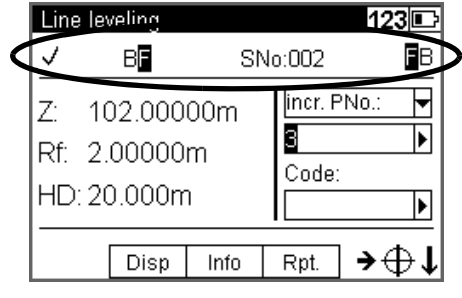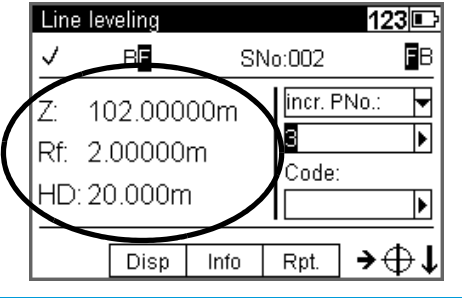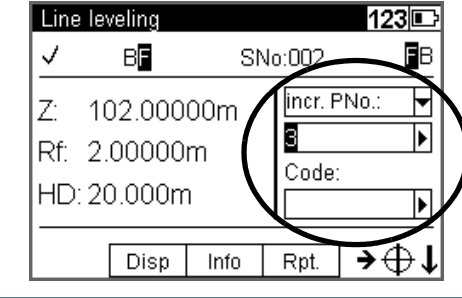| Key	Description	Comment
⏻	On/Off key	Switches the instrument on or off
⊕ or ◯	Trigger key	Starts a measurement
(spider)	Spider key	Navigates through menus, shows drop-down lists and changes check box status
↵	Enter key	Confirms inputs
Esc	Escape key	Returns to previous display/menu
α	Alpha key	Switches the keyboard keys between primary and secondary function. Status are indicated at the top of the display.
(Trimble)	Trimble key	Displays the Trimble functions menu
◀	Back step key	to delete previous input

Key	Description	Comment
. ,	Period and comma	Primary function: Period and comma Secondary function: Plus and minus (Press multiple times to get correct character)
0	0 or Space key	Primary function: 0 Secondary function: Space
1	1 or PQRS	Primary function: 1 Secondary function: PQRS (Press multiple times to get correct character)
2	2 or TUV	Primary function: 2 Secondary function: TUV
3	3 or WXYZ	Primary function: 3 Secondary function: WXYZ (Press multiple times to get correct character)
4	4 or GHI	Primary function: 4 Secondary function: GHI (Press multiple times to get correct character)
5	5 or JKL	Primary function: 5 Secondary function: JKL (Press multiple times to get correct character)
6	6 or MNO	Primary function: 6 Secondary function: MNO (Press multiple times to get correct character)
7	7	Primary function: 7 Secondary function:
8	8 or ABC	Primary function: 8 Secondary function: ABC (Press multiple times to get correct character)
9	9 or DEF	Primary function: 9 Secondary function: DEF (Press multiple times to get correct character)

Display

Display	Description
	Information regarding current program, input and battery status.
	Information regarding workflow status. Sample shows Line leveling.
	Result of the latest measurement.
	Input of information connected to the next measurement.
	Function field and information area.

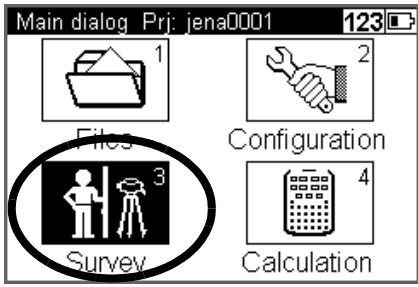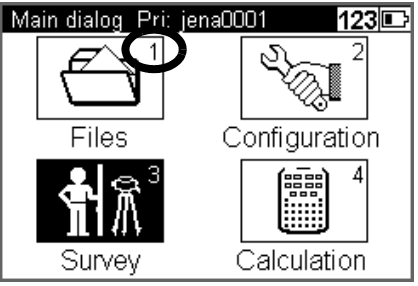| Display	Description
	When all information connected to the next measurement are entered this symbol will appear to indicate that the instrument is ready to measure.
	This symbol will appear as a reminder when the instrument is set to measure towards an inverted staff.
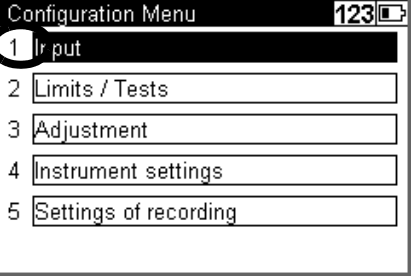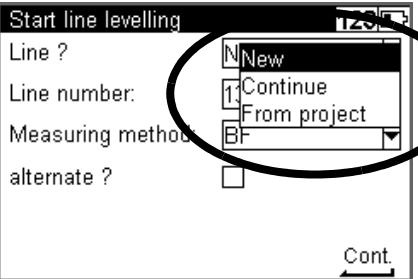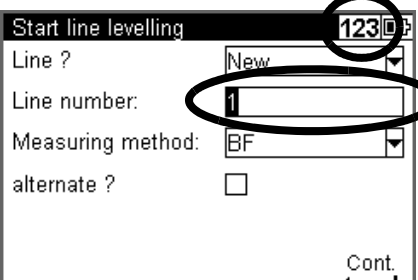
Principles of Keyboard and Display Functions

Display	Key function and description
	Navigate with the ⊕ spider key in the display menus to highlight the item you want to select.
	To confirm a selection press the ↵ enter key or go directly by pressing the number of the selection e.g. 1 number 1 key.
	Some input fields are marked with a drop down-arrow to indicate that input selections are made from a pre-defined list. Press the right arrow on the ⊕ spider key to select from a drop-down list, press enter to confirm. Press the left arrow on the ⊕ spider key to step through the possible selections.
	Some input fields are open for alpha and numeric inputs from the user. Type in the input of your choice with the instrument keyboard. Switch between numeric, capital letters or lowercase letters by pressing the α alpha key. The status is indicated at the top of the display.

Display	Key function and description
	Some inputs are made with a check box. Navigate with the ⊕ spider key in the display to highlight the check box. Press the left arrow on the ⊕ spider key to select or unselect.
	Navigate with the ⊕ spider key up, down, left or right.
	In this part of the display you can navigate with the ⊕ spider key up or down through the different input fields and down to the softkeys at the bottom of the display. When an input field is highlighted you can press the right arrow on the ⊕ spider key to select from a drop-down list or press the left arrow on the ⊕ spider key to step through the possible selections.
	In this part of the display you can navigate with the ⊕ spider key left or right to highlight different soft keys. Press ↵ Enter to select the highlighted soft key function. To be able to go back up to the input fields you must first highlight the Soft key located directly under the input fields, press up or down on the ⊕ spider key.
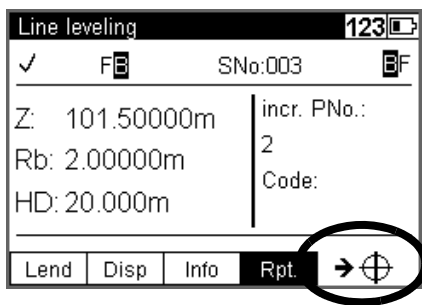
Display	Key function and description
Line leveling 123 ☐ ✓ F▮ SNo:003 ▣F Z: 101.50000m Rb: 2.00000m HD: 20.000m incr. PNo.: 2 Code: Lend | Disp | Info | Rpt. | → ⊕	The symbols displayed in the bottom corner of the display indicates the next step (see below).

→ ⊕   Ready to measure press ⊕ / ◯ measurement key

Select   Press ↵ enter key to select a detail

Store   Press ↵ enter key to store measurement

Accept   Press ↵ enter key to accept

Cont.   Press ↵ enter key to continue

Copy   Press ↵ enter key to copy data

Page 2   Press ↵ enter key to continue to next screen

↑ ↓   Press ✛ spider key up or down arrow to show further lines

Switching the Instrument On and Off

⏻ switching on and off

A properly charged battery is necessary for the operation of the instrument.

Switch on the instrument with the ⏻ key. After a short display of the Logo, the instrument is ready for measurement. The Main menu or the uncomplete application is always displayed.

DiNi Components

Compensator

Purpose

Correction of the current line of sight inclination by a mechanical compensator.

Function

Automatic alignment of the compensator ensures that an inclined line of sight is automatically leveled within the working range both for visual observation and internal electronic measurement. The compensator cannot be deactivated.

Working Range

The working range of the compensator is ± 15´ with a setting accuracy of ± 0.2" or ± 0.5" depending on instrument type. If the inclination range is exceeded a symbol of a non centered bubble will be shown in the top line of the display.
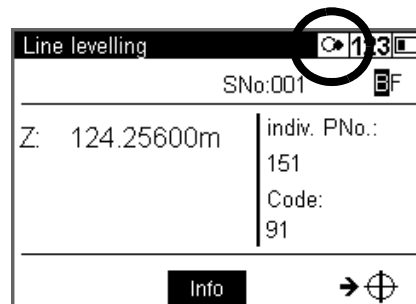
A warning information is generated and has to be confirmed after releveling the instrument.
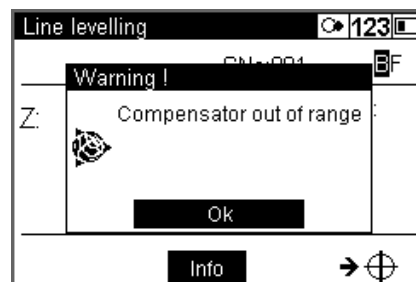
Checking

The compensator has a major influence on the instrument's line of sight. For run center adjustment, determine the residual line of sight inclination to permit distance-dependent correction of the measured values. For this, the Adjustment menu option on DiNi provides four methods. For precise height measurements, this check should be performed at regular intervals, see Chapter 8, Adjustment.

Angle Measuring System

Direct Measurement With DiNi

You can perform simple direction measurements and stake-outs. You can read the direction without any aid by means of an index line on the horizontal circle. The circle is graduated to 1 degree and 1 gon, estimated readings are possible down to 0.1 degrees and 0.1 gon.

Height/Distance Measuring System

For details, see .

Acoustic Signal Generator

Purpose

Confirmation of functions and warning signal when system messages are displayed.

Sound signals:

- Key function   Click
- Multiple measurements, interims value   Di
- Data if a complete measurement   Diii
- Error message   Diiiiiiiii
- Battery power below 10%   Di, Di, Di

With USB Memory Stick connected

- Connect the device or open communication   Da, Di
- Disconnect the device or open communication   Di, Da
- File operation was successfully   Dii, Di

The sound can be activated or deactivated in the instrument settings menu, see .

Memory

The permanent memory of the DiNi stores computation constants, operating modes, measuring units, etc. even after instrument shutoff.

The measured data and additional information is stored in the internal memory.

Data Safety

Data storage in the internal memory (non-volatile data memory without buffer battery) offers data safety for unlimited time.

Capacity DiNi:

The capacity of the internal data memory depends on the measuring mode, a line leveling with method BFFB will consume more lines then a single measurement.

It amounts to approximately 30 000 data lines.

Setup

Setup

An instrument setup with good measuring stability will increase the precision in the measurement result and allow you to utilize the measurement precision of the Trimble DiNi to its full extent.

Setup Stability

When a level is setup it is important to consider the following:

1. Set tripod legs wide apart to increase the stability of the setup. A setup where one leg is placed on e.g asphalt and the other two on soil will still be a stable setup provided that the tripod legs are set wide enough. If it is not possible to set the tripod legs wide apart due to obstacles, then the tripod can be lowered to increase stability.
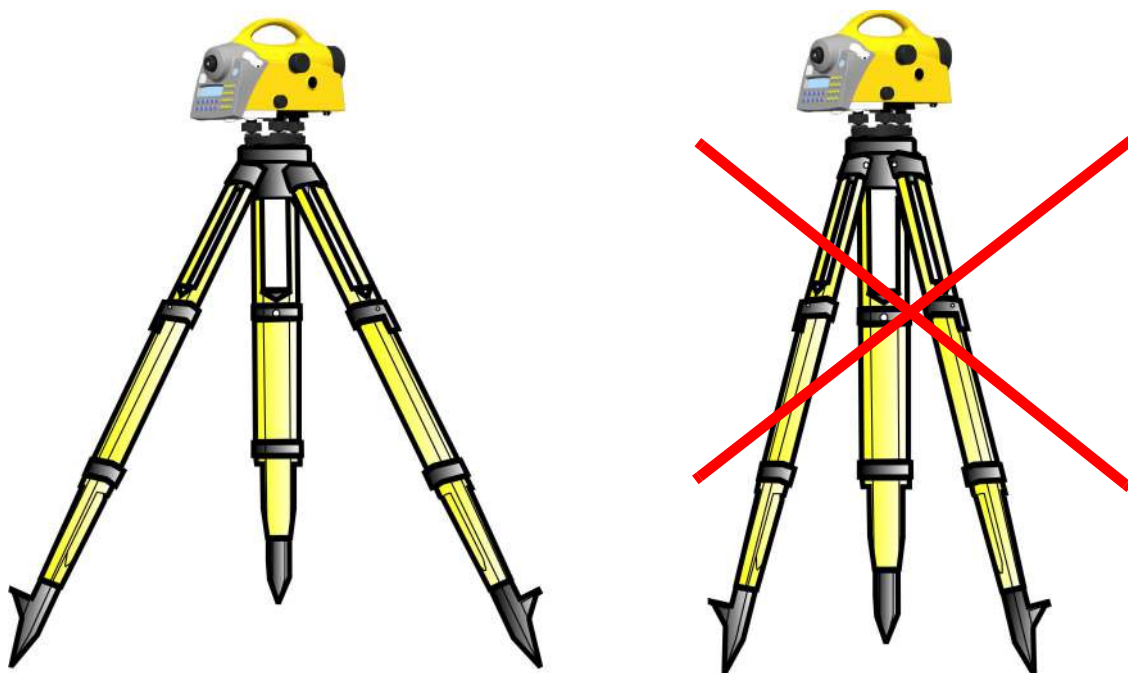
2. Make sure that all the screws on the tripod and/or tribrach are tightened to avoid any play.

3. Any survey quality tripod can be used. However, Trimble strongly recommends the use of tripod heads made of steel, aluminum or similar material. Tripod heads of fiberglass or other composite materials are not recommended.

TIP – Trimble offers tripod part number 7072550000000 with fixed, non-extendable legs. This tripod is recommended in some regions for leveling highest order lines.

Ambient Temperature

Take into account that a level requires sufficient time to adjust to the ambient temperature. The following rule-of-thumb for a high precision measurement applies: Temperature difference in degree Celsius (°C) x 2 = duration in minutes required for the instrument to adjust to the new temperature. Avoid sighting across fields with intense irradiation by sun light, e.g. at noon.

Setup and Coarse Centering

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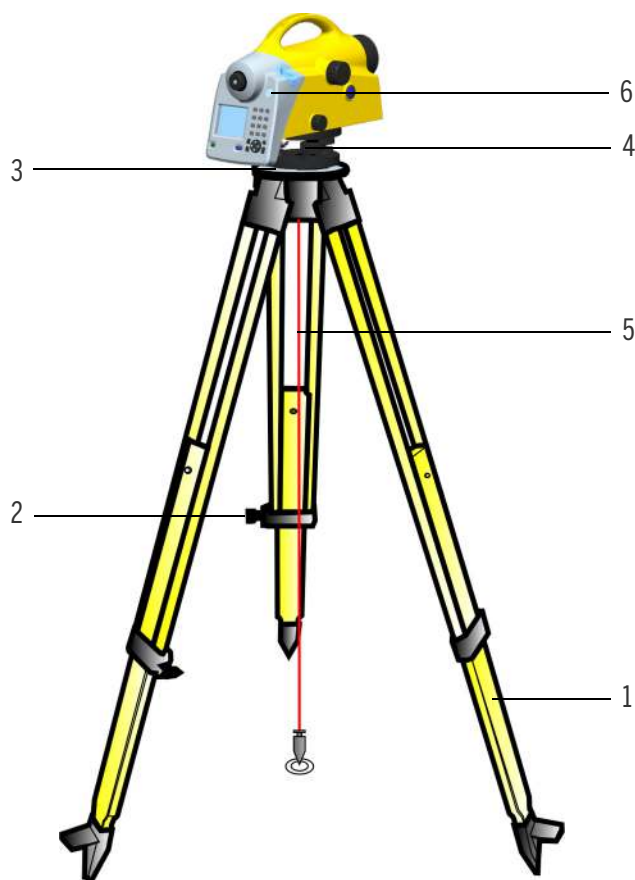
Setup

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 Centering (Only When Required)

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

Hook the plumb line (5) into the retaining screw and set up the tripod roughly centered above the ground mark.

Leveling and Fine Centering

Coarse leveling

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

Precision Leveling
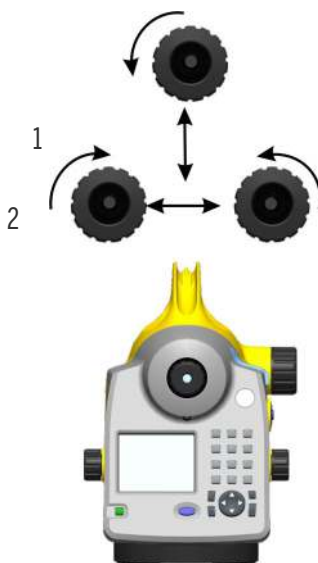
Align the control unit parallel with the imaginary connecting line between two tribrach screws. Level the instrument in the telescope axis (1) and rectangularly to it (2) by means of the tribrach screws. For checking, turn the instrument round the vertical axis in the diametrical position. In any case, the residual inclination should be within the working range of the compensator (± 15´) after having centered the circular bubble.

Fine Centering (Only When Required)

Shift the tribrach on the tripod head plate until the plumb line is hanging centrally above the ground mark; repeat the leveling various times, if necessary.

Telescope Focusing
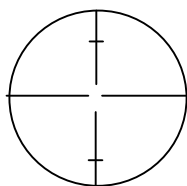
Focusing the Cross Hairs

Sight a bright, evenly colored surface and turn the telescope eyepiece until the line pattern is sharply defined.

⚠️ **WARNING –** Sighting of the sun or strong light sources must by all means be avoided because it would cause irreparable damage to your eyes.

Focusing the Target Point

Turn the telescope focusing control unit 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 cross hairs and the target; check focusing, if necessary.

⚠️ **WARNING –** Residual inclinations of the line of collimation remaining after having centred the circular bubble are eliminated by means of the compensator. But it does not compensate any inclinations caused by insufficient adjustment of the circular bubble or of the line of collimation. For this reason, both adjustments have to be checked.

Switching the Instrument On and Off

To switch the instrument on or off press the ⏻ on/off key.

Operating the OFF function unintentionally does not lead to a loss of measured values. The system will ask in case of certain functions, but on principle, all current values (line leveling) are saved in a non-volatile working memory.

Triggering Measurements

The ⊕ Trigger key on the keyboard or the ◯ Trigger key on the right side of the instrument will start a measurement.

Trigger key on right side
of instrument

Trigger key on instrument
keyboard
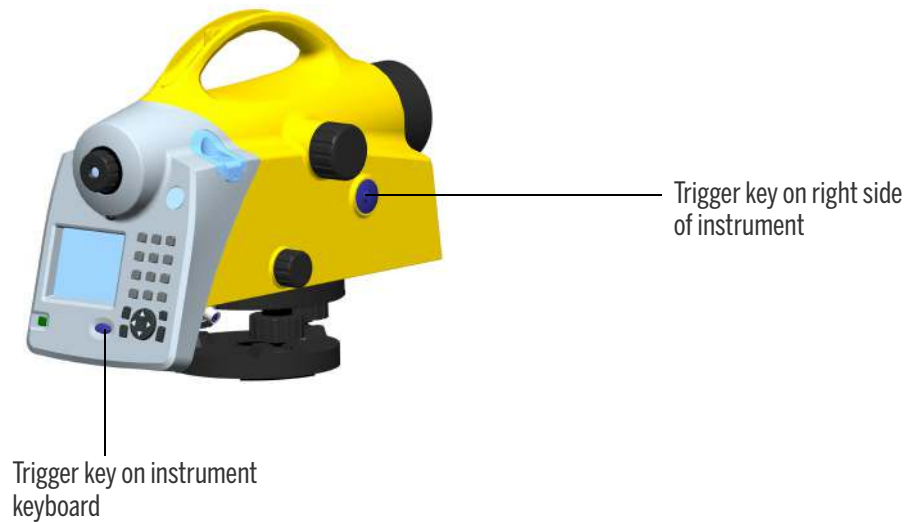
NOTE – For high precision measurements, Trimble recommends to use the trigger key on the right side
of the instrument. This trigger key is designed to minimize the influence of any vibrations caused by
touching the instrument when pressing the trigger key to start a measurement.
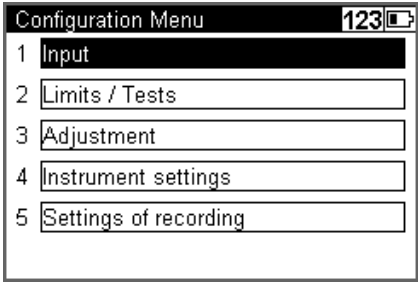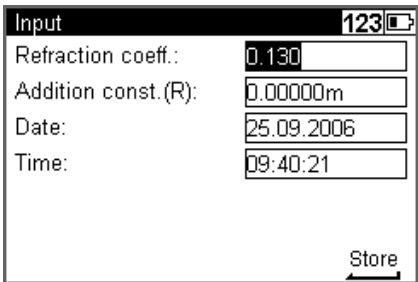
Configuring the DiNi

In the configuration menu it is possible to set all general instrument settings and make the instrument
adjustments.

Actions	Screen	Comments
To configure the DiNi, select Configuration.		
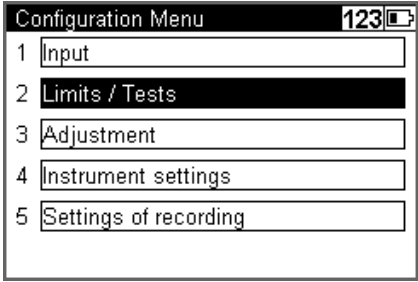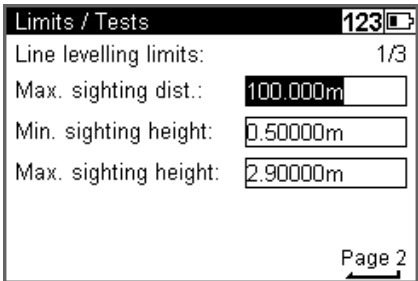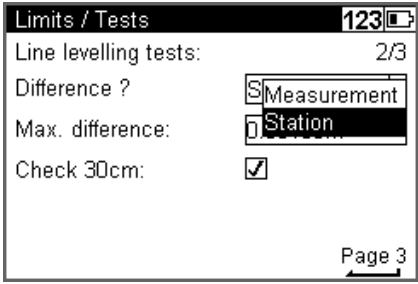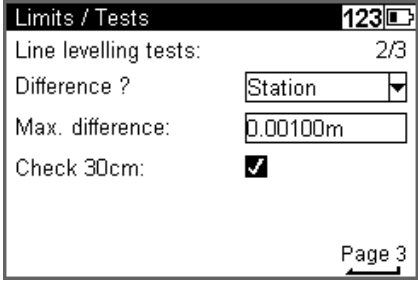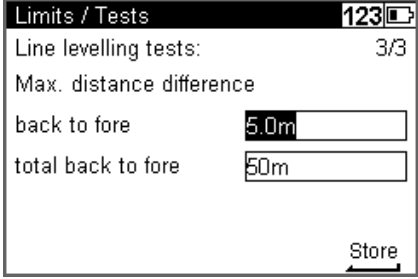
Input

Under Input it is possible to set the Refraction coeff., Addition constant (R), Date and Time.

Actions	Screen	Comments
Select Input from the Configuration menu.	Configuration Menu 123 1 Input 2 Limits / Tests 3 Adjustment 4 Instrument settings 5 Settings of recording	
Key in the Refraction coeff., Addition constant (R), Date and Time of your choice and press ↵ enter key to Store.	Input 123 Refraction coeff.: 0.130 Addition const.(R): 0.00000m Date: 25.09.2006 Time: 09:40:21 Store	Refraction coeff.: -1 - + 1 Addition const.(R): 0 m - 5 m
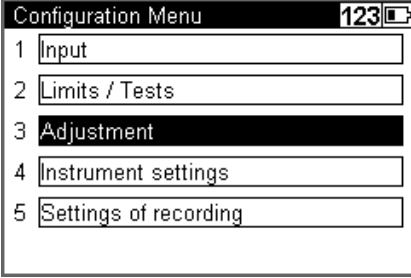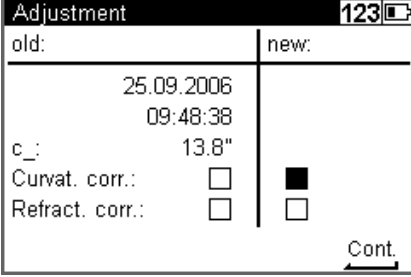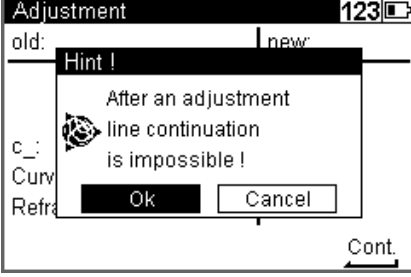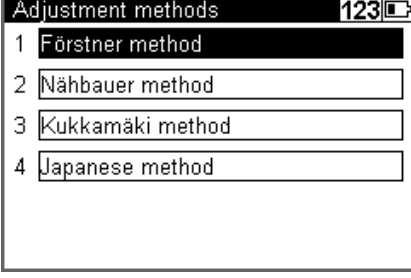
Limits / Tests

NOTE – Only for Line Leveling, except the 30cm control
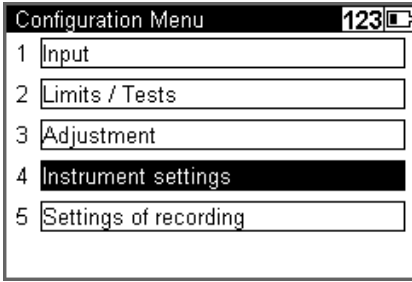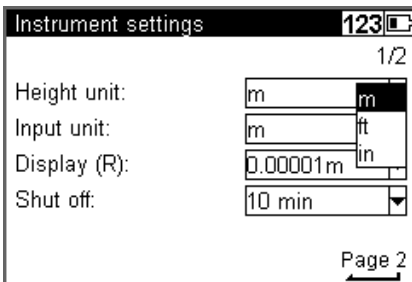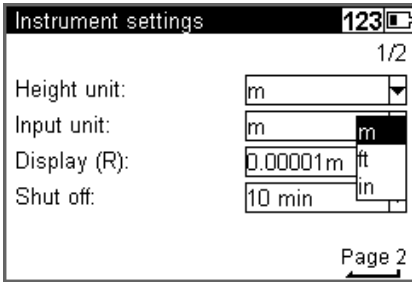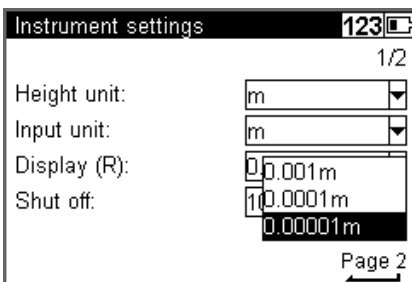
Actions	Screen	Comments
Select **Limits / Tests** from the Configuration menu.	Configuration Menu 123 1 Input 2 Limits / Tests 3 Adjustment 4 Instrument settings 5 Settings of recording	
Key in the **Max. sighting dist., Min. sighting height** and **Max. sighting height** of your choice and press ↵ enter to continue to **Page 2**.	Limits / Tests 123 Line levelling limits: 1/3 Max. sighting dist.: 100.000m Min. sighting height: 0.50000m Max. sighting height: 2.90000m Page 2	Max. sighting dist. range: 10m - 100m Min. sighting dist. range: 0m - 1m Max. sighting height range: 0m - 5m
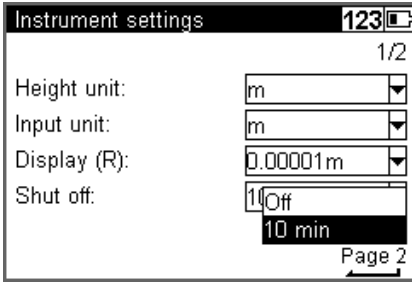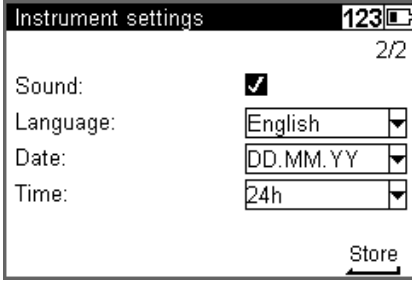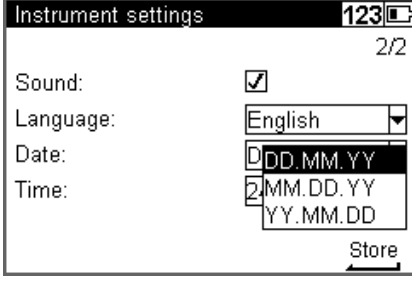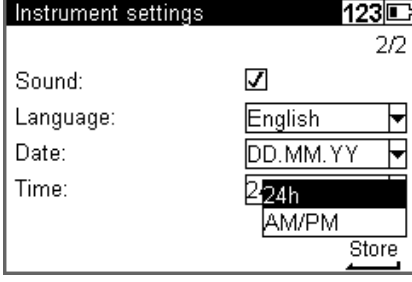
Actions	Screen	Comments
Select **Difference** from the drop-down list.	Limits / Tests 123 Line levelling tests: 2/3 Difference ? S Measurement / Station Max. difference: Check 30cm: ✓ Page 3	Station = B1-F1 to B2-F2 Measurement = B1 to B2 and F1 to F2
Key in the **Max. difference** of your choice. Select or clear the **Check 30 cm** check box and accept with ↵ enter.	Limits / Tests 123 Line levelling tests: 2/3 Difference ? Station ▼ Max. difference: 0.00100m Check 30cm: ✓ Page 3	Max. difference range: 0m - 0.01m
Key in the Max. distance of your choice for a station (back to fore) and for the whole line (total back to fore).	Limits / Tests 123 Line levelling tests: 3/3 Max. distance difference back to fore 5.0m total back to fore 50m Store	Range 0m - 5.0m Range 0m - 100m

Adjustment
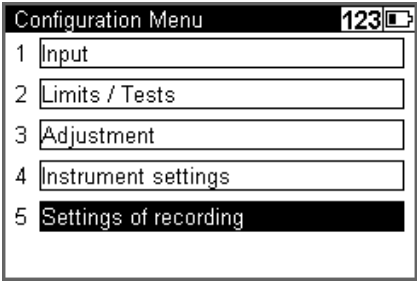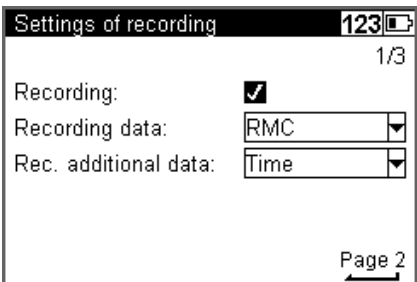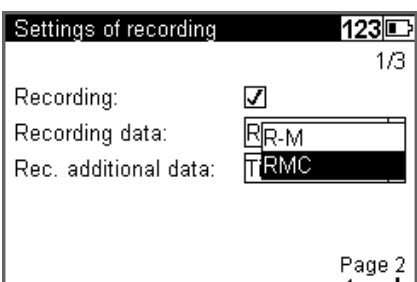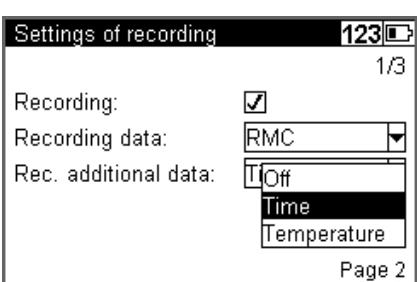
Actions	Screen	Comments
Select **Adjustment** from the Configuration menu.	Configuration Menu 123 1 Input 2 Limits / Tests 3 Adjustment 4 Instrument settings 5 Settings of recording	
The **old** adjustment value and information are displayed. Select **Curvature** and/or **refraction** correction on or off during adjustment. Press ↵ enter to **Continue**.	Adjustment 123 old: | new: 25.09.2006 09:48:38 c_: 13.8" Curvat. corr.: ☐ ■ Refract. corr.: ☐ ☐ Cont.	
Select **Ok** to continue or **Cancel** to abort the adjustment.	Adjustment 123 old: | new: Hint ! After an adjustment line continuation is impossible ! c_: Curv [Ok] [Cancel] Refr Cont.	**NOTE –** After an adjustment is made line continuation is impossible.
Select the adjustment method of your choice.	Adjustment methods 123 1 Förstner method 2 Nähbauer method 3 Kukkamäki method 4 Japanese method	For more information please see Adjusting the Line of Sight, page 121.
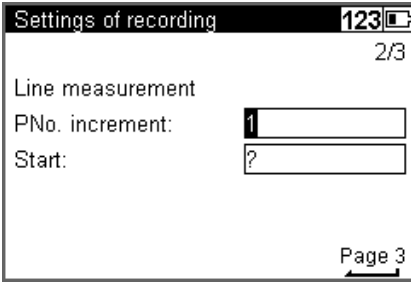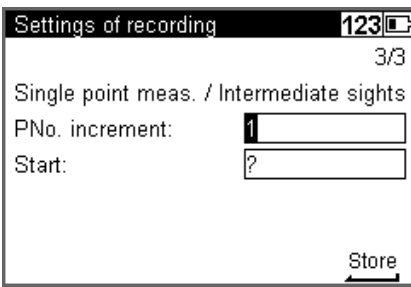
Instrument Settings

Actions	Screen	Comments
Select **Instrument Settings** from the Configuration menu.	Configuration Menu 123 1 Input 2 Limits / Tests 3 Adjustment 4 **Instrument settings** 5 Settings of recording	
Select **Height unit.**	Instrument settings 123 1/2 Height unit: m [m] Input unit: m [ft] Display (R): 0.00001m [in] Shut off: 10 min Page 2	m = meter ft = foot (US Survey foot) in = inches **NOTE –** It is possible to enter a single height in another unit without changing the default setting by manually adding the abbreviation of the unit after the value.
Select **Input unit.**	Instrument settings 123 1/2 Height unit: m Input unit: m [m] Display (R): 0.00001m [ft] Shut off: 10 min [in] Page 2	m = meter ft = foot in = inches
Select the number of decimals that will be displayed, **Display (R).**	Instrument settings 123 1/2 Height unit: m Input unit: m Display (R): 0 [0.001m] Shut off: 10 [0.0001m] [0.00001m] Page 2	**NOTE –** The instrument will still measure and save the values with the full number of decimals.

Actions	Screen	Comments
Select 10 min, to switch Off the instrument after 10 minutes without any key press.	Instrument settings 123 / 1/2 — Height unit: m — Input unit: m — Display (R): 0.00001m — Shut off: 10 / Off / 10 min — Page 2	The automatic switch Off will not work while using: • Continuous measurement. • Instrument connected to USB Memory Stick or PC.
Select or clear the **Sound** check box to turn the sound on or off.	Instrument settings 123 / 2/2 — Sound: ✓ — Language: English — Date: DD.MM.YY — Time: 24h — Store	
Select the display **Language**.	Instrument settings 123 / 2/2 — Sound: ✓ — Language: E English / D German — Date: — Time: 24h — Store	Languages will be changed after confirming the selection
Select the **Date** system.	Instrument settings 123 / 2/2 — Sound: ✓ — Language: English — Date: D DD.MM.YY / 2 MM.DD.YY / YY.MM.DD — Time: — Store	D = Day M = Month Y = Year
Select the **Time** system.	Instrument settings 123 / 2/2 — Sound: ✓ — Language: English — Date: DD.MM.YY — Time: 2 24h / AM/PM — Store	

Settings of Recording
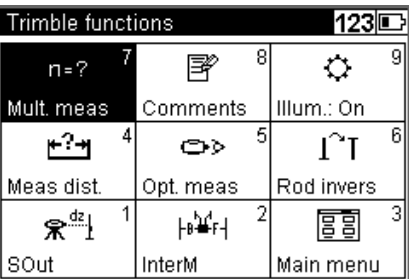
Actions	Screen	Comments
Select **Settings of Recording** from the Configuration menu.	Configuration Menu 123 1 Input 2 Limits / Tests 3 Adjustment 4 Instrument settings 5 Settings of recording	
Select or clear the **Recording** check box to turn on or off the recording.	Settings of recording 123 1/3 Recording: ✓ Recording data: RMC Rec. additional data: Time Page 2	
Select **Recording Data.**	Settings of recording 123 1/3 Recording: ✓ Recording data: R R-M Rec. additional data: T RMC Page 2	R-M = Only the measured values are saved RMC = The measured and calculated values are saved. **NOTE –** RMC must be set to be able to adjust the level line after measurement.
Select **Rec. additional data.** Press ⏎ enter to continue to **Page 2**.	Settings of recording 123 1/3 Recording: ✓ Recording data: RMC Rec. additional data: Ti Off Time Temperature Page 2	**TIP –** Date and Time will be stored in instrument, type 0.3mm/km only.

Actions	Screen	Comments
Number system Line measurement: Enter PNo. Increment and Start number. Press ↵ enter to confirm and continue. See Incremented and Individual Point Number, page 59.	Settings of recording 123▯ 2/3 Line measurement PNo. increment: [1] Start: [?] Page 3	The **start** number will count with the **PNo.increment**.
Number system Single point measurement / Intermediated sights: Enter PNo. Increment and Start number. Press ↵ enter to confirm and continue. See Incremented and Individual Point Number, page 59.	Settings of recording 123▯ 3/3 Single point meas. / Intermediate sights PNo. increment: [1] Start: [?] Store	The **start** number will count with the **PNo.increment**.

Trimble Functions
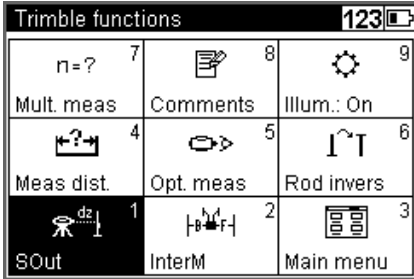
The Trimble Functions menu can be reached at all stages by pressing the ⬛ Trimble icon key The following functions are available.

NOTE – All functions are not available at all times, the available functions in the Functions Menu are related to the selected program.

Actions	Screen	Comments
Press the ⬛ Trimble icon key.	Trimble functions 123▯ n=? 7 — Mult. meas 📝 8 — Comments ✿ 9 — Illum.: On ⊢?⊣ 4 — Meas dist. ⊂▷ 5 — Opt. meas ⌐T 6 — Rod invers ⚞dz 1 — SOut ⊢B⊣ 2 — InterM 🗄 3 — Main menu	
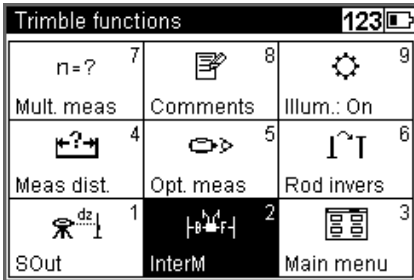
Call up Stake out Point

During Line leveling it is possible to stake out a point.

Actions	Screen	Comments
Select **SOut**.	Trimble functions 123 n=? 7 Mult. meas Comments 8 Illum.: On 9 Meas dist. 4 Opt. meas 5 Rod invers 6 SOut 1 InterM 2 Main menu 3	See Stake Out, page 81 for further information.

Intermediate Sights
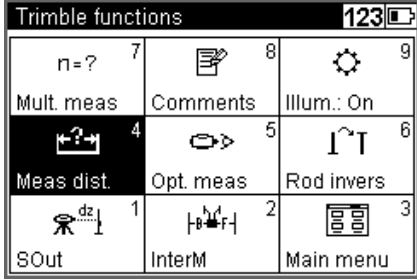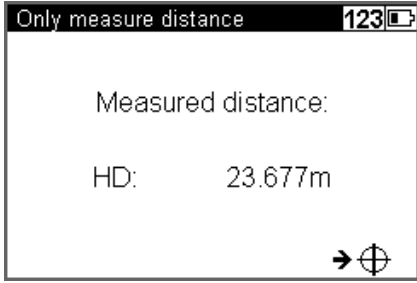
During Line leveling it is possible to measure a single point.

Actions	Screen	Comments
Select **InterM**.	Trimble functions 123 n=? 7 Mult. meas Comments 8 Illum.: On 9 Meas dist. 4 Opt. meas 5 Rod invers 6 SOut 1 InterM 2 Main menu 3	See Single Point Measurement (Without Reference Height), page 61.

Measure Distance

Sometimes it is necessary to know the distance to the staff before doing the final measurement, e.g., in a Line leveling it is necessary to know a distance to the staff to adjust the total distance for backsight and foresight.
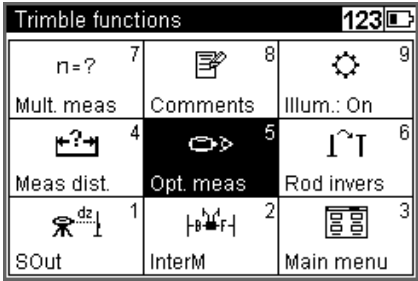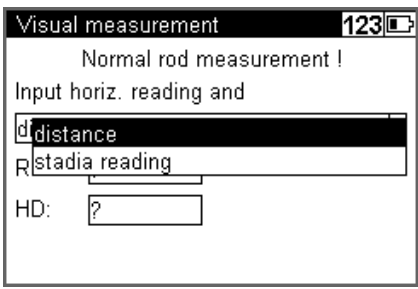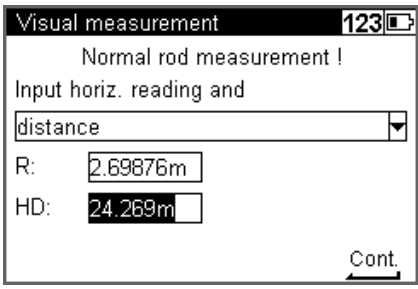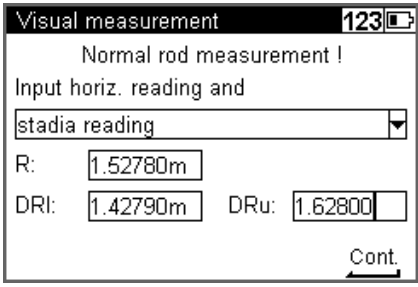
With the **Measure Distance** function it is possible measure only the distance to a point.

Actions	Screen	Comments
Select **Meas dist.**	Trimble functions 123 7 n=? Mult. meas 8 Comments 9 Illum.: On 4 Meas dist. 5 Opt. meas 6 Rod invers 1 SOut 2 InterM 3 Main menu	
Press the ⊕ / ○ trigger key to measure. Press Esc Escape to return to the program.	Only measure distance 123 Measured distance: HD: 23.677m →⊕	

Optical Measurement
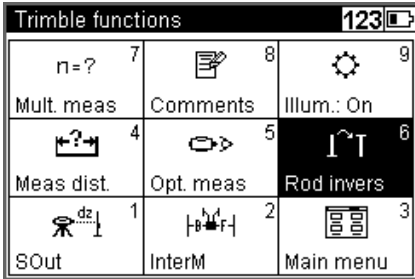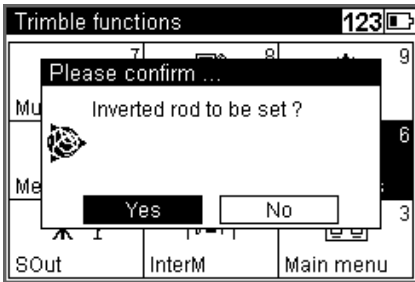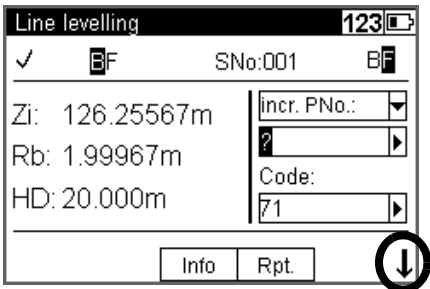
In some cases, when a digital measurement is not possible, the input of an optical measurement from a metrical staff may become necessary. The readings can then manually be keyed in for this point.

NOTE – Take into account that an optical measurement is less precise than a digital measurement and that the adjusting measurement has been carried out electronically (reticle shifted to the nominal value according to electronic adjustment) - (identity of electronic and optical horizon).

Actions	Screen	Comments
Select **Opt. meas.**		
Select if you want to key in the **Distance** value or if you want to use **Stadia readings**.		
If **Distance** is selected, key in the horizontal reading **HD** and the rod reading R. Press ↵ enter key to **Continue**.		
If **Stadia reading** is selected, key in the stadia reading values and the rod reading R. Press ↵ enter key to **Continue**.		Stadia readings = The readings from the upper and lower Reichenbach stadia lines

Inverted Staff Measurements

Inverted measurements are required for work underground and inside buildings, the staff base is turned upwards. The inverted staff measurement will be set for all measurements made until this setting is changed.

Actions	Screen	Comments
Select **staff invers.**		
Select **Yes** to confirm inverted staff setting.		Yes = Inverted staff No = Normal staff
		When inverted staff is set an arrow pointing downwards will be shown in the lower right corner of the display.

Multiple Measurements

Repeated measurements (nM) and Standard deviation (mR) can be defined to be sure that the required accuracy is reached.

nM=1	One measurement only
nM>1; mR=0	Performance of all measurements
nM>1; mR>1	Performance of measurements until number of repetitions or standard deviation has been reached

In repeat measurements, the mean values of staff reading and distance and the standard deviation are displayed after each measurement.

If the standard deviation has been defined, at least three measurements are performed.

When the desired standard deviation has been obtained, the process can be stopped, but take into account that vibrations to the instrument by the key depression have to be avoided - otherwise the last value would falsify the result.

The standard deviation can be saved, but must be defined in Setting of recordings.

NOTE – In this case, line adjustments are not possible.

The number of measurements is always saved.

Actions	Screen	Comments
Select **Mult. meas**.		
Key in the number of measurements **nM**.		nM = The number of measurements that the instrument will make before a result is accepted. Maximum = 10 measurements.
Key in the standard deviation **mR**. Press ⏎ enter key to **Store**.		mR = The maximum standard deviation to be reached before a result is accepted. A minimum of three measurements will be made.
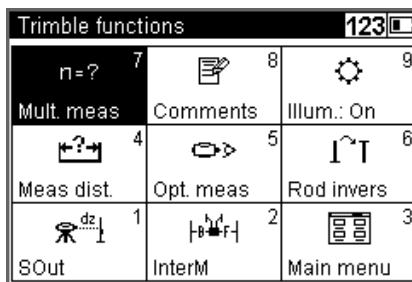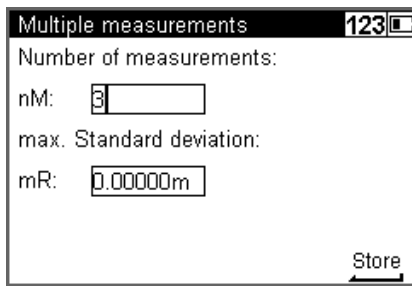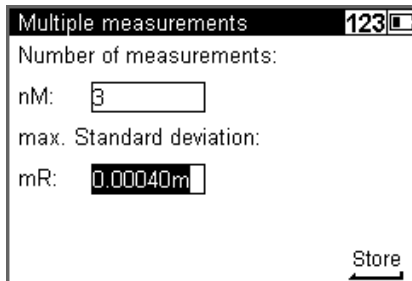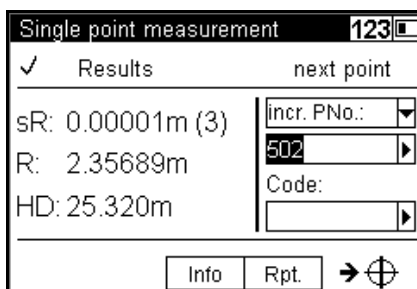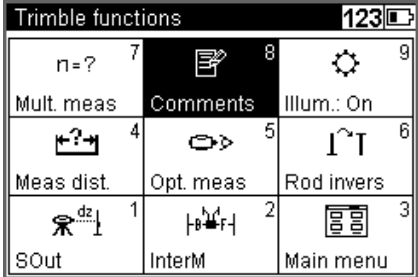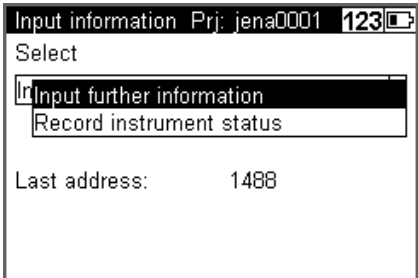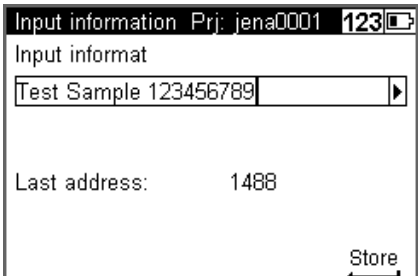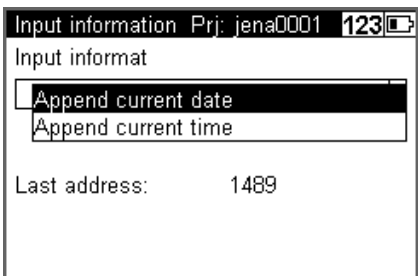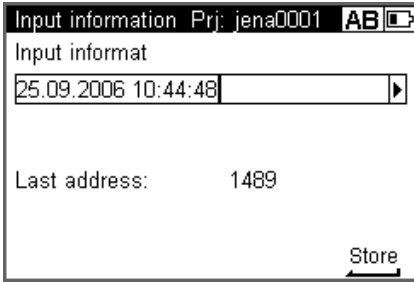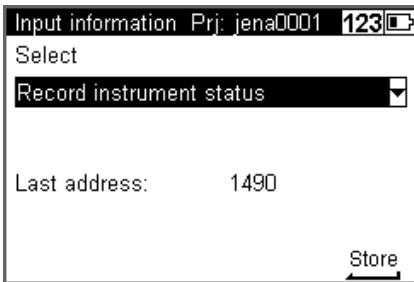
Input Comments
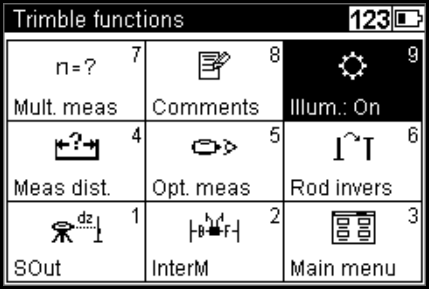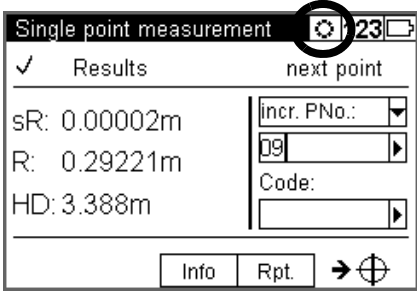
Whenever it is necessary during the measurement alphanumeric text information including date and time can be entered successively.

Actions	Screen	Comments
Select **Comments.**		
Select **Input further information**.		
It is now possible to enter alpha and numeric signs.		
To add current date or time to the information, select **Append current date** and/or **Append current time**.		

Actions	Screen	Comments
Press ⏎ enter key to store the information.	Input information Prj: jena0001 **AB** ▭ Input informat 25.09.2006 10:44:48 ▶ Last address: 1489 Store	
With this command it is possible to document the basic status of the instrument. Data lines with the following contents are then successively recorded: • Measuring unit • Amount of the line of sight correction • Date of last adjustment • Earth curvature / refraction setting - Refraction coefficient • Staff offset/addition constant to quit the instrument information	Input information Prj: jena0001 **123** ▭ Select Record instrument status ▾ Last address: 1490 Store	
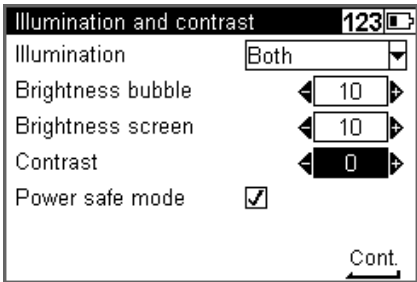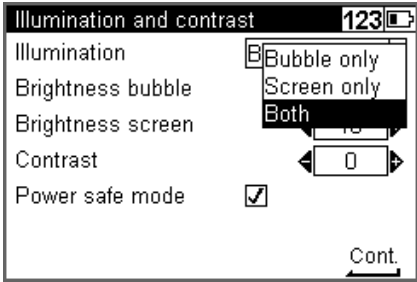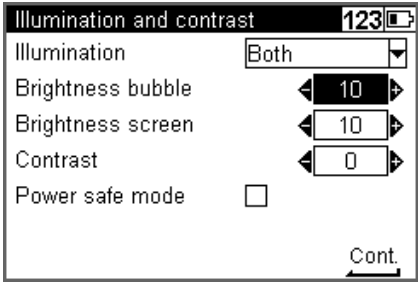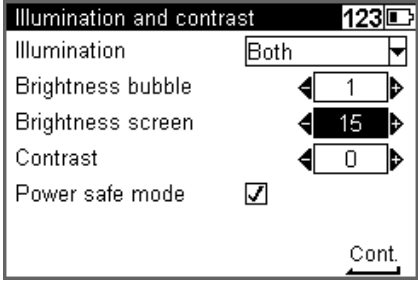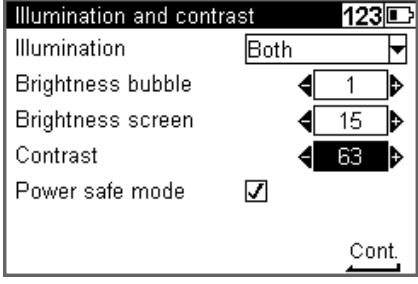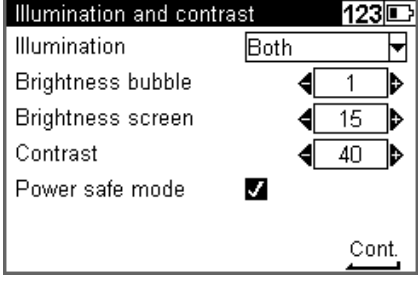
Illumination

With the Illumination function it is possible to switch the display and/or bubble illumination On or Off.

Actions	Screen	Comments
Select **Illum.** Switch between illumination On or Off with the ⏎ enter key or **9** number 9 key.		
A symbol will be shown as long as the illumination is switched on.		Using the Power Safe mode, the instrument will switch off the illumination after 30 second. The symbol sun will be changed to symbol moon. With the next keypress the light will be on and the function behind the keypress will be ignored
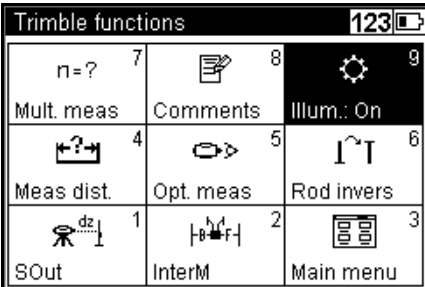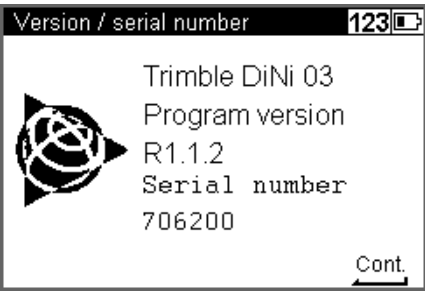
Illumination and Contrast

In this screen it is possible to set the illumination on or off for the display and/or bubble. The brightness of the illumination, The contrast of the display and Power safe mode.

Actions	Screen	Comments
Press **0** key.		
In the Illumination drop down list it is possible to select if you want illumination on Bubble only, Screen only or Both.		

Actions	Screen	Comments
To change the brightness of the bubble illumination highlight Brightness bubble and use the right and left arrow on the ✪ spider key to increase or decrease brightness.	Illumination and contrast 123 Illumination — Both Brightness bubble — ◄ 10 ► Brightness screen — ◄ 10 ► Contrast — ◄ 0 ► Power safe mode — ☐ Cont.	
To change the brightness of the screen illumination highlight Brightness screen and use the right and left arrow on the ✪ spider key to increase or decrease brightness.	Illumination and contrast 123 Illumination — Both Brightness bubble — ◄ 1 ► Brightness screen — ◄ 15 ► Contrast — ◄ 0 ► Power safe mode — ☑ Cont.	
To change the contrast of the screen highlight Contrast and use the right and left arrow on the ✪ spider key to increase or decrease contrast.	Illumination and contrast 123 Illumination — Both Brightness bubble — ◄ 1 ► Brightness screen — ◄ 15 ► Contrast — ◄ 63 ► Power safe mode — ☑ Cont.	
Select or clear the **Power safe mode** check box to turn on or off. press ⏎ enter key to confirm your settings.	Illumination and contrast 123 Illumination — Both Brightness bubble — ◄ 1 ► Brightness screen — ◄ 15 ► Contrast — ◄ 40 ► Power safe mode — ☑ Cont.	

Version and Serial Number
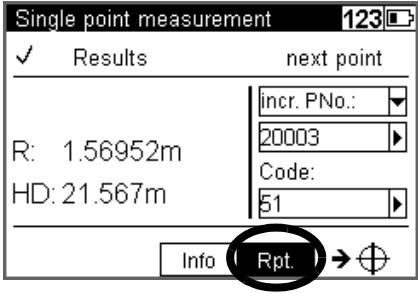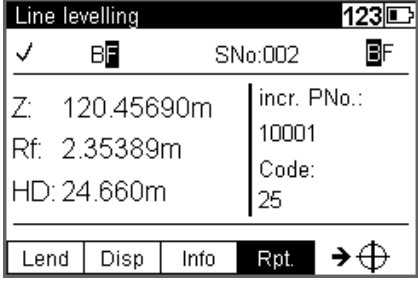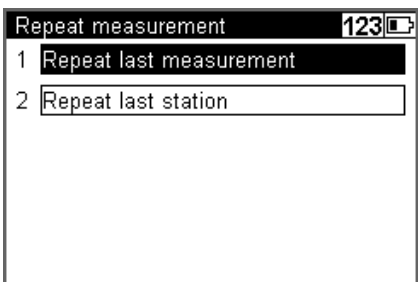
Actions	Screen	Comments
Press ⣿ dot/comma key.		
The **Program version** and **Serial number** are displayed. Press ↵ enter key to **Continue** to the **Main dialog**.		

Measuring Programs
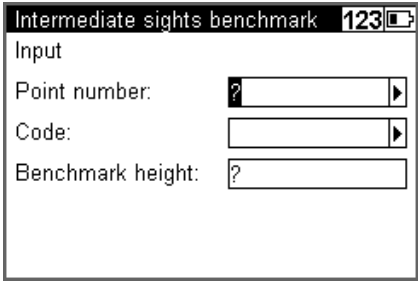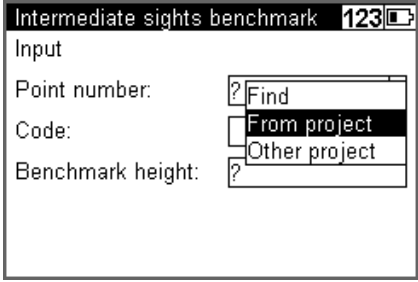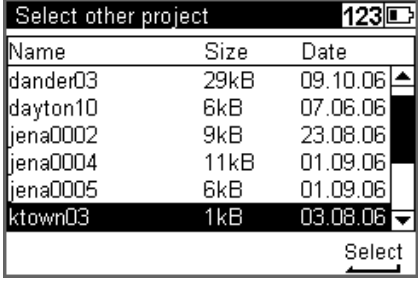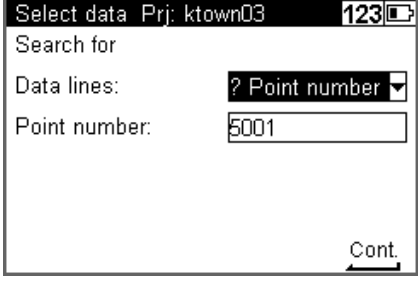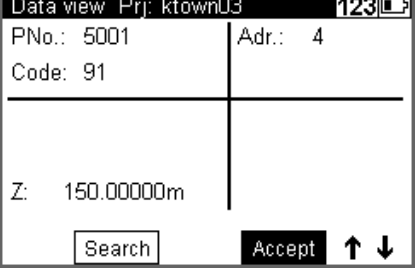
Principles
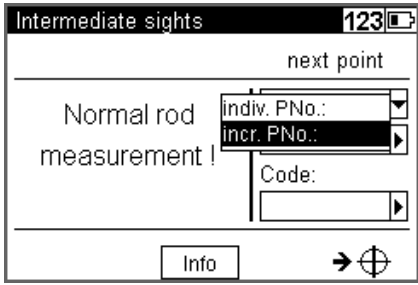
Repetition of Measurements

Actions	Screen	Comments
Select the function field **Rpt**., press ↵ enter to confirm.	Single point measurement 123 ✓ Results next point incr. PNo.: ▼ R: 1.56952m 20003 ▶ Code: HD: 21.567m 51 ▶ Info Rpt. ➔ ⊕	**NOTE –** The last measurement can be repeated in each case.
e.g. line leveling. Select the function field **Rpt.** confirm with Enter.	Line levelling 123 ✓ BF SNo:002 BF Z: 120.45690m incr. PNo.: Rf: 2.35389m 10001 Code: HD: 24.660m 25 Lend Disp Info Rpt. ➔ ⊕	In this case, the original data lines are marked with ##### in the code range of PI and not used for computing.
Select the appropriate function.	Repeat measurement 123 1 Repeat last measurement 2 Repeat last station	As far as it is reasonable from a technical point of view, the last station (line leveling) can be repeated as well.
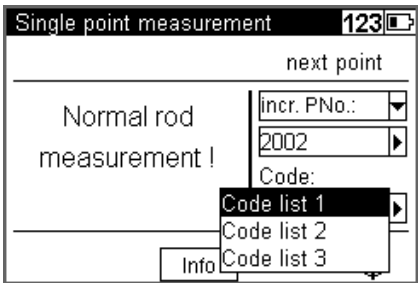
Search for Reference Heights in the Memory

Actions	Screen	Comments
Key in **Point number**.	Intermediate sights benchmark 123 Input Point number: ? Code: Benchmark height: ?	Using the input function all fields can be entered.
Select from where the reference height is selected.	Intermediate sights benchmark 123 Input Point number: ? Find Code: From project Other project Benchmark height: ?	**From project** offers points in the selected "working" project. **Other projects** offers the selection for all other projects.
Select the requested project.	Select other project 123 Name — Size — Date dander03 — 29kB — 09.10.06 dayton10 — 6kB — 07.06.06 jena0002 — 9kB — 23.08.06 jena0004 — 11kB — 01.09.06 jena0005 — 6kB — 01.09.06 ktown03 — 1kB — 03.08.06 Select	All projects available in order of created time.
Key in **Data lines**. With cursor left or right define the search criteria for the point and define the point.	Select data Prj: ktown03 123 Search for Data lines: ? Point number Point number: 5001 Cont.	The selected project is visible in the Status line.
Confirm the selected point or search with spider key up and down arrows to find further lines with identical criteria.	Data view Prj: ktown03 123 PNo.: 5001 — Adr.: 4 Code: 91 Z: 150.00000m Search — Accept ↑ ↓	Select **Search**.
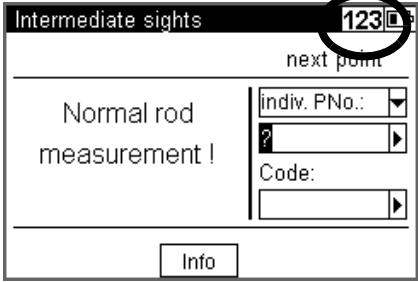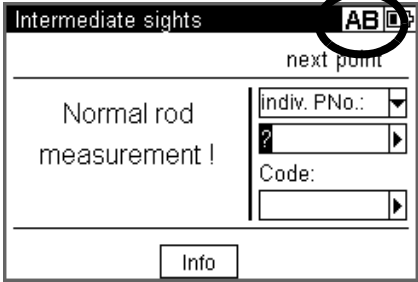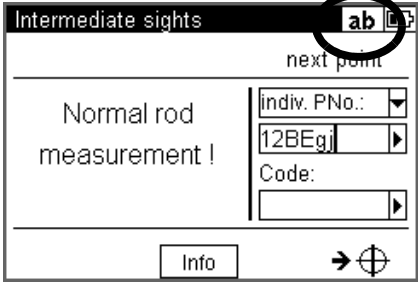
Incremented and Individual Point Number

Actions	Screen	Comments
Key in **line incr. PNo**. Select with cursor left or right and down incr. PNo. or indiv. PNo.	Intermediate sights 123 next point Normal rod measurement ! indiv. PNo.: incr. PNo.: Code: Info	The function allows toggle between the input of incremented and individual point numbers. The incremented number is incremented by your setting, normally 1. The user has two count systems for incremented point numbers. One for Line leveling points and one for Intermediate points. The start number and the increment has to be defined, see Settings of Recording, page 44. After using an individual point number the system will switch to the incremented value used before. In line levelings, the input of the number of the start point and end point is requested. The point number has 8 digits.

Entering Code

Actions	Screen	Comments
There is a possibility to add a singe alpha numeric value or to add codes appropriate to the entered three code lists. It is possible to add code after code.	Single point measurement 123 next point Normal rod measurement ! incr. PNo.: 2002 Code: Code list 1 Code list 2 Code list 3 Info	See Creating or Modifying the Three Code Lists, page 107. The point code has 5 digits.

Alphanumeric Input

Actions	Screen	Comments
Key in a input line		Status line shows the current font.
Select with Alpha key the alpha input.		Multiple press on the keys will produce the appropriate character
		Increment will run with the right placed numeric characters only.

Single Point Measurement (Without Reference Height)

This program can be reached with Main menu, Survey and then Single point measurement.
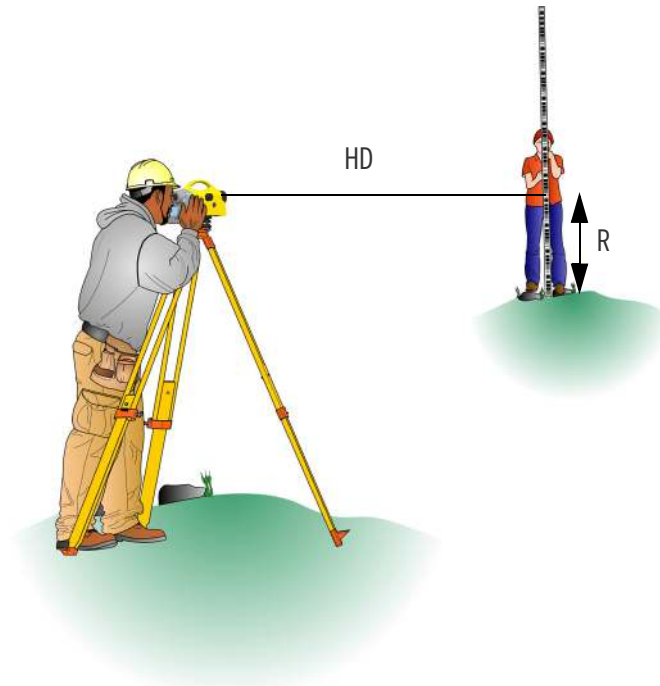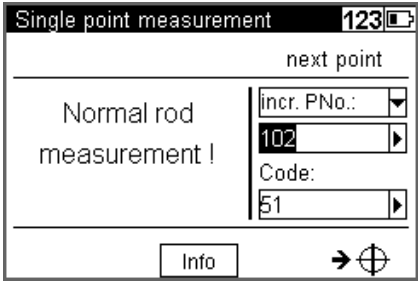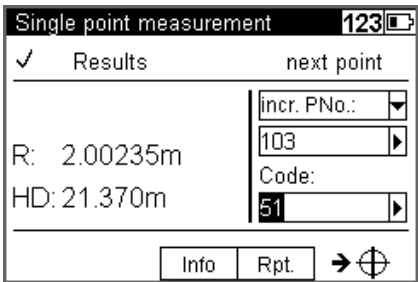
When measuring without reference height, staff readings can be displayed successively and independently of each other. If recording and point number incrementation have been activated, the measurements are stored correspondingly.

Result:

R = Staff reading

HD = Horizontal distance

Actions	Screen	Comments
Select **Survey** and **Single Point measurement.** Enter Point number and Point code. Press the ⊕ / ◎ trigger key to start the measurement.	Single point measurement 123 next point Normal rod measurement ! incr. PNo.: 102 Code: 51 Info →⊕	The point number and code entered will be stored with the next measurement.
Start measurement to next point.	Single point measurement 123 ✓ Results next point R: 2.00235m HD: 21.370m incr. PNo.: 103 Code: 51 Info Rpt. →⊕	**Info** shows battery status and time, date. Rpt. offers repetition

Line Leveling

The individual height differences are measured and added up. When entering the heights of the start and end points, the nominal (actual) difference is computed. Intermediate sights and stake out within the line as well as continuing the line are possible.

Result:

Sh: total height difference

Db,Df: sum of backsight and foresight distances
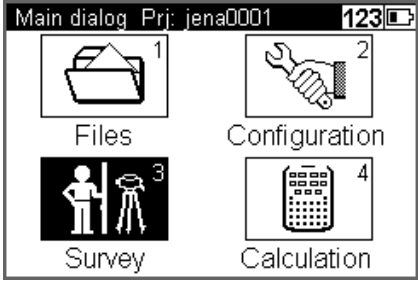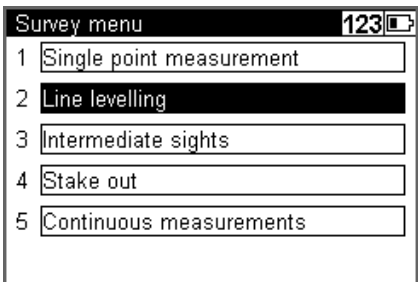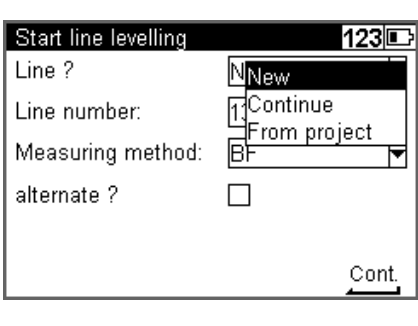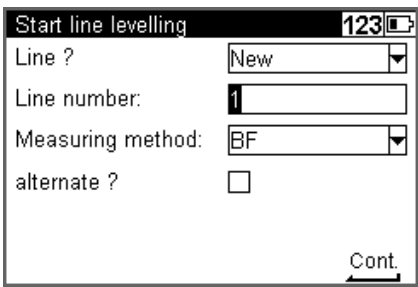
dz: final difference (if reference heights for start and end points have been entered)
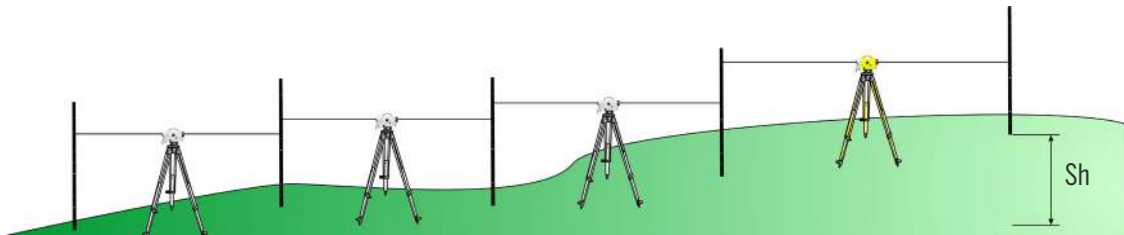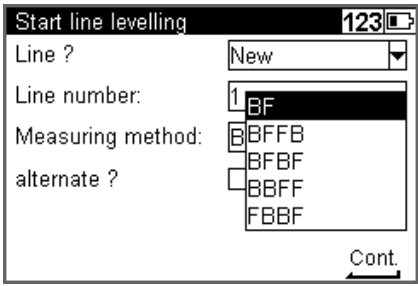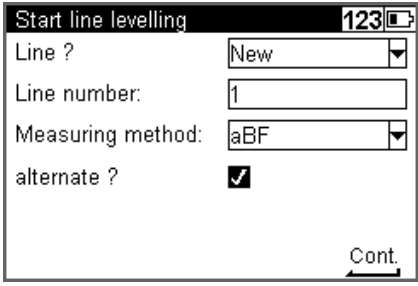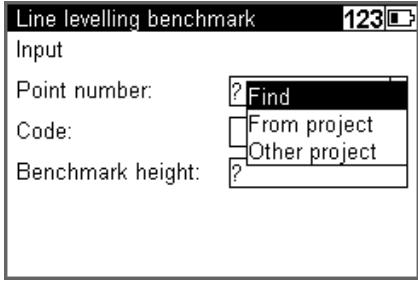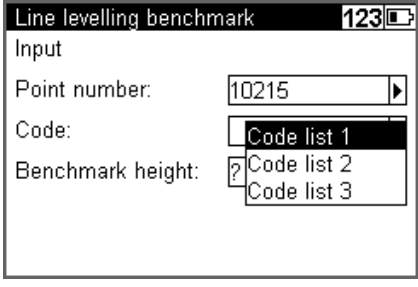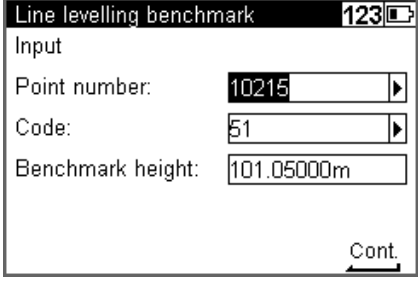
TIP – All important settings (point number incrementation, resolution of measured data) are to be made before starting the line measurement. That refers especially to the saving as relevant aspect for the line adjustment option.
– The DiNi allows a subsequent line adjustment only when measuring in the level mode.
– To ensure a high accuracy, it is possible to monitor adjustable limits and tests e.g. for sighting distance, sighting heights, station differences and the 30cm interval check.
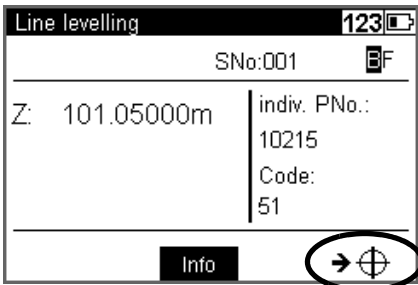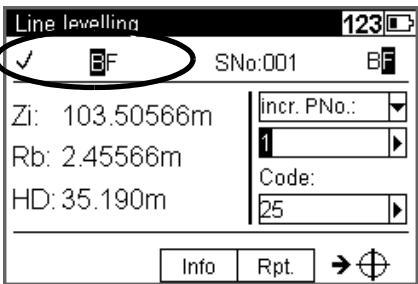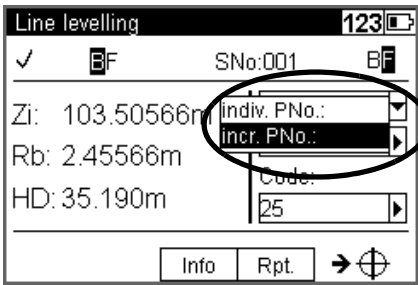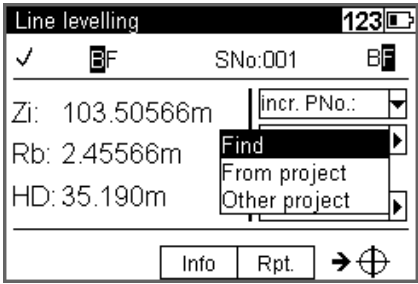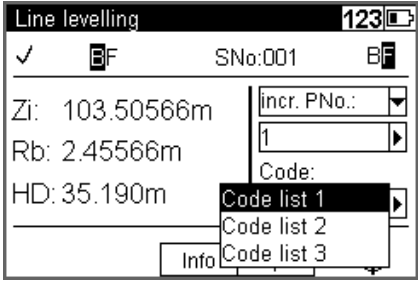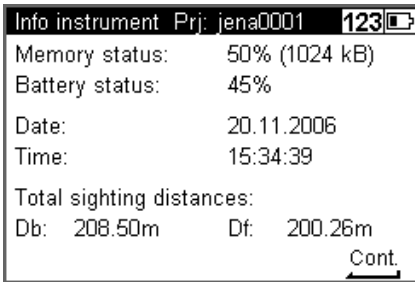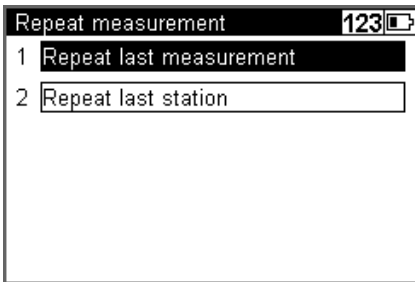
Starting New Line / Continuing Line

Actions	Screen	Comments
Select **Survey**.	*Main dialog Prj: jena0001* — Files (1), Configuration (2), Survey (3), Calculation (4)	
Select **2 Line leveling**.	*Survey menu* — 1 Single point measurement, 2 Line levelling, 3 Intermediate sights, 4 Stake out, 5 Continuous measurements	
Select **Line ?**	*Start line levelling* — Line ?: New / Continue / From project; Line number: 1; Measuring method: BF; alternate ?; Cont.	When selecting **continue** an uncompleted line will be automatically continued. When selecting **From project** the line number is requested. Each completed line within a project can be continued. A final line adjustment through all data of a line is also possible.

TIP – In order to minimize potential problems in long lines, we recommend to insert now and then fixed change points where the line ends and is continued immediately with the "continue line" option. This operation (line end / continuation) does not affect further line computing, but enables you, in case of a problem, to link the possibly lost line to this point and to connect later the partial lines manually (to add them).

Key in the **Line number** of your choice.	*Start line levelling* — Line ?: New; Line number: 1; Measuring method: BF; alternate ?; Cont.	

Actions	Screen	Comments

Select the **Measuring method**.	Start line levelling 123
	Line ? New
	Line number: 1 BF
	Measuring method: B BFFB
	  BFBF
	alternate ? BBFF
	  FBBF
	Cont.
		DiNi 0.7/1.3:
		BF and BFFB
		DiNi 0.3/1.0:
		BF, BFFB, FBBF, BFBF, BBFF

Select or deselect **alternate**. To confirm the inputs on this page and continue to the next page press enter ⏎, **Cont.**	Start line levelling 123 Line ? New Line number: 1 Measuring method: aBF alternate ? ✓ Cont.	
Select **Point number** from the drop-down list or key in the point number of your choice.	Line levelling benchmark 123 Input Point number: ? Find Code: From project Other project Benchmark height: ?	Select **Find** to find the next free point number. Select **From project** to select a point number from the present project. Select **Other project** to select a point number from another project.
Select **Code** from the drop-down list or key in the code of your choice.	Line levelling benchmark 123 Input Point number: 10215 ▶ Code: Code list 1 Code list 2 Benchmark height: ? Code list 3	Select **From list** to select a code from a code list.
Key in the benchmark height.	Line levelling benchmark 123 Input Point number: 10215 ▶ Code: 51 ▶ Benchmark height: 101.05000m Cont.	If Point number is chosen from a list the benchmark height will be given automatically.
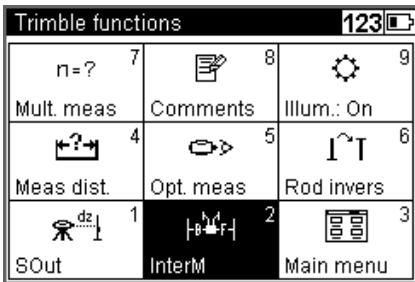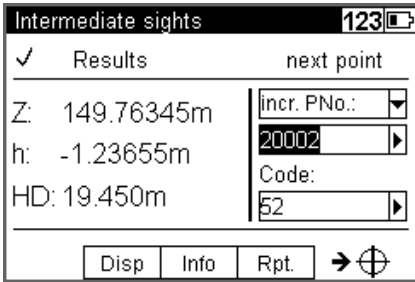
Backsight and Foresight Measurements

Actions	Screen	Comments
Aim and focus the instrument to the staff. Start a backsight measurement with the ⊕ / ◯ trigger key.	Line levelling 123 — SNo:001 BF — Z: 101.05000m — indiv. PNo.: 10215 — Code: 51 — Info →⊕	The symbol on the right bottom part of the display indicates that the instrument is ready to measure.
When the backsight measurement is ready the result will be displayed.	Line levelling 123 — ✓ BF SNo:001 BF — Zi: 103.50566m — Rb: 2.45566m — HD: 35.190m — incr. PNo.: 1 — Code: 25 — Info Rpt. →⊕	When a measurement is ready it will be marked as done and the number of measurement will increment.
Select incremented or individual point number.	Line levelling 123 — ✓ BF SNo:001 BF — Zi: 103.50566m indiv. PNo.: incr. PNo.: — Rb: 2.45566m — HD: 35.190m Code: 25 — Info Rpt. →⊕	
Select **Point number** from the drop-down list or key in the point number of your choice.	Line levelling 123 — ✓ BF SNo:001 BF — Zi: 103.50566m incr. PNo.: — Rb: 2.45566m Find — HD: 35.190m From project Other project — Info Rpt. →⊕	Select **Find** to find the next free point number. Select **From project** to select a point number from the present project. Select **Other project** to select a point number from another project.
Select **Code** from the drop-down list or key in the point number of your choice.	Line levelling 123 — ✓ BF SNo:001 BF — Zi: 103.50566m incr. PNo.: 1 — Rb: 2.45566m Code: — HD: 35.190m Code list 1 Code list 2 — Info Code list 3	Select **From list** to select a code from a code list.

Actions	Screen	Comments
Select **Info.** As total sighting distances are known, the next stations have to be selected in such a way that the total sighting distances Db and Df are almost identical at the end of the line.	Info instrument Prj: jena0001 123 Memory status: 50% (1024 kB) Battery status: 45% Date: 20.11.2006 Time: 15:34:39 Total sighting distances: Db: 208.50m Df: 200.26m Cont.	Additional information Date, Time and Memory status. Db = Distance backsight Df = Distance foresight
Select **Rpt.** if you wish to repeat the last measurement or the last station	Repeat measurement 123 1 Repeat last measurement 2 Repeat last station	Repeated Data lines will be marked with 5 # and ignored for calculations.

Intermediate Sights in Line Leveling
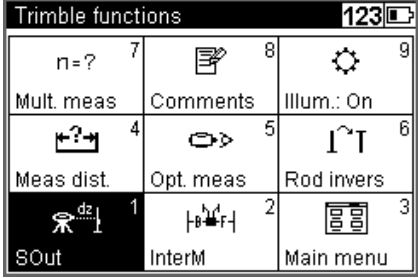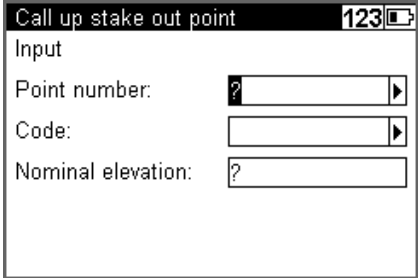
After backsight measurement (Method BF, BBFF) or complete station measurement (all other Methods including alternated versions) are done (reference height available) Intermediate Sights measurements are possible.

Actions	Screen	Comments
Press 📷 Trimble key and select **InteM** (2).	Trimble functions 123 n=? 7 Mult. meas 📝 8 Comments ✪ 9 Illum.: On ↤?↦ 4 Meas dist. ⊂▷ 5 Opt. meas ↥T 6 Rod invers 🔭dz 1 SOut ├B▲F┤ 2 InterM 📇 3 Main menu	

Start the measurement with the ⊕ / ◯ trigger key.
Press Esc Escape to return to Line leveling.
	Intermediate sights 123
	✓ Results next point
	Z: 149.76345m incr. PNo.:
	h: -1.23655m 20002
	HD: 19.450m Code:
	                  52
	        Disp Info Rpt. →⊕
		Start number and Increment works appropriate the settings different to the Line leveling.

NOTE – The program Line Adjustment will only calculate and improve the Intermediate points in respect to the respective instrument station.

Stake Out in Line Leveling
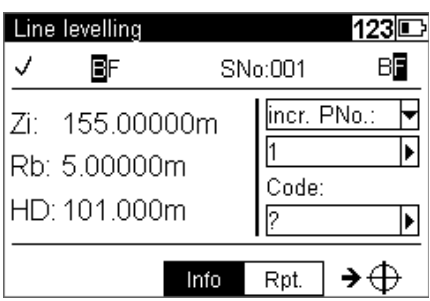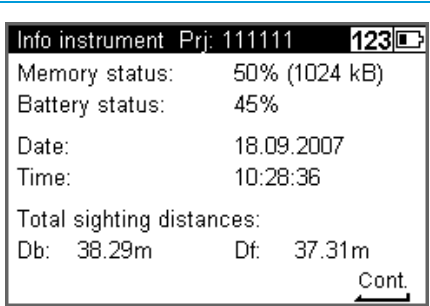
After backsight measurement (Method BF, BBFF) or complete station measurement (all other Methods including alternated versions) are done (reference height available) Stake out measurements are possible.

Actions	Screen	Comments
Press ⊵ Trimble key and Select **SOut**.	Trimble functions 123 □▷ n=? 7 — Mult. meas 📝 8 — Comments ✪ 9 — Illum.: On ↤?↦ 4 — Meas dist. ◌▷ 5 — Opt. meas ↿T 6 — Rod invers 🎯dz 1 — SOut ↦🔼↤ 2 — InterM 🔳🔳 3 — Main menu	
Select Stake Out **Point number** from this or other projects or key in the point number, code and nominal elevation of your choice. Press ⎋ Escape to return to Line leveling	Call up stake out point 123 □▷ Input Point number: [?] ▶ Code: [ ] ▶ Nominal elevation: [?]	

NOTE – The program Line Adjustment will not adjust and change the Stake Out heights.

Selectable and Automatic Controls During Line Leveling

Selectable Controls

Actions	Screen	Comments
It is possible at every station to see the total sighting distances. Select **Info** and press ⏎ enter key.	Line levelling 123 ✓ BF SNo:001 BF Zi: 155.00000m Rb: 5.00000m HD: 101.000m incr. PNo.: 1 Code: ? Info Rpt. ➔⊕	
The total sighting distances are displayed as Db and Df. Press ⏎ enter key to **Continue**.	Info instrument Prj: 111111 123 Memory status: 50% (1024 kB) Battery status: 45% Date: 18.09.2007 Time: 10:28:36 Total sighting distances: Db: 38.29m Df: 37.31m Cont.	**NOTE –** As total sighting distances are known, the next stations have to be selected in such a way that the total sighting distances Db and Df are almost identical at the end of the line.

Automatic Controls
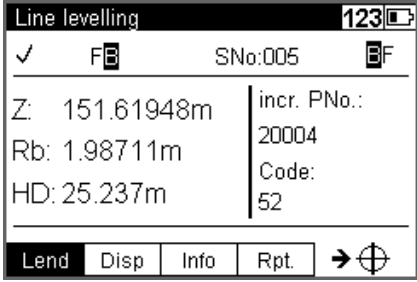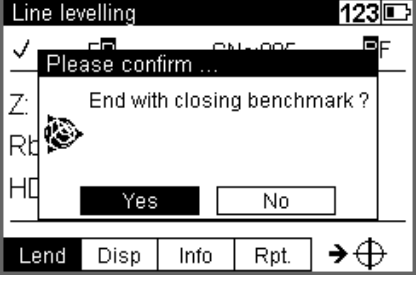
Actions	Screen	Comments
To set up automatic controls, see Limits / Tests, page 39.		The following automatic controls can be set: • Maximum sighting distance • Minimum sighting height • Maximum sighting height • Maximum station difference or double measurement difference(e.g. in BFFB) • Check up for the 30cm interval.

The instrument will warn the user when a measurement is outside the set limits.
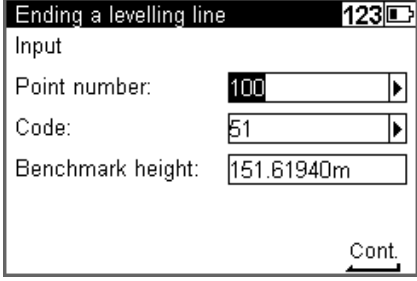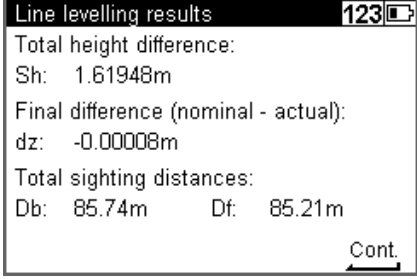 	
Press **No** to accept measurement or **Yes** to repeat measurement.
	Line levelling 123
	✓ Measuring ***
	Warning !
	Zi: Distance too large
	    41.420m > 40.000m
	Rb: Abort measurement ?
	HD: [No] [Yes]
	      Info Rpt. → ⊕	
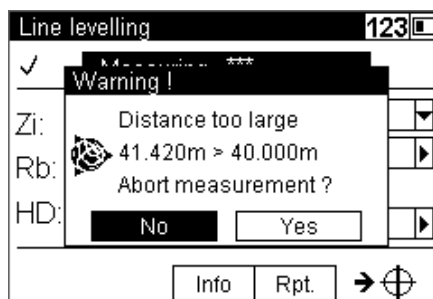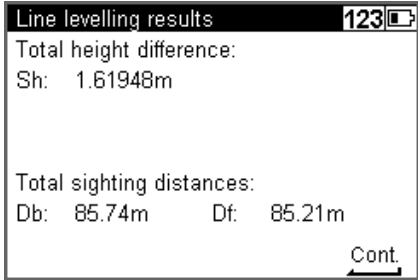
Ending a Leveling Line

Actions	Screen	Comments
Select End.		
Select Yes at a point with a known height. Select No at a point with a unknown height.		

With Known Height

Actions	Screen	Comments
Select: • enter Point number, Code and Benchmark height from your choice or • select from the memory a known point with Point number, Code and Benchmark height. Select Cont. to continue.		If at this station the start point number were entered, the program will take all data (height, code) from this point (Slope line).
Select Cont. to finish the line.		Results: Sh: total height difference: Db,Df:sum of backsight and foresight distances dz:final difference because entering the benchmark heights.

With Unknown Height

Actions	Screen	Comments
Select Cont. to finish the line.	Line levelling results 123 Total height difference: Sh: 1.61948m Total sighting distances: Db: 85.74m Df: 85.21m Cont.	Results: Sh: total height difference Db,Df:sum of backsight and foresight distances

Dual lines leveling (Cholesky Method and Single Station Dual Points Method)

NOTE – These leveling methods are based on 2 leveling lines, which are measured at the same time. The Cholesky method is mostly used in France and the Single Station Dual Points Method (SSDP) is a common method in China.

There are only these screens mentioned, which are different to the normal line leveling screens.
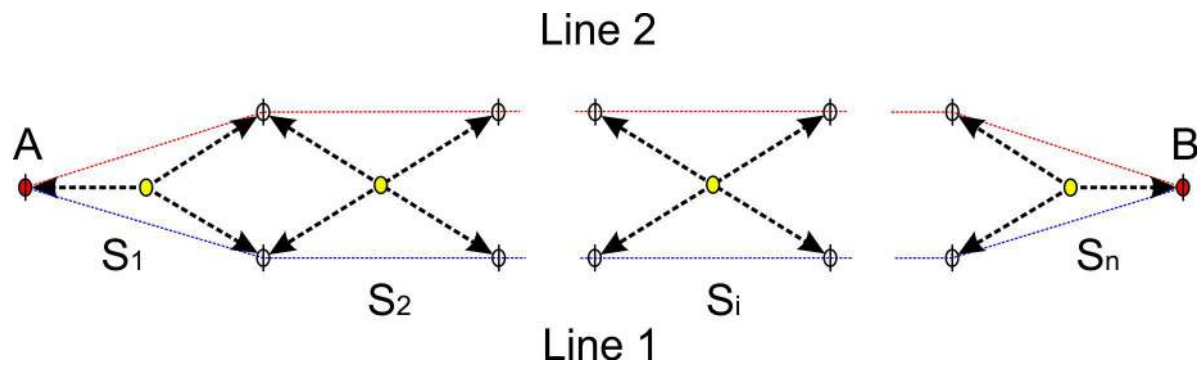
A	Start point
B	End point
S	Station point
⬤	Instrument
⬦	Rod

For the Cholesky Method you have 2 choices for your observation method.

ChSp - Cholesky Simple (readings clockwise to your rods)

ChAd - Cholesky Advanced (readings clockwise and anticlockwise to your rods)

For the Single Station Dual Points Measurement Method (SSDP), which is a common method in China, there are the following observation methods available.
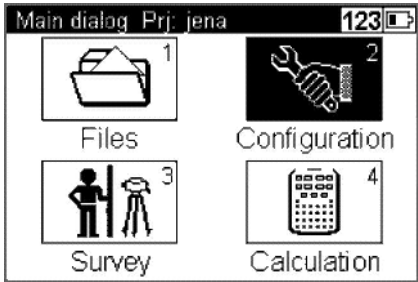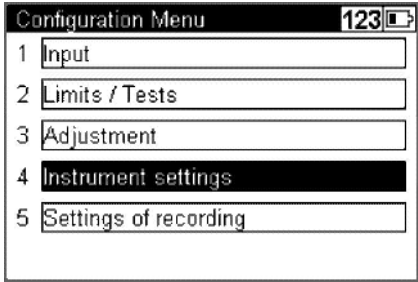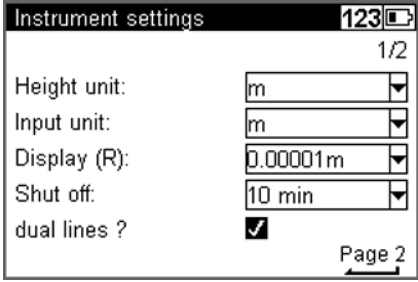
- HQ - BF
- HQQH - BFFB
- HQHQ - BFBF*

- HHQQ - BBFF*
- QHHQ - FBBF*
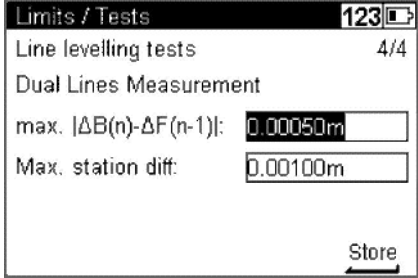
The choices for the SSDP method are similar to the normal observation methods (H means Back and Q means Forward, in relation to the Chinese wording).

*only available with DiNi 0.3
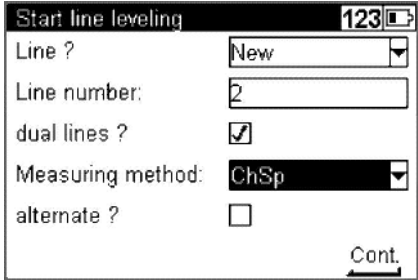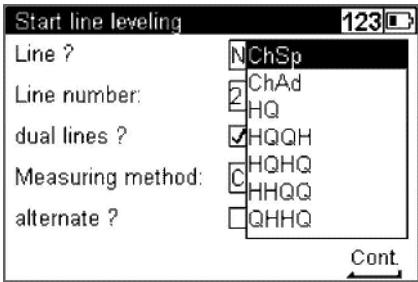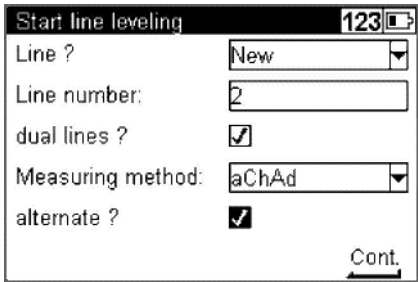
To start a line leveling with dual lines, the dual lines option must be selected in the menu **Configuration - Instrument settings**.

Actions	Screen	Comments
Select **Configuration**.		
Select **Instrument settings**.		
Select/deselect **dual lines?** To confirm the input on this page and continue to the next page press enter ◙ **Cont.**		
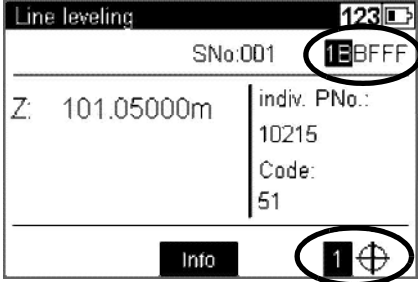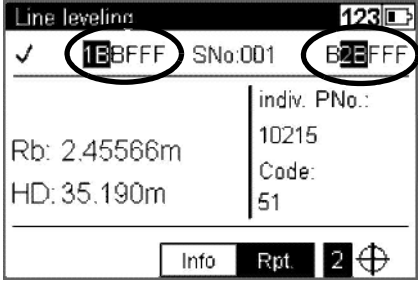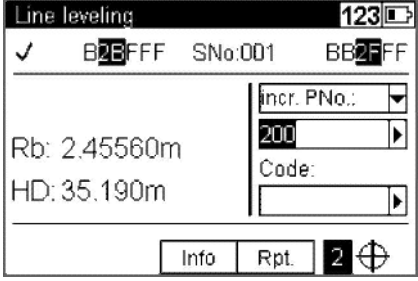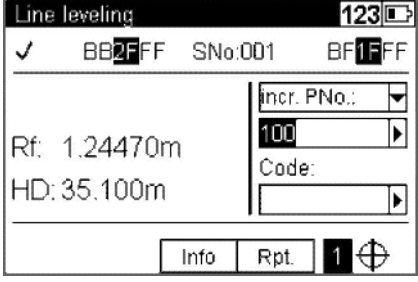
If the dual lines option is selected, there are some more tests for the line leveling under **Configuration - Limits / Tests** available.

Actions	Screen	Comments
Key in the Max. difference between the 2 backsights of your station to the 2 foresights from your last station (DBn-DFn-1). Key in the max. difference for the station heights of the two lines (H1-H2).	Limits / Tests 123 Line levelling tests 4/4 Dual Lines Measurement max. |ΔB(n)-ΔF(n-1)|: 0.00050m Max. station diff: 0.00100m Store	Range: 0m - 0,01m Check for the rod stability of your backsight, in relation to the foresight of your last station. Range: 0m - 0,01m Check for a systematic drift for one of the two lines, without a control point check. **NOTE –** If you enter 0 as limit, the test will be not active.
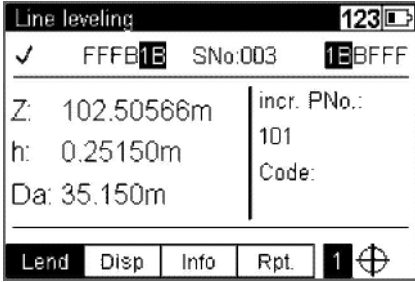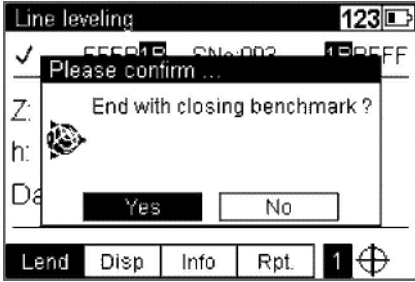
Start New Line / Continuing Line

Actions	Screen	Comments
Select / deselect dual lines?	Start line leveling 123 Line ? New Line number: 2 dual lines ? ☑ Measuring method: ChSp alternate ? ☐ Cont.	
Select **Measuring method:**	Start line leveling 123 Line ? N ChSp Line number: 2 ChAd dual lines ? ☑ HQ Measuring method: C HQQH alternate ? ☐ HQHQ HHQQ QHHQ Cont.	DiNi 0.7: ChSp, ChAd, HQ und HQQH DiNi 0.3: ChSp, ChAd, HQ, HQQH, HQHQ, HHQQ, QHHQ
Select/deselect **alternate?** To confirm the inputs on this page and continue to the next page press enter ⏎ **Cont.**	Start line leveling 123 Line ? New Line number: 2 dual lines ? ☑ Measuring method: aChAd alternate ? ☑ Cont.	Alternate measuring method is available for the following observation methods: aChAd aHQ aHQQH aHQHQ aHHQQ aQHHQ
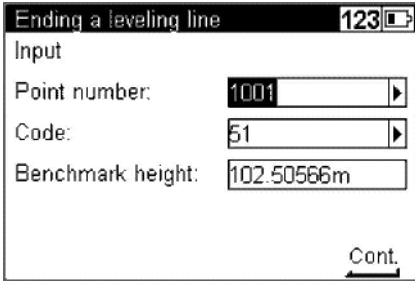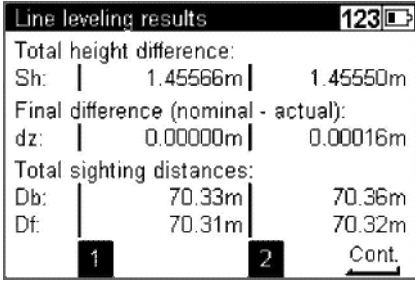
Backsight and Foresight Measurement

Actions	Screen	Comments
Aim and focus the instrument to the staff. Start a backsight measurement with the ⊕ / ◯ trigger key.	Line leveling 123 SNo:001 1BBFFF Z: 101.05000m indiv. PNo.: 10215 Code: 51 Info 1 ⊕	At the status bar in the top right corner there are 5 sights displayed (just to make sure you have more than 4 sights for one station with dual line leveling). The next supposed sight is indicated inverse and shows the line number in front of the B or F.
		The symbol on the right bottom part of the display indicates that the instrument is ready to measure and gives you a hint which line should be measured next.
When the backsight measurement is ready the result will be displayed.	Line leveling 123 ✓ 1BBFFF SNo:001 B2BFFF indiv. PNo.: 10215 Rb: 2.45566m Code: HD: 35.190m 51 Info Rpt. 2 ⊕	The progress of the measurements is displayed in the status bar of the screen. The result for the last measured rod is displayed on the left side and the next supposed rod is displayed on the right side.
	Line leveling 123 ✓ B2BFFF SNo:001 BB2FFF incr. PNo.: 200 Rb: 2.45560m Code: HD: 35.190m Info Rpt. 2 ⊕	It is strongly recommended to choose a different range for the point numbers of the 2 different lines! (e.g. 100 for the first line and 200 for the second line)
	Line leveling 123 ✓ BB2FFF SNo:001 BF1FFF incr. PNo.: 100 Rf: 1.24470m Code: HD: 35.100m Info Rpt. 1 ⊕	It is strongly recommended to choose a different range for the point numbers of the 2 different lines! (e.g. 100 for the first line and 200 for the second line)
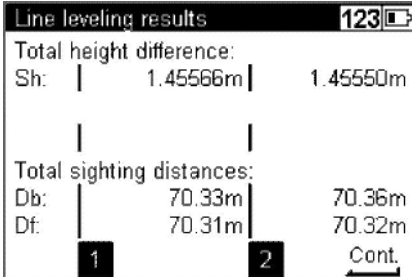
Ending a Leveling Line

Actions	Screen	Comments
Select Lend.		
Select **Yes** at a point with a known height. Select **No** at a point with a unknown height.		

With Known Height

Actions	Screen	Comments
Select: • enter Point number, Code and Benchmark height from your choice or • select from the memory a known point with Point number, Code and Benchmark height. Select **Cont.** to continue.		If at this station the start point number were entered, the program will take all data (height, code) from this point (Slope line).
Select **Cont.** to finish the line.		Results: Sh: total height difference: Db,Df: sum of backsight and foresight distances dz: final difference because entering the benchmark heights.

With Unknown Height

| Actions	Screen	Comments
Select **Cont.** to finish the line.		Results: Sh: total height difference Db,Df:sum of backsight and foresight distances

Intermediate Sights

After a backsight measurement of a point with known height, the heights of discretionary points are determined.
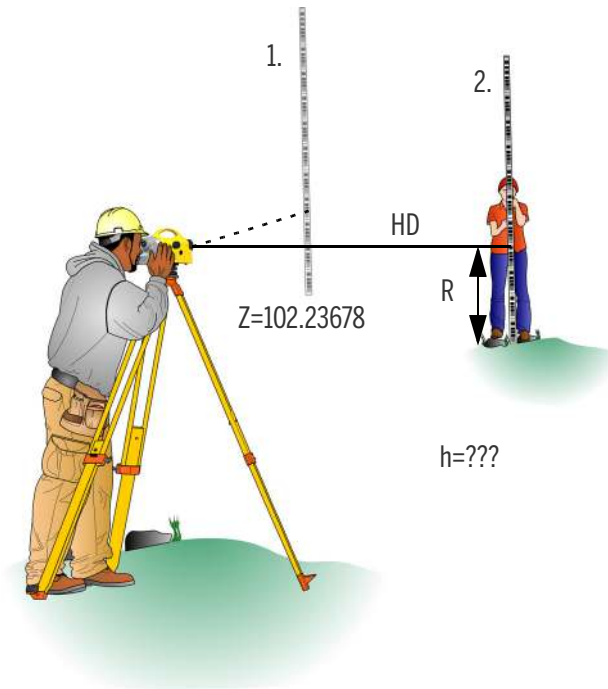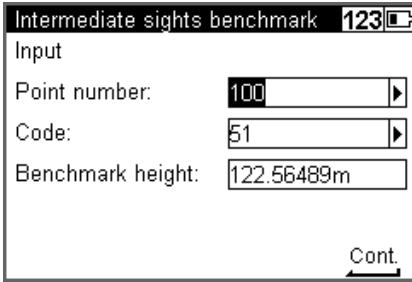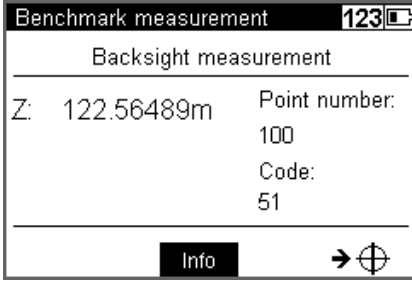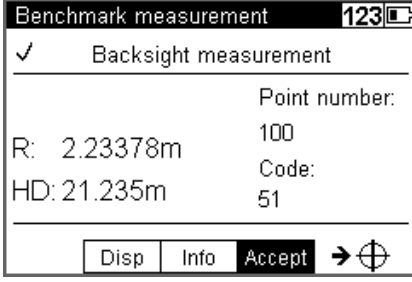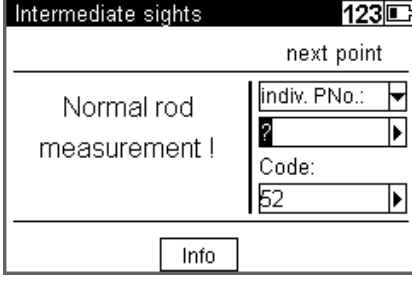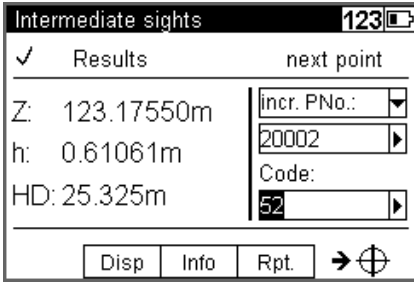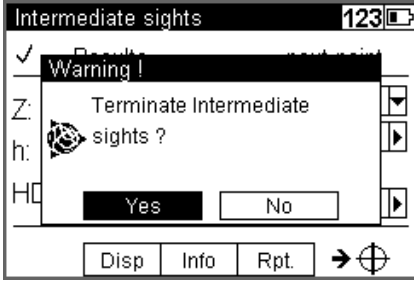
Result:

Z = Height of intermediate point

h = Height difference between new and backsight point (for display only)

Actions	Screen	Comments
Select **Survey** and **Intermediate Sights**.		
Select Point number from the drop-down list or key in the benchmark point with number, code and height of your choice.		Select Find to find the next free point number. Select From project to select a point number from the present project. Select Other project to select a point number from another project.

Actions	Screen	Comments
Press ↵ enter key to continue.	**Intermediate sights benchmark** **123**▢ Input Point number: 100 ▶ Code: 51 ▶ Benchmark height: 122.56489m Cont.	Selected benchmark points can be modified in number and code.
Aim and focus the instrument to the staff at the benchmark. Start the measurement with the ⊕ / ◯ trigger key.	**Benchmark measurement** **123**▢ Backsight measurement Z: 122.56489m Point number: 100 Code: 51 Info → ⊕	
Accept the measurement to benchmark point or repeat the measurement.	**Benchmark measurement** **123**▢ ✓ Backsight measurement Point number: 100 R: 2.23378m Code: HD: 21.235m 51 Disp Info Accept → ⊕	
Key in the point number and code for new point. Start the measurement with the ⊕ / ◯ trigger key.	**Intermediate sights** **123**▢ next point Normal rod measurement ! indiv. PNo.: ▼ ? ▶ Code: 52 ▶ Info	Incr./Indiv: Define the number type. PNo: Select Find to find the next free point number. Code: Select from a list.

Actions	Screen	Comments
Key in the point number and code for next new point. Start the measurement with the ⊕ / ◯ trigger key.	Intermediate sights · 123 · ✓ Results · next point · Z: 123.17550m · h: 0.61061m · HD: 25.325m · incr. PNo.: 20002 · Code: 52 · Disp · Info · Rpt. · →⊕	Result of new point. Select **Disp** to change view. Select **Rpt.** to repeat last measurement.
Press Esc escape key Select Yes and press ⏎ enter key to end the program.	Intermediate sights · 123 · Warning ! · Terminate Intermediate sights ? · Yes · No · Disp · Info · Rpt. · →⊕	
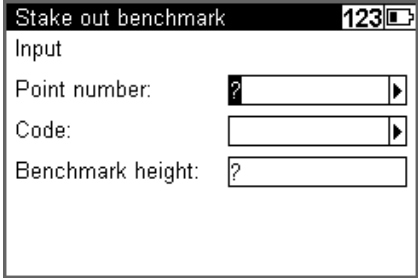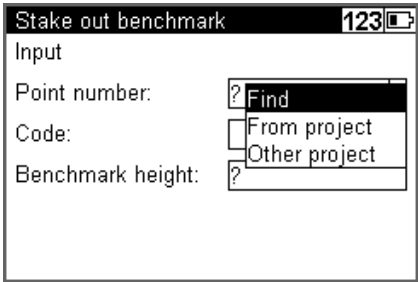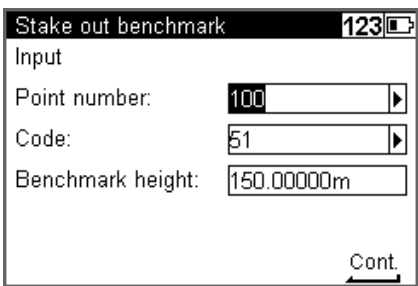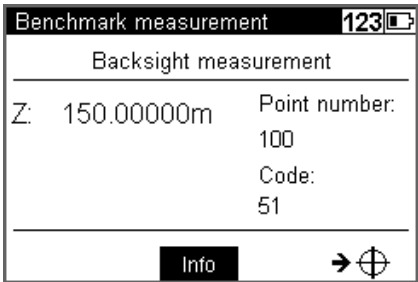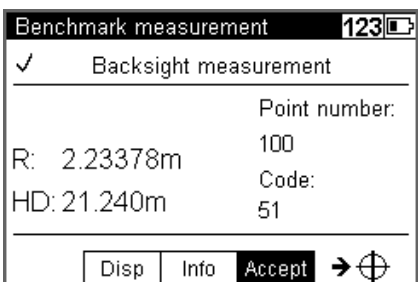
Stake Out

Stake Out
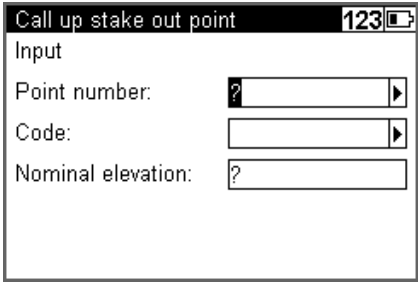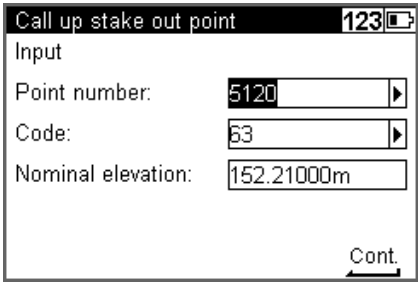
After the measurement of a point with known height, the heights of the points to be staked out (approximate points) and the differences between nominal and actual values are determined. The staff is shifted until the difference measured between the nominal and actual values has been reduced sufficiently.
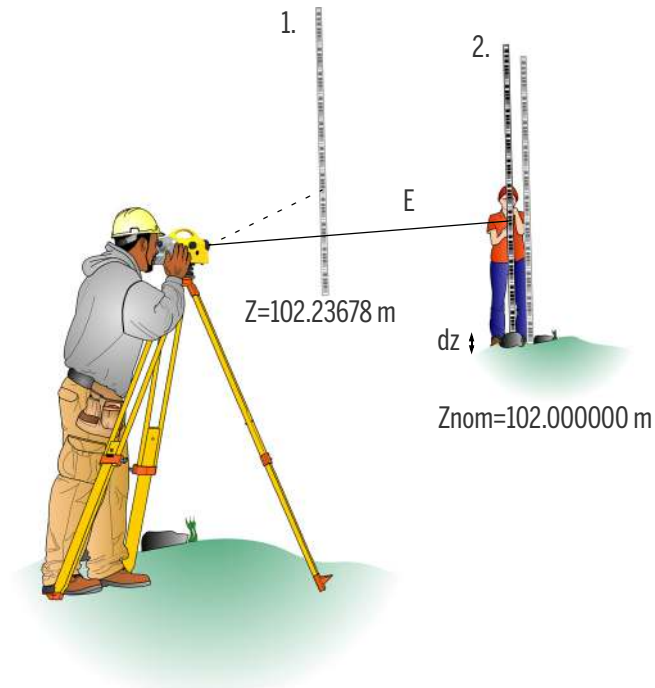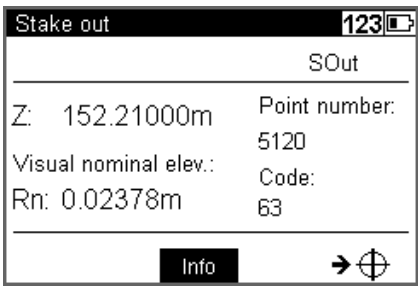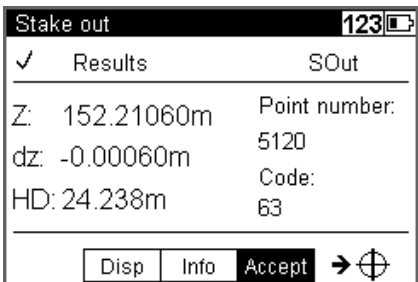
Result:
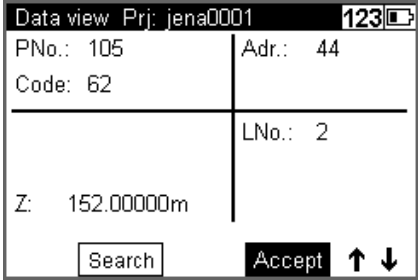
dz:Setting out difference (nominal - actual)

Actions	Screen	Comments
Select **Survey** and **Stake out.**	Stake out benchmark 123 Input Point number: ? Code: Benchmark height: ?	
Select **Point number** from the drop-down list or key in the benchmark point with **Point number**, **Code** and **Benchmark height** of your choice.	Stake out benchmark 123 Input Point number: ? Find Code: From project Other project Benchmark height: ?	Select Find to find the next free point number.Select From project to select a point number from the present project.Select Other project to select a point number from another project.
Press ↵ enter key to Continue.	Stake out benchmark 123 Input Point number: 100 Code: 51 Benchmark height: 150.00000m Cont.	Selected benchmark points can be modified in **Point number** and **Code**.
Aim and focus the instrument to the staff at the benchmark. Start the measurement with the ⊕ / ◯ trigger key.	Benchmark measurement 123 Backsight measurement Z: 150.00000m Point number: 100 Code: 51 Info →⊕	
Accept the measurement to benchmark point or repeat the measurement.	Benchmark measurement 123 ✓ Backsight measurement Point number: 100 R: 2.23378m Code: 51 HD: 21.240m Disp Info Accept →⊕	

Actions	Screen	Comments
Select **Point number** from the drop-down list or key in the **Point number**, **Code** and **Benchmark height** for the Stake out point of your choice.	Call up stake out point 123 Input Point number: ? Code: Nominal elevation: ?	Select Find to find the next free point number. Select From project to select a point number from the present project. Select Other project to select a point number from another project.
Press ⏎ enter key to Continue.	Call up stake out point 123 Input Point number: 5120 Code: 63 Nominal elevation: 152.21000m Cont.	Selected Stake out points can be modified in **Point number** and **Code**.

Measurement to Digital Graduation of Staff

Actions	Screen	Comments
Aim and focus instrument to staff at Stake out point. Start the measurement with the ⊕ / ◯ trigger key.	Stake out 123 SOut Z: 152.21000m Point number: 5120 Visual nominal elev.: Code: Rn: 0.02378m 63 Info →⊕	
Select accept and press ⏎ enter key to confirm and save the result.	Stake out 123 ✓ Results SOut Z: 152.21060m Point number: 5120 dz: -0.00060m Code: HD: 24.238m 63 Disp | Info | Accept →⊕	According to the deviation dz, staff will be shifted and measurement repeated until dz has been reduced sufficiently.
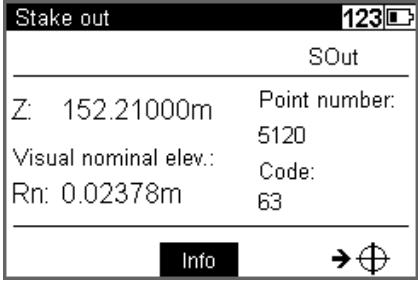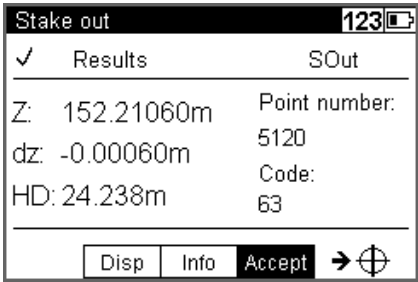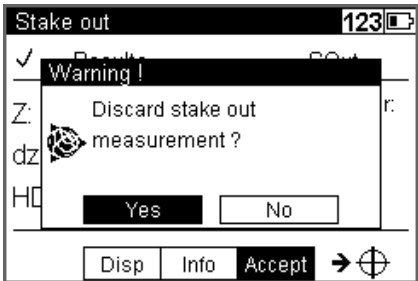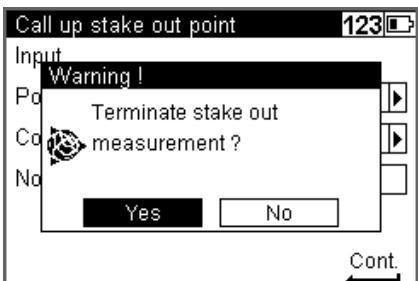
Actions	Screen	Comments
Select **Down arrow** and press ↵ enter key to call up the next Stake out point or press **Esc** escape key to key in the next Stake out point or use Search to define the next search criteria.	Data view Prj: jena0001 **123**▭ PNo.: 105 Adr.: 44 Code: 62 LNo.: 2 Z: 152.00000m [Search] [Accept] ↑ ↓	

TIP – When calling the heights to be staked out from a project in instrument memory, the address of the last height just staked out appears after the result has been confirmed. By pressing ✛ spider key down arrow and **Accept** this value, the next height to be staked out can be called immediately, provided that the heights have been stored in the desired order in the project. By pressing **Esc** escape key it is possible to return to the menu to enter heights and call up search.

TIP – With **Search** a search criteria for the next Stake out point can be defined.

Stake Out With Metrical Graduation of the Staff

Staff carrier turns staff with metrical graduation towards the observer and receives instruction for height adjustment of staff.

Actions	Screen	Comments
To release the control measurement start a measurement with the ⊕ / ◯ trigger key.	Stake out [123▭] / SOut / Z: 152.21000m — Point number: 5120 / Visual nominal elev.: — Code: 63 / Rn: 0.02378m / [Info] →⊕	staff carrier turns staff with metrical graduation towards the observer and receives instruction for height adjustment of staff. After height adjustment of the staff, carrier turns staff with code graduation to observer.
Select accept and press ↵ enter key to confirm and save the result.	Stake out [123▭] / ✓ Results SOut / Z: 152.21060m — Point number: 5120 / dz: -0.00060m — Code: 63 / HD: 24.238m / [Disp] [Info] [Accept] →⊕	Select **Disp** to change view.
Press Esc escape key, select **Yes** and press ↵ enter key to discard the stake out measurement.	Stake out [123▭] / ✓ Results SOut / Warning ! / Z: Discard stake out / dz: measurement ? / HD: / [Yes] [No] / [Disp] [Info] [Accept] →⊕	
Press Esc escape key, select **Yes** and press ↵ enter key to end the stake out measurement.	Call up stake out point [123▭] / Input / Po Warning ! ▶ / Co Terminate stake out ▶ / No measurement ? / [Yes] [No] / Cont.	

Line Adjustment

Line Adjustment (For Instrument Type 0.3mm/km Only)

In line leveling, a line is linked to points with known heights at the beginning and at the end so that the measured height difference can be compared with the nominal height difference.

The "line adjustment" program allows to spread the occurring difference over the individual staff stations proportionally to the sighting distances, obtaining adjusted heights as result. During this operation, the measured values (staff readings, distances) are *not* changed. Intermediate sights are only improved according to the improvement of the respective instrument station.

Line adjustments can only be performed if the leveling line has been completed and saved on the memory along with the intermediate heights.
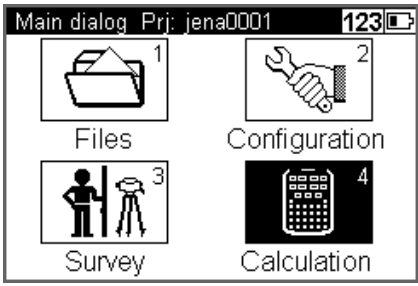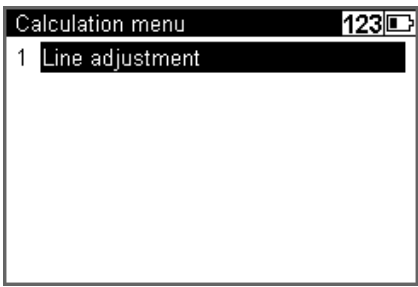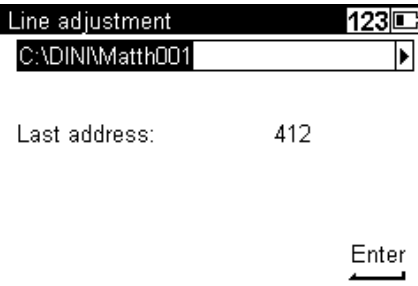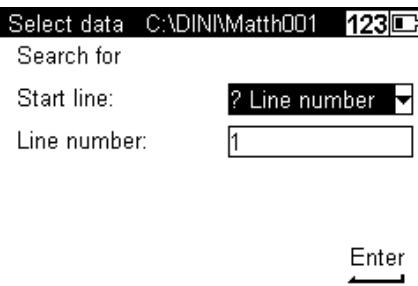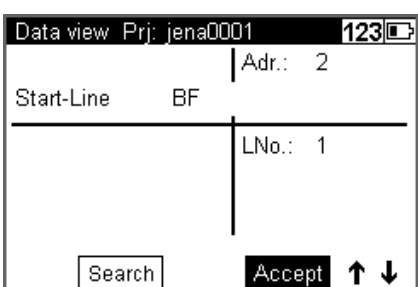
It may happen that the definite heights of backsight points are not yet known when the line is measured. In this case, the nominal height values can be entered during the line adjustment. It is also possible to adjust loops. Loops are leveling lines with identical start and end height.
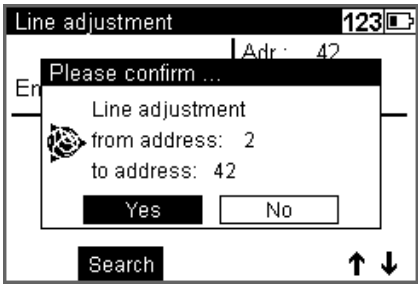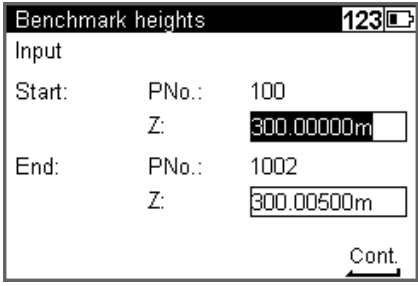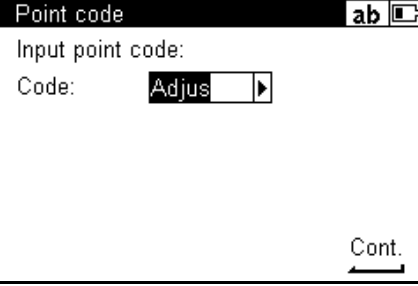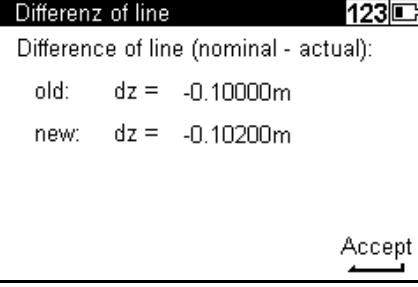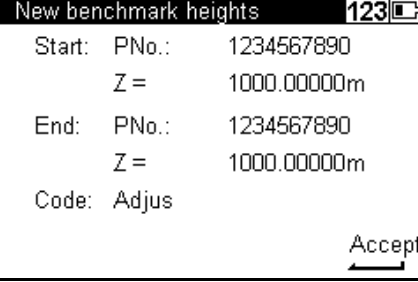
Requirements for a line adjustment:
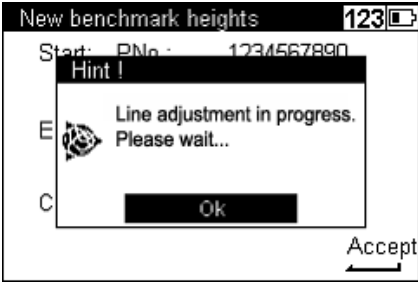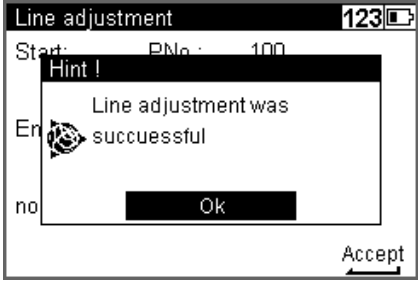
1. The entire leveling line has to be recorded in **one** project.

2. Set in **any case** the recording mode **RMC**.

   Otherwise line adjustment will not be possible, as in the project no space is reserved for the adjusted heights.

3. While measuring a station, the leveling line must not be interrupted in such a way that measurements are skipped.

4. The common adjustment of successive partial lines is only possible if they are linked by the "continue line" option. But they can be positioned in chronological order at different spots in the project. Different partial lines started in each case with "new line" can only be adjusted separately.

5. Line adjustment does not include averaging between fore and back reading.

6. Line adjustment cannot be repeated.

7. Before starting line adjustment, make sure the battery is sufficiently charged.

8. The data stored on memory must not be changed between line measurement and line adjustment. (Before line adjustment is actually started, the leveling line is checked by recalculating the measured line. The program accepts the following differences between original and recalculated values:

   Heights: 0.00002m

   Distances: 0.02m

Actions	Screen	Comments
In the Main dialog select **Calculation**.	Main dialog Prj: jena0001 — Files (1), Configuration (2), Survey (3), Calculation (4)	
Select **Line Adjustment**.	Calculation menu — 1 Line adjustment	
Selected the project to be adjusted and press ↵ enter key to continue.	Line adjustment — C:\DINI\Matth001 — Last address: 412 — Enter	The program offers the "working" project as default. All lines in all projects are adjustable.
Define the search criteria and enter the value of your choice. Press ↵ enter key to continue.	Select data C:\DINI\Matth001 — Search for — Start line: ? Line number — Line number: 1 — Enter	Search is available with Point number, Point code, Line number and Memory address.
Select **Accept** and press ↵ enter key to accept the proposed line. Press ⊕ spider key up or down arrow to search for lines with the same criteria.	Data view Prj: jena0001 — Adr.: 2 — Start-Line BF — LNo.: 1 — Search Accept ↑ ↓	

Actions	Screen	Comments
Select **Ok** and press ↵ enter key to continue.	Line adjustment 123 Adr: 42 Please confirm … En Line adjustment from address: 2 to address: 42 Yes No Search ↑ ↓	The program will find automatically the end of this line and all the continuations. Program will inform about the data lines for the chosen Line.
Key in or confirm the proposed **Benchmark heights** press ↵ enter key to continue.	Benchmark heights 123 Input Start: PNo.: 100 Z: 300.00000m End: PNo.: 1002 Z: 300.00500m Cont.	
Key in or confirm the proposed **Code** for the changed Benchmark heights. Press ↵ enter key to **Continue**.	Point code ab Input point code: Code: Adjus ▶ Cont.	Changed point code helps to identify the changed heights.
Press ↵ enter key to **Accept**.	Differenz of line 123 Difference of line (nominal - actual): old: dz = -0.10000m new: dz = -0.10200m Accept	Helps to identify human errors in this process.
Press ↵ enter key to **Accept**.	New benchmark heights 123 Start: PNo.: 1234567890 Z = 1000.00000m End: PNo.: 1234567890 Z = 1000.00000m Code: Adjus Accept	

Actions	Screen	Comments
Press ⏎ enter key to continue	New benchmark heights `123` Start: PNo: 1234567890 **Hint !** Line adjustment in progress. Please wait... E C Ok Accept	Program checks the data lines for changes. With changed data line (heights) the line adjustment is impossible.
Finalize the adjustment by pressing ⏎ enter key to **End**.	Line adjustment `123` Start: PNo: 100 **Hint !** Line adjustment was En succuessful no Ok Accept	

Measuring Function

► Measuring Principles and Components

► Hints for Precision Measurements

Measuring Principles and Components

DiNi height measurement

The method of single interval measurement is used to determine the height value (comprising a code and interpolation value) on the basis of 15 two-centimeter intervals of the staff and to average the results. For perfect recognition of the intervals and the coded information which they contain, it is essential that the staff image be accurately focused on the instrument cross-hairs. The usual fluctuations in focusing does not influence the measurement result.

DiNi distance measurement

In the DiNi, the distance to the staff is computed together with the determination of the height. This distance is the horizontal distance between the vertical axis of the instrument and the plane of the graduation of the staff (not the center of the staff base).

Staff section in the leveling mode

For the determination of heights and distances on the DiNi, the instrument only requires a 30 cm staff section positioned symmetrically to the sighting axis. To ensure optimum measurement results, this staff section must be free from interruptions. Normally this can be easily checked in the eyepiece. For sighting distances of less than 14 m, however, a staff section larger than the visible one is evaluated. If the staff section is interrupted (e.g. by branches) or if measurements are taken beyond the base or top of the staff, the evaluated staff section is no longer symmetrical to the sighting axis.

Since major asymmetries may impair the measuring accuracy, measurement is blocked if obstacles cover more than a few centimeters beyond the cross-hairs (error message: "out of measuring range").

For distances between the minimum sighting distance and a few meters, the instrument only requires a staff section of 10 cm. Due to this minimum measuring section, a range of approx. 6 cm from the beginning and end of the staff is not read for the shortest sighting distance.

Staff code

The staff code consists of 2 cm intervals filled white (yellow) / black or half white (yellow) / half black. For height and distance measurements, only the edges of the 2 cm intervals are used. Thus, necessary controls of invar staves are made easy. The precision code consisting of 1 mm wide lines is only used for decoding purposes in case of sighting distances of less than 6 meters.

Pendulum stop

If the pendulum is at its stop, measurement cannot be started. If the pendulum reaches its stop in the measuring process, the measurement is stopped and error message "compensator out of range" is displayed.

Light conditions

sun

Direct solar irradiation in the telescope must be avoided as this may be harmful to the eye and may cause failure of the measurement. If sun reflections are visible in the telescope (sun low on horizon), shade the telescope with your hand until the reflections disappear. In the case of sun reflections on the staff, turn the staff sideways until the reflections are no longer visible to the observer.

strong light

If measurements are performed against strong light, the measuring time may be increased and the accuracy of the measured data may be reduced.

variation in brightness / overexposure

If variations in brightness during the measuring process lead to overexposure of individual measurements (the sun comes out), the measurement is automatically restarted.

If this situation occurs repeatedly, measurement is stopped with error message "Change in brightness too great". It can then be started again.

twilight / insufficient illumination

If the measuring signal in twilight is too weak for reliable measurement, if the staff section available is not sufficient for measurement or if no staff has been sighted, error message "Staff cannot be read" is displayed.

If the brightness is just about sufficient for measurement, the measuring time may be markedly increased. Should the resulting measuring times exceed 5 seconds, reduced accuracy of the measured data must be expected. In such cases, it is advisable to illuminate the staff.

staff illumination

If the staff has to be illuminated, we recommend to use a fluorescent lamp installed laterally in front of the staff beside the graduation. If the lamp is placed approximately at the height of the line of sight, a 10 W lamp (12 V, 220 V) will do. Directional light, e.g. by using an accumulator lamp, is not recommendable due to inhomogeneous illumination, formation of shadows or reflexes which could lead to errors of measurement.

Measuring beam interruption

In sunlight, a short interruption of the measuring beam is of virtually no importance, due to the short exposure times. If the measuring beam is interrupted by traffic and measurements are lost, the measuring time will be extended accordingly.

Vibrations

The displayed reading is a mean value obtained from several measurements. In the case of major differences between the individual measured values, the measurement is rejected and error message "Standard deviation out of range" is displayed. This only eliminates gross errors; an assessment of the

quality of the measured data is not made. In the case of vibrations or air turbulences, it has been found that the measurements displaying the smallest deviations need not necessarily provide the best measured data.

Multiple Measurement

We recommend to use the multiple measurement option in such cases. Avoid triggering a measurement in moments of strong vibration, e.g. when a heavy vehicle is passing. This can be visually checked.

5 m telescopic staff

DiNi instruments provide measurements with DiNi code staves of up to 5 m length. For this, the 5 m telescopic staff Td 24 and TD 25 are available. For the measurements all staff sections below the measured height value must be slid out and locked. If you take measurements with the staff being pushed in either partially or completely, for example as you do not need the full length of the staff, make sure not to sight at the pushed in section of the staff. Otherwise, erroneous measurements or nonsensical results cannot be precluded.

Hints for Precision Measurements

A digital level is an optical level with automatic data logging, data storage and data processing. For this reason, the marginal conditions to be observed when using a digital level are the same as with an optical level.

Hints for Precision Leveling

- Do not expose tripod and instrument to one-sided irradiation by sun light. Avoid sighting across fields with intense irradiation by sun light, e.g. at noon.

- Take into account that also digital levels require sufficient time to adjust to the ambient temperature. The measurement applies: Temperature difference in Kelvin x 2 = duration in minutes required for the instrument to adjust to the new temperature. For measurements of normal accuracy, e.g. using foldable staves, at least half the above duration should be considered for temperature adjustment.

- The DiNi instruments are equipped with a temperature sensor. The temperature gradient of the line of sight of the instrument is determined and stored by the factory. The instrument carries out the necessary improvement of the line of sight immediately during the measurement. This correction is only possible in instruments completely adjusted to the ambient temperature and, consequently, does not make the temperature adjustment unnecessary.

- Equal sighting distances shall by all means be kept to eliminate possible variations of the line of sight by temperature, mechanical stress and instrumental effects (focusing lens).

- Do not choose sighting distances that are considerably longer than 30 m.

- To obtain the specified accuracy of the instrument and eliminate the residual compensator error, make sure the circular level has been adjusted well and apply one of the following methods for measuring:

  a. Measurement according to an alternate method, known as "red trousers" method (BFFB,FBBF)

  b. Measurement according to a non-alternate method (BFFB,BFFB) after measuring B,F, readjust the circular level with orientation to foresight.

- Before triggering a measurement, make sure that vibrations and shocks transmitted to the instrument e.g. from passing heavy vehicles or strong gusts of wind have settled (check by viewing through telescope or decide by experience).

- Use selectable and automatic controls during Line leveling. These warnings offer the possibility to repeat or use the readings. Under all these circumstances the reading may still be possible, but these tests offer the user the possibility to ensure the highest accuracy in the appropriate application.

  – A warning can be set to avoid measurement to the lowest part of the staff (ground refraction).

  – A warning can be set to avoid measurement to the upper part of the staff. This feature is only recommended for highest precision in case of permanent measurement at the upper end of the staff (e.g. in a tunnel).

  – A check can be made to ensure that a full 30cm of the staff is visible, equally spaced around the horizontal cross hair. This feature is only recommended for highest precision in case the 30cm section may be partially obscured by obstruction.

Underground, Staff Sinking Into the Ground, Vertical Positioning, Turning

Similar to optical levels.

Invar Staves

On request there is a staff certificate, which describes the staves. The staves have to be used, transported and stored properly and to be calibrated in corresponding time intervals.

Hints for Precision Measurement - Area Leveling

For precise area leveling, the adjustment of the line of sight is of great importance due to the different sighting distances. In line leveling, the possible inclination of the horizon is eliminated by equal sighting distances. For precise area leveling, the adjustment of the instrument prior to the measurement is absolutely advisable. In measurements carried out throughout the day, with great temperature differences between the beginning and end of measurements and additionally strong irradiation by sunlight, the internal temperature correction system of the instrument eliminates the main part of the variations of the line of sight. But to make sure, comparison measurements to fixed points should be made and readjustments should be carried out in between, if necessary.

Data Management
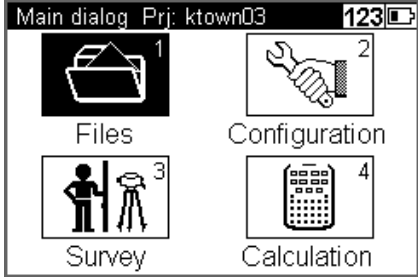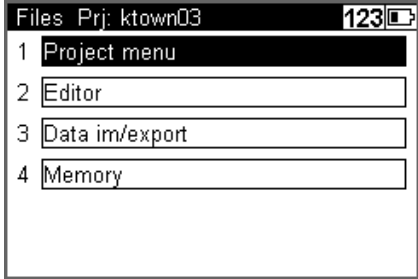
Data Management

DiNi offers a project (files) oriented data storage. Data are stored physically in the internal memory in an internal data format. The data can be transferred directly via Cable to PC or to a USB Memory Stick. During transfer of the data the format will be changed to the common ASCII format M5, thus backwards compatible to the former DiNi Series is guaranteed. The exported project will have the unit of measurement in relation to the current setting (Configuration, Instrument settings Height unit). This allows exporting the file in different units of measurement appropriate to the users chooses.

USB Cable/Adapter
73841019

Via USB Memory Stick

Via cable
73840019
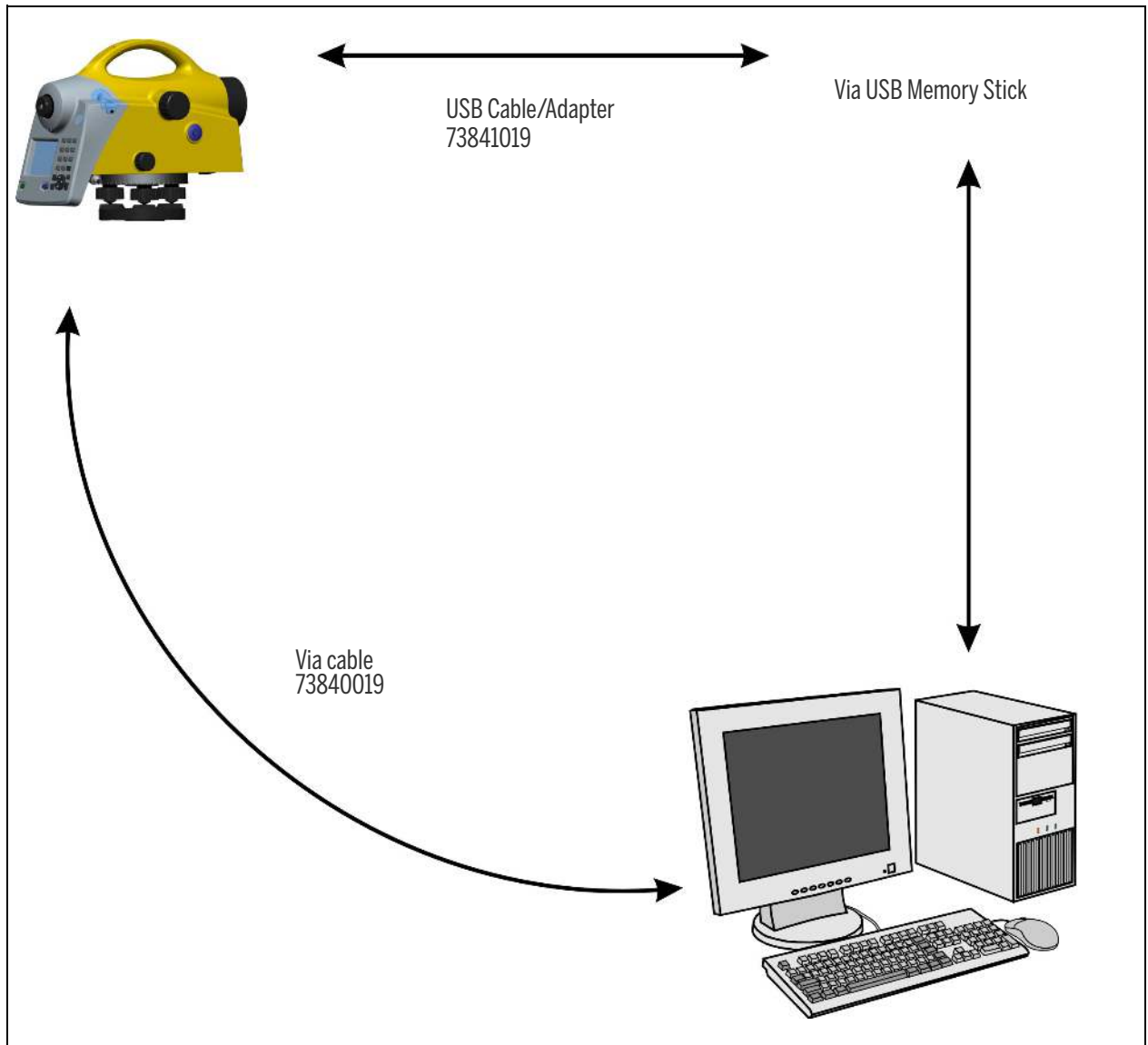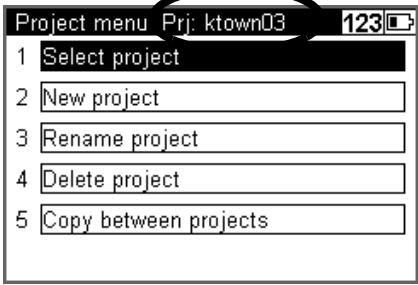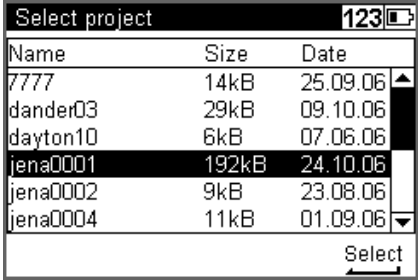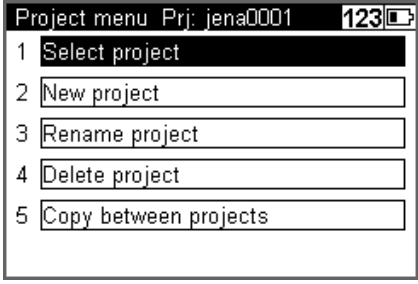
Project Management
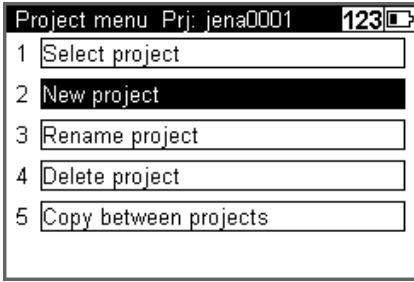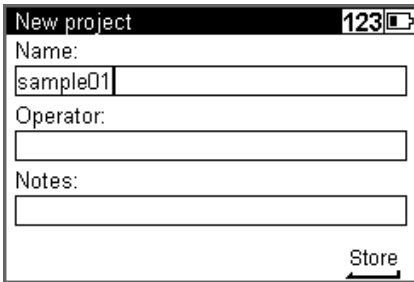
The submenu allows you to select, create, delete and rename projects. Additionally the content from a complete project can be copied in another project.

Actions	Screen	Comments
In the Main dialog select **Files.**		
Select **Project menu.**		

Select a Project

Actions	Screen	Comments
Select **Select project (1)**.	Project menu Prj: ktown03 123 1 Select project 2 New project 3 Rename project 4 Delete project 5 Copy between projects	
Highlight the requested project from the project list and press ↵ enter key to select.	Select project 123 Name Size Date 7777 14kB 25.09.06 dander03 29kB 09.10.06 dayton10 6kB 07.06.06 jena0001 192kB 24.10.06 jena0002 9kB 23.08.06 jena0004 11kB 01.09.06 Select	All projects are available in the chronological order they were created.
	Project menu Prj: jena0001 123 1 Select project 2 New project 3 Rename project 4 Delete project 5 Copy between projects	Selected project will be displayed in Main Menu and most of the surveying menus

Create a Project
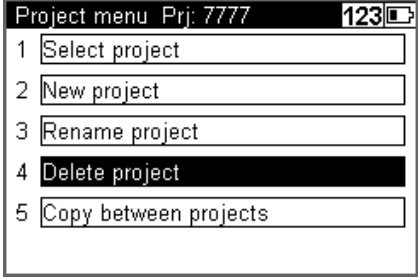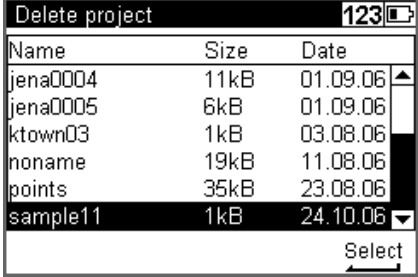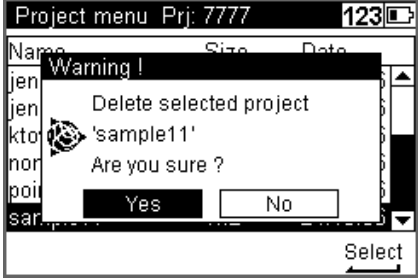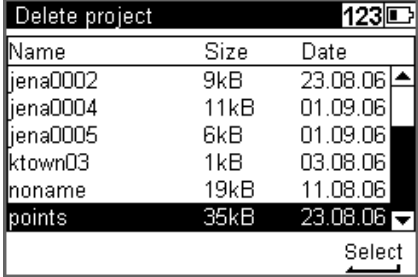
Actions	Screen	Comments
Select **New project.**	Project menu Prj: jena0001 **123** 1 Select project 2 New project 3 Rename project 4 Delete project 5 Copy between projects	
Key in the project **Name** of your choice. You can also key in the **Operator** name and **Notes**. Press ↵ enter key to **Store** the project. The project can now be selected from the project list.	New project **123** Name: sample01 Operator: Notes: Store	Input fields are open for alpha and numeric inputs. Name field is limited to 8 character (software compatibility to older versions)

Rename a Project
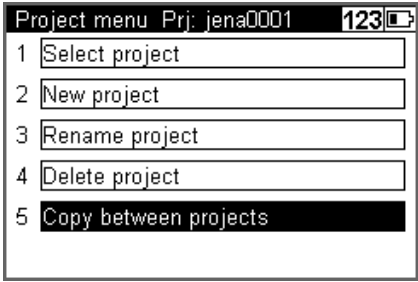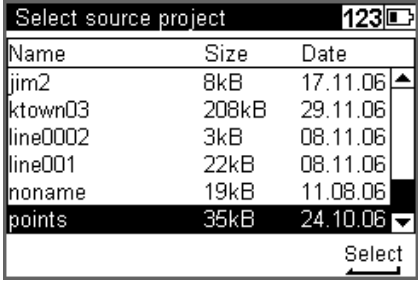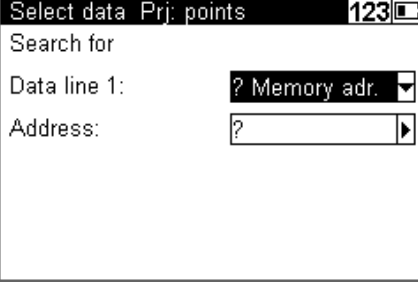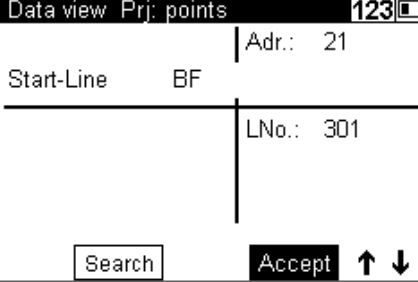
Actions	Screen	Comments
Select **Rename project.**	Project menu Prj: sample01 **123** 1 Select project 2 New project 3 Rename project 4 Delete project 5 Copy between projects	
Select the requested project and press ↵ enter key to **Select**.	Rename project **123** Name Size Date jena0004 11kB 01.09.06 jena0005 6kB 01.09.06 ktown03 1kB 03.08.06 noname 19kB 11.08.06 points 35kB 23.08.06 sample01 1kB 24.10.06 Select	All projects are available in the chronological order they were created.
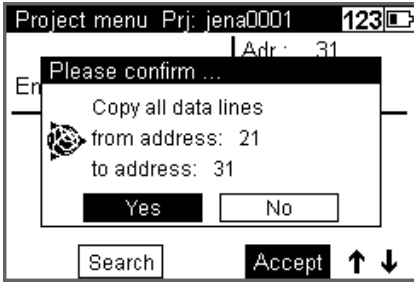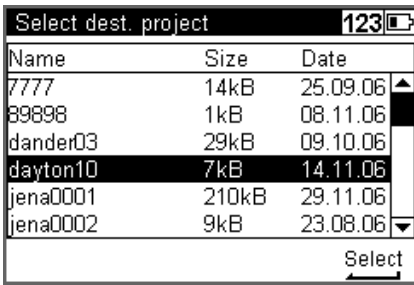
Actions	Screen	Comments
Key in the new project name and press ⏎ enter key to **Store**.	Rename project 123▯ Old name: 'sample01' New name: sample11 Store	Input field are open for alpha and numeric inputs
Press Esc escape key to return to the project menu.	Rename project 123▯ Name Size Date jena0004 11kB 01.09.06 ▲ jena0005 6kB 01.09.06 ktown03 1kB 03.08.06 noname 19kB 11.08.06 points 35kB 23.08.06 sample11 1kB 24.10.06 ▼ Select	The change will be shown in the project list.

Delete a Project

Actions	Screen	Comments
Select **Delete project.**	Project menu Prj: 7777 123▭ 1 Select project 2 New project 3 Rename project 4 Delete project 5 Copy between projects	
Highlight the requested project and press ↵ enter key to **Select**.	Delete project 123▭ Name Size Date jena0004 11kB 01.09.06 ▲ jena0005 6kB 01.09.06 ktown03 1kB 03.08.06 noname 19kB 11.08.06 points 35kB 23.08.06 sample11 1kB 24.10.06 ▼ Select	All projects available in order of created time.
Select **Yes** and press ↵ enter key to delete the selected project. Select **No** and press ↵ enter key to escape.	Project menu Prj: 7777 123▭ Name Size Date Warning ! jen jen Delete selected project kto 'sample11' nor Are you sure ? poi sar [Yes] [No] Select	
Select next project to be deleted or and press **Esc** escape key to return to the project menu.	Delete project 123▭ Name Size Date jena0002 9kB 23.08.06 ▲ jena0004 11kB 01.09.06 jena0005 6kB 01.09.06 ktown03 1kB 03.08.06 noname 19kB 11.08.06 points 35kB 23.08.06 ▼ Select	
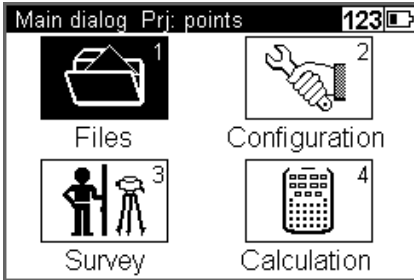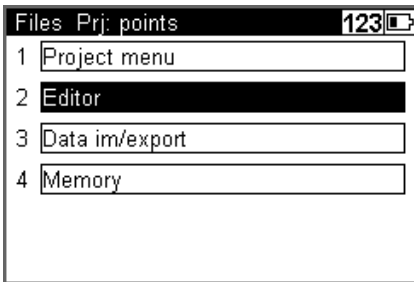
Copy Between Projects

Actions	Screen	Comments
Select **Copy between projects.**	Project menu Prj: jena0001 123 1 Select project 2 New project 3 Rename project 4 Delete project 5 Copy between projects	
Highlight the source project and press ↵ enter key to **select.**	Select source project 123 Name / Size / Date jim2 8kB 17.11.06 ktown03 208kB 29.11.06 line0002 3kB 08.11.06 line001 22kB 08.11.06 noname 19kB 11.08.06 points 35kB 24.10.06 Select	
All Data lines will be transferred between Data line 1 and Data line 2.	Select data Prj: points 123 Search for Data line 1: ? Memory adr. Address: ?	
Before final accepting the data line will be shown in the Editor screen, the selection can be still changed. Same procedure for the Data Line 2.	Data view Prj: points 123 Adr.: 21 Start-Line BF LNo.: 301 Search Accept ↑ ↓	
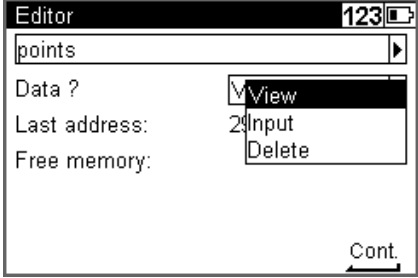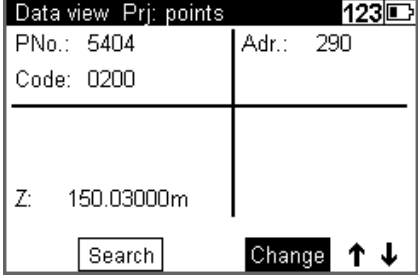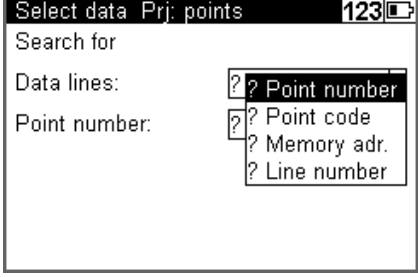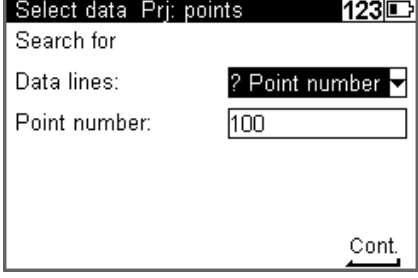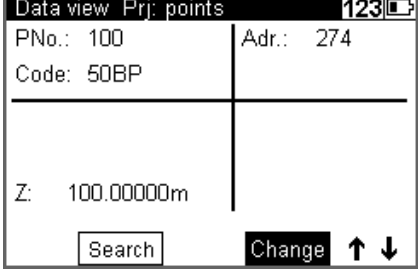
Actions	Screen	Comments
Select **Yes** to confirm or **No** to escape. Confirm the selection from line to line.	Project menu Prj: jena0001 123 Please confirm ... Copy all data lines from address: 21 to address: 31 Yes No Search Accept ↑ ↓	
Highlight the destination project and press ⏎ enter key to **select**.	Select dest. project 123 Name Size Date 7777 14kB 25.09.06 89898 1kB 08.11.06 dander03 29kB 09.10.06 dayton10 7kB 14.11.06 jena0001 210kB 29.11.06 jena0002 9kB 23.08.06 Select	The process will then run without any user activities

Editor

The Editor allows searching data lines for viewing and changing, input data lines (Height, Point number and Code), delete data lines and creating or modifying the three code lists.
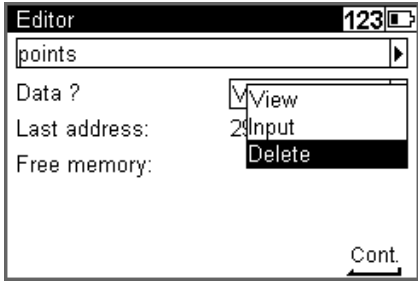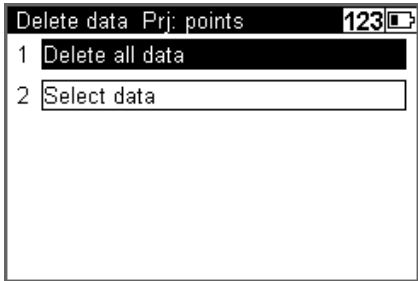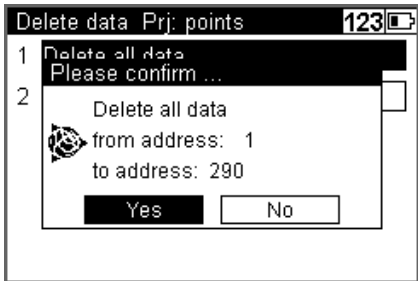
Actions	Screen	Comments
In the **Main dialog** Select **Files.**	Main dialog Prj: points 123 1 Files 2 Configuration 3 Survey 4 Calculation	
Select **Editor.**	Files Prj: points 123 1 Project menu 2 Editor 3 Data im/export 4 Memory	

Searching Data Lines
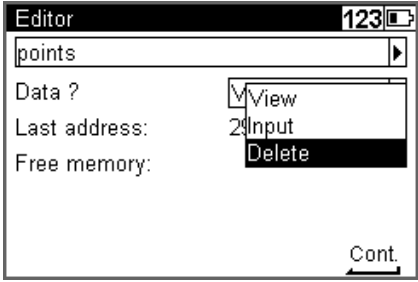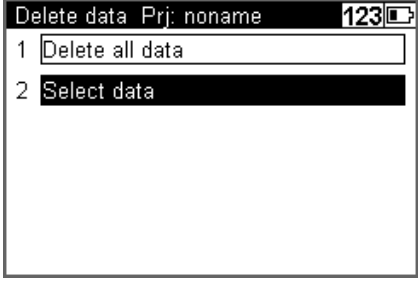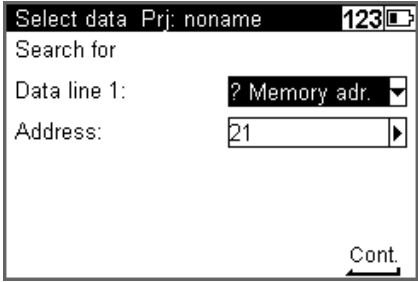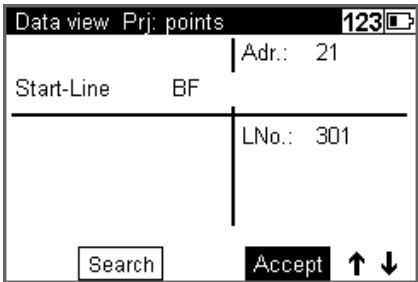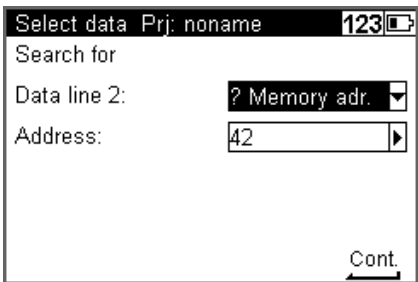
Actions	Screen	Comments
Select **Data?** from the drop down list. Select **View** and press ⏎ enter key to **Continue**.	Editor 123▭ points ▶ Data ? View Last address: 2 Input Free memory: Delete Cont.	
Select **Search** and press ⏎ enter key to **Continue**.	Data view Prj: points 123▭ PNo.: 5404 Adr.: 290 Code: 0200 Z: 150.03000m Search Change ↑ ↓	The last data line of the project will be shown.
Select Data lines from the drop down list. Select **Point number**, **Point code**, **Memory address** or **Line number.** Press ⏎ enter key to **Continue**.	Select data Prj: points 123▭ Search for Data lines: ? ? Point number Point number: ? ? Point code ? Memory adr. ? Line number	
Key in the **Point number** press ⏎ enter key to **Continue**.	Select data Prj: points 123▭ Search for Data lines: ? Point number ▾ Point number: 100 Cont.	
Press ✛ spider key up or down arrow to search for lines with identical criteria. Select Change to change Heights, Point numbers and Codes	Data view Prj: points 123▭ PNo.: 100 Adr.: 274 Code: 50BP Z: 100.00000m Search Change ↑ ↓	The program will not allow changing of the measurement values!
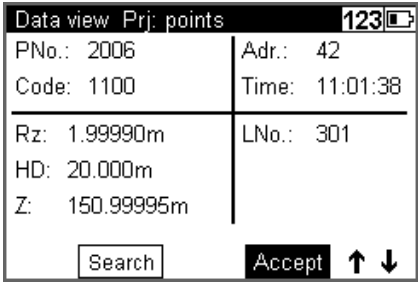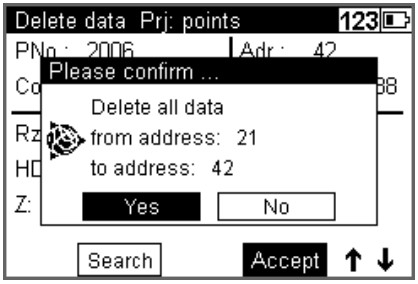
Deleting Data Lines

Delete all Data
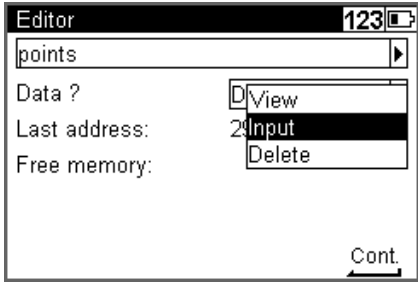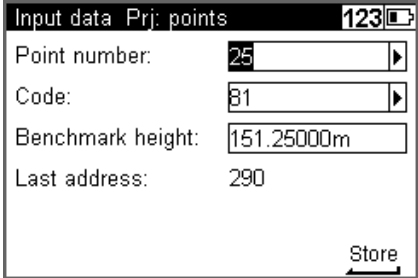
Actions	Screen	Comments
Select **Data?** from the drop down list. Select **Delete** and press ⏎ enter key to **Continue**.		
Select **Delete all data.**		
Select **Yes** and press ⏎ enter key to delete all data in the address range.		

Deleting Selected Data Lines

Actions	Screen	Comments
Select **Data?** from the drop down list. Select **Delete** and press ⏎ enter key to **Continue**.	Editor 123 points ▶ Data ? View Last address: 2 Input Free memory: Delete Cont.	
Select **Select data.**	Delete data Prj: noname 123 1 Delete all data 2 Select data	
Select search criteria from **Data line 1** drop down list press ⏎ enter key to confirm. Key in the **Address** and press ⏎ enter key to confirm. Press ⏎ enter key to **Continue**.	Select data Prj: noname 123 Search for Data line 1: ? Memory adr. ▼ Address: 21 ▶ Cont.	
Select **Accept** and press ⏎ enter key to confirm.	Data view Prj: points 123 Adr.: 21 Start-Line BF LNo.: 301 Search Accept ↑ ↓	
Select search criteria from **Data line 2** drop down list press ⏎ enter key to confirm. Key in the **Address** and press ⏎ enter key to confirm. Press ⏎ enter key to **Continue**.	Select data Prj: noname 123 Search for Data line 2: ? Memory adr. ▼ Address: 42 ▶ Cont.	
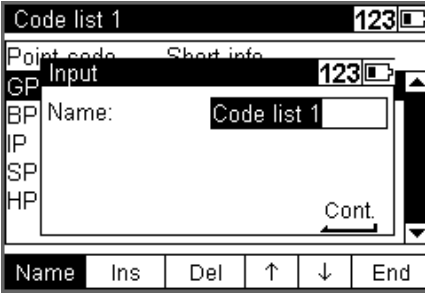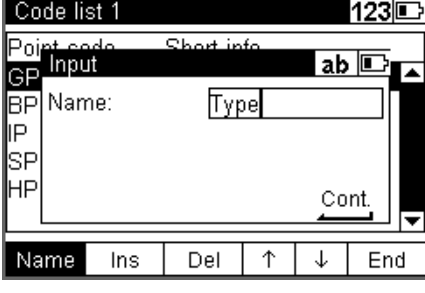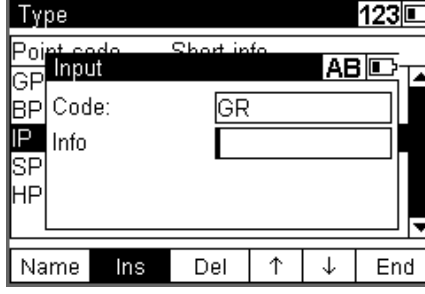
Actions	Screen	Comments
Select **Accept** and press ⏎ enter key to confirm.	Data view Prj: points 123▭ PNo.: 2006 Adr.: 42 Code: 1100 Time: 11:01:38 Rz: 1.99990m LNo.: 301 HD: 20.000m Z: 150.99995m [Search] [Accept] ↑ ↓	
Select **Yes** and press ⏎ enter key to confirm.	Delete data Prj: points 123▭ PNo.: 2006 Adr.: 42 Please confirm ... Co 88 Delete all data Rz from address: 21 HD to address: 42 Z: [Yes] [No] [Search] [Accept] ↑ ↓	**NOTE –** All data from address 21 to 42 will be deleted.

Input of Data Lines

Actions	Screen	Comments
Select **Data?** from the drop down list. Select **Input** and press ⏎ enter key to **Continue**.	Editor 123 points ▶ Data ? D View Last address: 2 Input Free memory: Delete Cont.	
Key in **Point number**, **Code** and **Benchmark height**. Press ⏎ enter key to **Store** the values. When all points have been entered press **Esc** escape key to return to the **Editor**.	Input data Prj: points 123 Point number: 25 ▶ Code: 81 ▶ Benchmark height: 151.25000m Last address: 290 Store	**Point number** - Select **Find** to find the next free point number. **Code** - Select **From list** to select a code from a list

Creating or Modifying the Three Code Lists

Actions	Screen	Comments
Select a code list from the drop down list press ⏎ enter key to confirm.	Editor 123 noname Other project Data ? Code list 1 Last address: Code list 2 Free memory: Code list 3 1967 kB Cont.	
Overview about current list content	Code list 1 123 Point code Short info GP Ground point ▲ BP Benchmark IP Intermed. point SP Stake out point HP Height def. ▼ Name Ins Del ↑ ↓ End	

Actions	Screen	Comments
To change the name, highlight **Name** and press ↵ enter key.	Code list 1 — Input Name: Code list 1 — Name | Ins | Del | ↑ | ↓ | End	
Enter the new name of the code list and press ↵ enter key to **Continue**.	Code list 1 — Input Name: Type — Name | Ins | Del | ↑ | ↓ | End	
To insert a new item, highlight **Ins** and press ↵ enter key.	Type — Input Code: GR Info — Name | Ins | Del | ↑ | ↓ | End	
Select an entry in the list. Highlight **Del** and press ↵ enter key. Select **Yes** and press ↵ enter key to continue or select **No** and press ↵ enter key to abort.	Type — Please confirm … Delete selected list entry ? Yes | No — Name | Ins | Del | ↑ | ↓ | End	

Actions	Screen	Comments
To change an items order in the list, select the item in the list by pressing the ✛ spider key up or down arrow. When the item is highlighted select the **Move Up** or **Move Down** arrow press ↵ enter key to move the item in the list	Type ⬛123⬛ Point code — Short info GP — Ground point ▲ BP — Benchmark **SP — Stake out point** IP — Intermed. point HP — Height def. ▼ Name | Ins | Del | ↑ | ↓ | End	
Highlight **End** and press ↵ enter key to confirm all the changes.	Type ⬛123⬛ Point code — Short info GP — Ground point ▲ **BP — Benchmark** SP — Stake out point IP — Intermed. point HP — Height def. ▼ Name | Ins | Del | ↑ | ↓ | **End**	
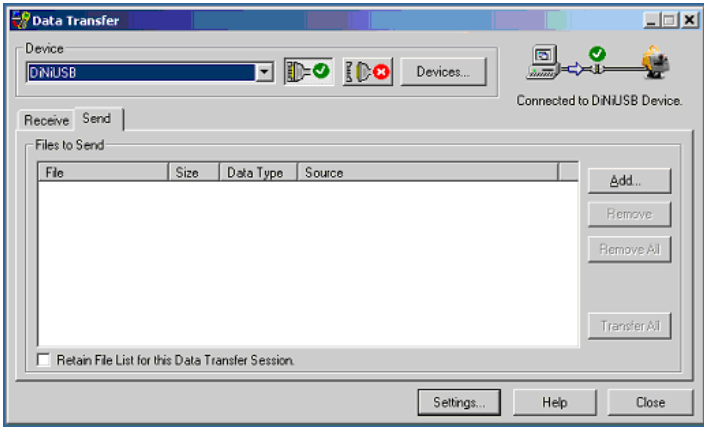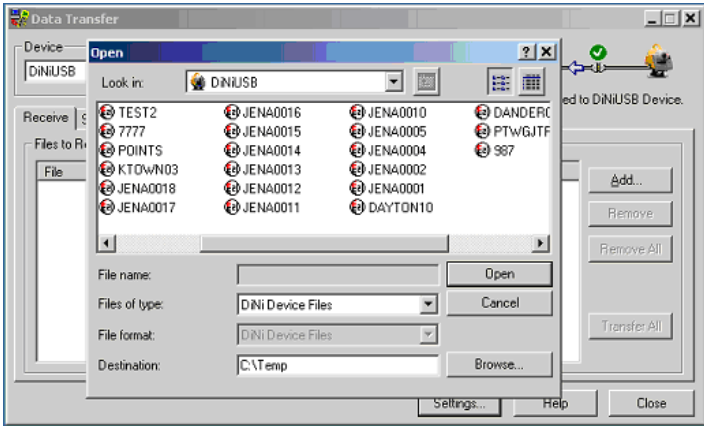
Data Transfer

DiNi to PC

Actions	Screen	Comments
Connect PC via cable PN 73840019 to the Trimble DiNi. Start Trimble Data transfer at the PC. Use Device "DiNiUSB".		
Use the Receive tab. Select the files for transferring to PC. Define the folder at the PC and start the data transfer.		

PC to DiNi

Actions	Screen	Comments
Use the Send tab. Select the files for transferring to DiNi. Start the data transfer.		
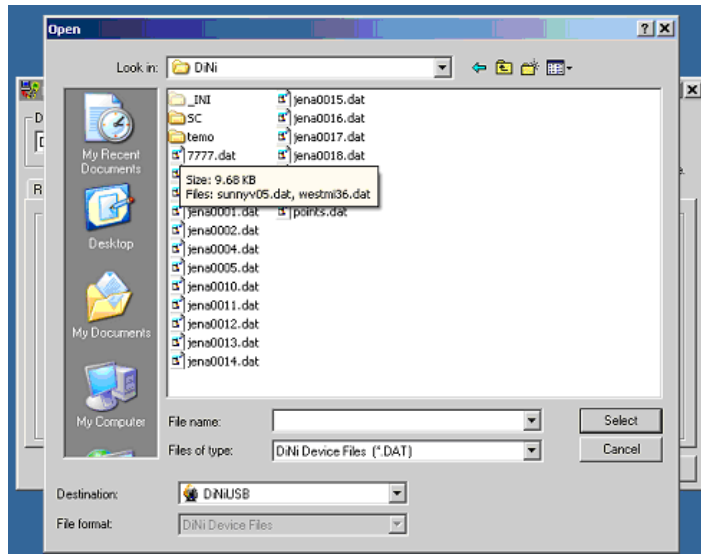
DiNi to USB Memory Stick

Actions	Screen	Comments
Connect the USB Memory Stick via cable PN 73841019 to the Trimble DiNi. The instrument offers the possibility to open the menu for Data import and export directly.		**NOTE –** While a measurement runs, the instrument will reject the possibility for this menu! It is possible to open the menu after the measurement via the known workflow.
The instrument allows copying files in both directions.		**NOTE –** If the name already exists, the instrument will offer the possibility to copy the file under a new name. **NOTE –** Before data transfer the program will check the free space and reject the activity in case of less memory. Please accept unused space for data security. **NOTE –** The program will inform and reject an empty file.
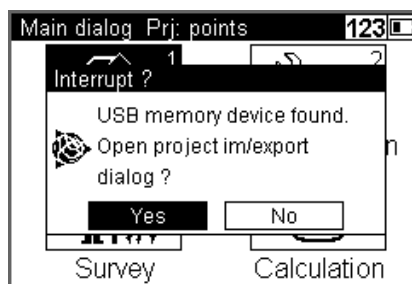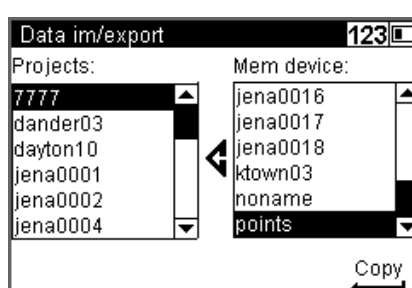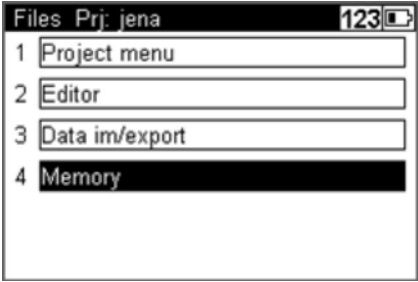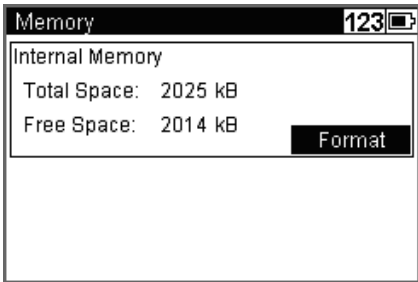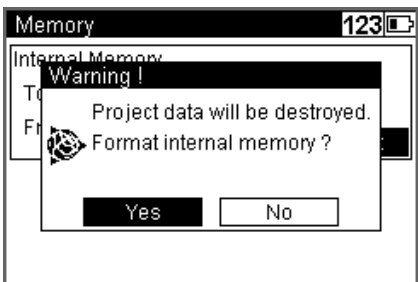
Memory

Actions	Screen	Comments
Select **Files** and **Memory**		
Select **Format** Internal Memory, press [↵] enter key to confirm.		
Select **Yes** and press [↵] enter key to confirm.		⚠ **CAUTION –** All data in the internal memory, including the history file for the c_values, will be erased.

⚠ **CAUTION –** When formatting the internal memory all stored data will be lost.

Data Format

The M5 Data Record Format

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 nine M5 data lines from address 164 to 172. Column 119 includes a blank (no error code).

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

Column	Description
Col.120-121	Carriage return<, Line feed
Col. 119	Blank field
Col. 114-117	Unit for block5
Col. 99-112	Block5 value block
Col. 96-97	Type identifier5 for block5
Col. 91-94	Unit for block4
Col. 76-89	Block4 value block
Col. 73-74	Type identifier4 for block4
Col. 68-71	Unit for block3
Col. 53-66	Block3 value block
Col. 50-51	Type identifier3 for block3
Col. 22-48	Information block
Col. 18-20	Type identification2, Trimble DiNi is using TO, KD1 and KD2
Col. 12-16	Memory address of data line
Col. 8-10	Type identifier1 Adr for address
Col. 1-6	Defines M5 format

Explanation to the data line

Abbreviation	Description	Digits	Characters	Meaning
For	Format identifier M5	3	alpha	DiNi Format
	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 TO, KDa
a	Marking value	1	numeric	a=1, 2
		27	alpha	Information block
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
T5	Type identifier	2	alpha	Value5
	Value5	14	numeric	14-digit value
dim5	Unit	4	alpha	4-digit

Special char.	Description	Digits	ASCII code	Hex code
|	Separator	1	ASCII124	Hex 7C
<	CR (Carriage Return)	1	ASCII13	Hex 0D
=	LF (Line Feed)	1	ASCII10	Hex 0A

The Text Information in the M5 Format

The information block has 27 characters.

```
1         10        20        30        40        50        60        70        80        90        100       110       120
|         |         |         |         |         |         |         |         |         |         |         |         |
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789
For M5|Adr      6|TO  Start-Line       ChSp      2|                     |                    |                         |
For M5|Adr      7|KD1     100                     2|                     |                    |Z      100.00000 m        |
For M5|Adr      8|KD1     100   114:52:333        2|Rb        0.87746 m  |HD         4.957 m  |                         |
For M5|Adr      9|KD1     100   214:53:093        2|Rb        0.87755 m  |HD         4.957 m  |                         |
For M5|Adr     10|KD1      10   214:55:213        2|Rf        0.84742 m  |HD         4.955 m  |                         |
For M5|Adr     11|KD1      10   214:55:21         2|                     |                    |Z      100.03013 m        |
For M5|Adr     12|KD1      20   114:56:173        2|Rf        0.85861 m  |HD         4.957 m  |                         |
For M5|Adr     13|KD1      20   114:56:17         2|                     |                    |Z      100.01885 m        |
For M5|Adr     14|KD1      20   114:57:203        2|Rb        0.87088 m  |HD         4.915 m  |                         |
For M5|Adr     15|KD1      10   214:58:103        2|Rb        0.85958 m  |HD         4.919 m  |                         |
For M5|Adr     16|KD1     200   214:59:083        2|Rf        0.88932 m  |HD         4.919 m  |                         |
For M5|Adr     17|KD1     200   214:59:08         2|                     |                    |Z      100.00039 m        |
For M5|Adr     18|KD1      21   114:59:293        2|Rf        0.88933 m  |HD         4.919 m  |                         |
For M5|Adr     19|KD1      21   114:59:29         2|                     |                    |Z      100.00040 m        |
For M5|Adr     20|KD1     200   1                 2|Sh        0.00040 m  |dz        -0.00040 m |Z      100.00000 m        |
For M5|Adr     21|KD2     200   1  2              2|Db        9.87 m     |Df        9.88 m     |Z      100.00040 m        |
For M5|Adr     22|KD1     200   2                 2|Sh        0.00039 m  |dz        -0.00039 m |Z      100.00000 m        |
For M5|Adr     23|KD2     200   2  2              2|Db        9.88 m     |Df        9.87 m     |Z      100.00039 m        |
For M5|Adr     24|TO  End-Line                    2|                     |                    |                         |
```

TO for Text information

KD for Point identification

KD1:

8 character Point ID (21-29)

5 character Point code (30-34)

1 character differentiation between the 2 lines of the dual lines measurement (35)

8 character time stamp [DiNi03 only] (36-43)

1 character number of readings (44)

4 character line number (45-48)

KD2:

8 character Point ID (21-29)

5 character Point code (30-34)

1 character differentiation between the 2 lines of the dual lines measurement (35)

3 character number of stations (36-38)

4 character line number (45-48)

TO:

23 character text info (21-44)

4 character line number (45-48)

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.

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:

"KD" for point identification, "TO" for text information, "R", "HD", "Z" for T3, T4, T5.

Definition of the Type Identifiers

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 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.

Type Identifiers - Formats M5

TI in Display	TI in Record	Designation
R	R	Single staff reading
Rb	Rb	Staff reading in backsight
Rf	Rf	Staff reading in foresight
Rz	Rz	Staff reading in intermediate sight
sR	sR	Standard dev. of mean staff reading (in multiple meas.)
nM	-	number of measurements (in multiple measurements)
mR	-	nominal standard deviation (in multiple measurements)
Z	Z	Height of backsight point
Z	Z	Height of point measured in foresight
Z	Z	Height of intermediate sight
Zi	-	Instrument height (equal to sight. h.)
Zs	Z	Nominal height/closing height
h	-	Height difference of a station or height difference from previous measurement
Sh	-	Height difference of complete line
dz	dz	Setting out difference (nominal-actual)
dz	dz	Closing difference of line (nominal-actual)
HD	HD	Single distances
HD	HD	Backsight distance
HD	HD	Foresight distance
HD	HD	Intermediate sight distance
Da	-	Mean value of backsight distance (for display only)
Da	-	Mean value of foresight distance (for display only)
DRl	-	Reading from the lower Reichenbach stadia line
DRu	-	reading from the upper Reichenbach stadia line
Db	Db	Total of backsight distances
Df	Df	Total of foresight distances
c_	c_	Line of sight error
rk	rk	Refraction coefficient
Of	Of	Staff offset
PNo	*	Point number recorded in information block
Code	*	Point Code recorded in information block
Zno	*	Line number recorded in information block
Sno	*	Station number recorded in information block
-	TO	Text information, general
-	KD	Point identification

NOTE – Values which are neither displayed nor recorded are marked by a dash (-). The Db and Df data refer to the last station completed.

Recording Data and Data Lines With DiNi

Mode	Content of Record							Comments
	Content of PI	R-M			RMR			
		T1	T2	T3	T1	T2	T3	
Single Point meas.	....	R	HD		R	HD		
Multiple meas.	....	R	HD	sR	R	HD		
Line	Start-Line BF							
	Start-Line BFFB							
	....			Z			Z	Reference height
	Cont-Line							after line interrupt.
Line BF	....	Rb	HD	sR	Rb	HD		Backsight1
	....	Rf	HD	sR	Rf	HD		Foresight1
	....						Z	Foresight height
Line BFFB	....	Rb	HD	sR	Rb	HD		Backsight1
	....	Rf	HD	sR	Rf	HD		Foresight1
	....	Rf	HD	sR	Rf	HD		Foresight2
	....	Rb	HD	sR	Rb	HD		Backsight2
	....						Z	Foresight height
Line intM	Intermediate sight.							
	....	Rz	HD	sR	Rz	HD	Z	
	End of interm. sight.							
Line SOut	Stake out							
	....		dz	Z		dz	Z	Stake out diff., nom. height
	....	Rz	HD	sR	Rz	HD	Z	Check measurement
	End of stake out							
Line end	....		dz	Z		dz	Z	Nominal closing height
	....	Db	Df	Z	Db	Df	Z	Actual closing height
	End of line							
Intermediate sights and Stake out	Backsight							
	....			Z			Z	reference height
	....	R	HD	sR	R	HD		backsight meas.
Adjustment	refract.ON/OFF earth curv. ON/OFF	c_			c_			appropriate the inputs
	Date Time							
INP	Visual measurement							before input data

Mode	Content of Record							Comments
	Content of PI	R-M			RMR			
		T1	T2	T3	T1	T2	T3	
Input	Value inputted	rk			rk			
	Value inputted	Lx			Lx			
Comments	Info							enter info
Record instrument status	Measuring unit: meters							Combination of measuring units, adjustment, and input
Normal/INV	Normal rod							after change
	Inverted rod							after change

The recording data line "Optical measurement" refers to the next measurement even if it is not recorded in the following data line.

8
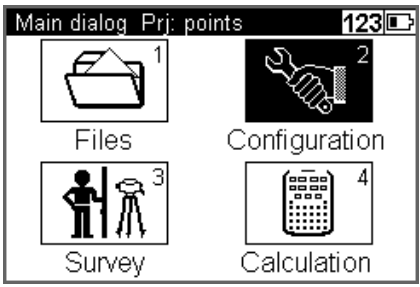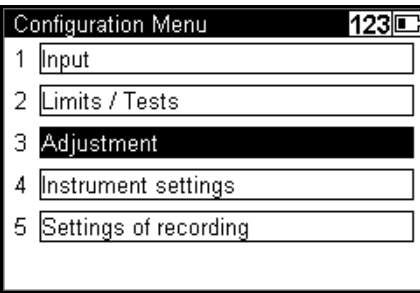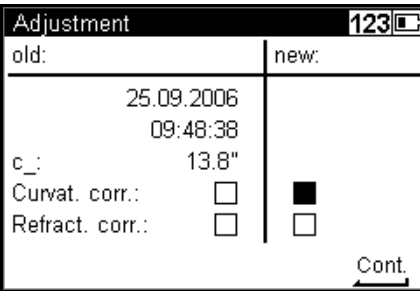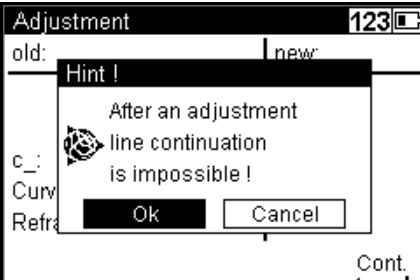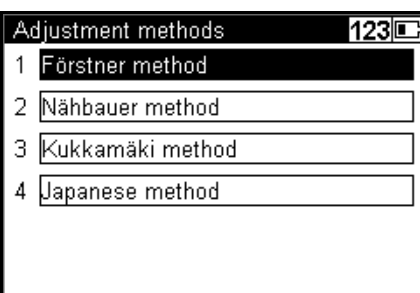
Adjustment

Adjusting the Line of Sight

The instrument adjustment defines the necessary corrections for the line sight of DiNi, which are required to ensure optimum measuring accuracy. 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 measurement results, particularly in case of different distances from instrument to staff. Adjusting the line of sight and defined measurement methods eliminating these errors.

Calling up the Adjustment Function

Actions	Screen	Comments
Select **Configuration** from the Main Dialog		
Select **Adjustment** from the Configuration menu.		
The old adjustment value and information are displayed. Select Curvature and refraction correction on or off during adjustment. Press ⏎ enter to continue.		
Press **Ok** to continue or **Cancel** to abort the adjustment.		**NOTE –** After an adjustment is made line continuation is impossible.
Select the adjustment method and press ⏎ enter to continue.		

Förstner Method

Set up two rods (A,B) roughly 45 m apart. Divide this distance into three and define 2 instrument stations (1,2) about 15 m away from the rods on the connecting line between them. Measure both rods from each of these stations.
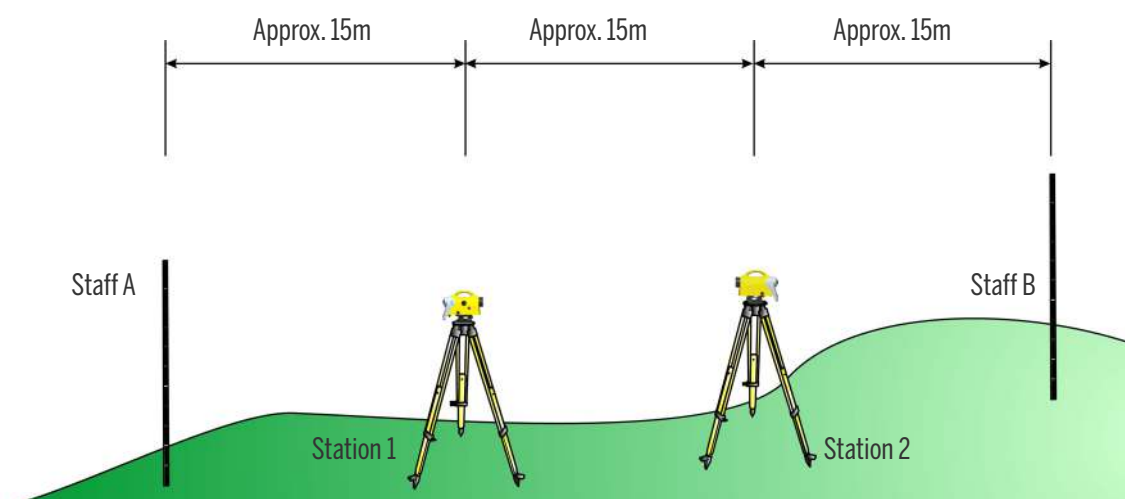
Näbauer Method

Define a distance of approx. 45 m length and divide it roughly into three. Create an instrument station (1,2) at either end and set up a staff at each point marking one third of the connecting line (A,B). Measure both rods from each of the instrument stations.
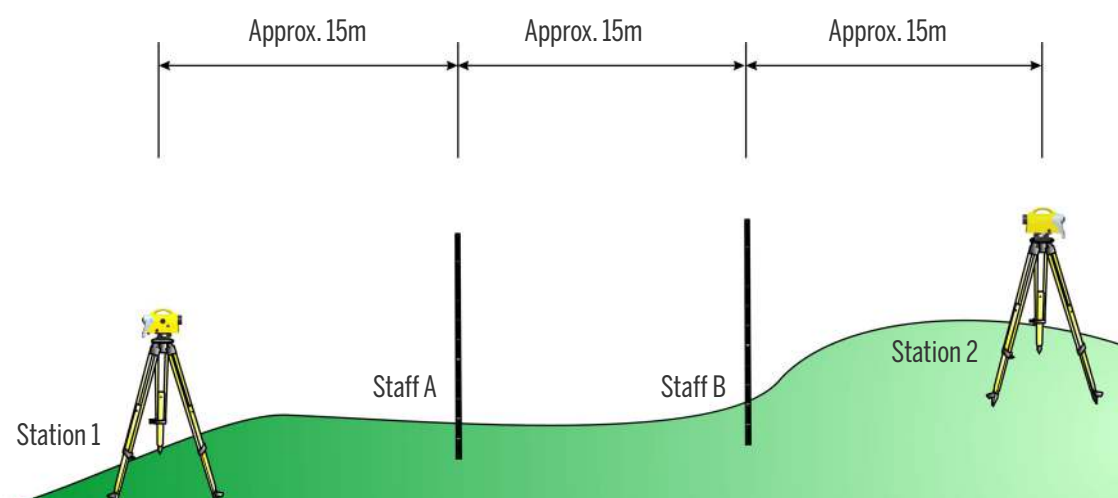
Kukkamäki Method

Set up 2 rods (A, B) roughly 20 m apart. First measure these rods from instrument station (1) located midway on the connecting line between the two rods. Then repeat the measurement from instrument station (2) which is located on the elongation of the two staff stations approx. 20 m outside the defined distance.
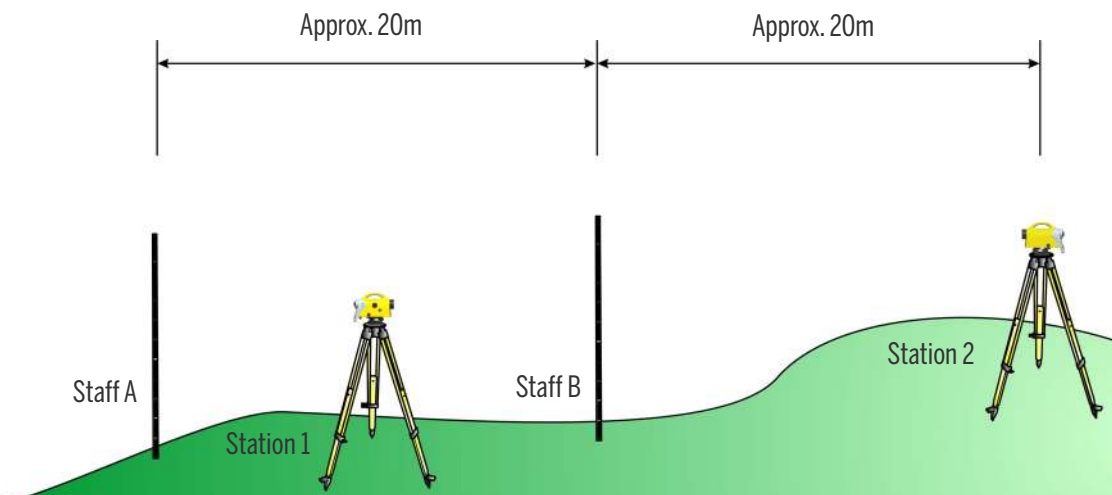
Japanese Method

This method is largely identical with the Kukkamäki method. With this method, however, the distance between the rods should be about 30 m with station (2) being about 3 m behind staff A.
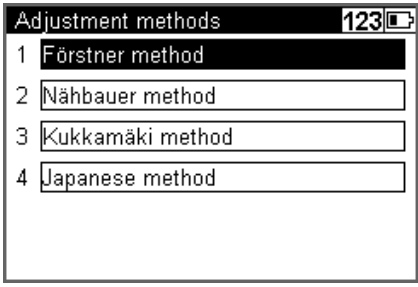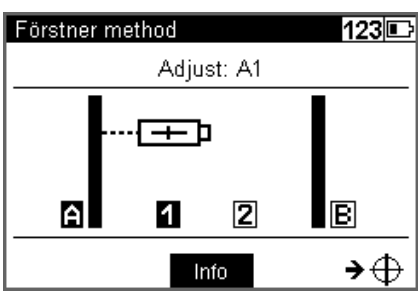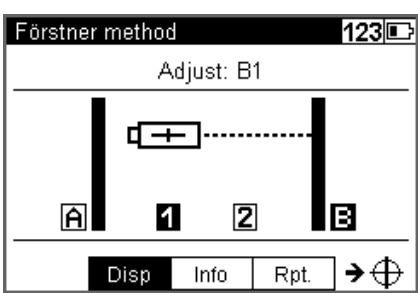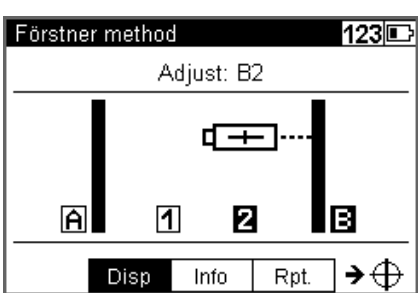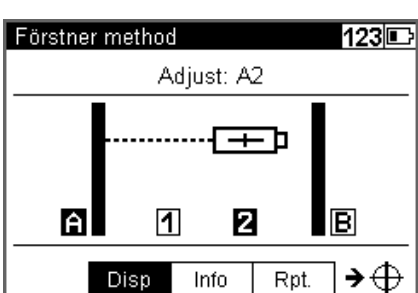
Making the Adjustment
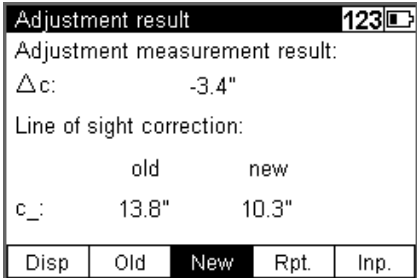
⚠️ **CAUTION –** Before starting any adjustment, allow the instrument to adapt to the ambient temperature and make sure it is protected against heating up on one side (sun radiation).
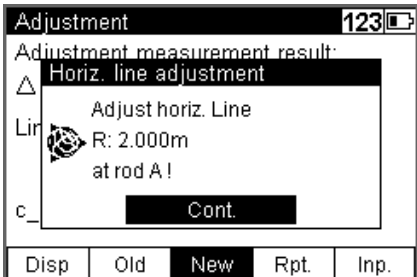
⚠️ **CAUTION –** After the selection of the adjustment method, you can change the settings of earth curvature and refraction. This is not possible at another point of the DiNi menu system. Changes of earth curvature and refraction settings become effective only if you adjust the system afterwards. The line of sight will then be corrected accordingly.

It may become necessary to correct the staff reading for earth curvature, if you must take measurements with different sighting distances and correction is not provided by the evaluation program used. General application of refraction correction is controversial. It is, however, possible on DiNi instruments. You can change the coefficient of refraction in the **Input** menu. If you set the coefficient to zero, the correction of refraction will be inactive.

⚠️ **CAUTION –** If the adjustment is done more than one time and the correction value (for example, median correction) is manually entered, you must be extremely careful. There is no internal check for the manually-entered correction value available in the DiNi.

Actions	Screen	Comments
Select the method of your choice. In this example we will show the **Förstner method**.	Adjustment methods 123 1 Förstner method 2 Nähbauer method 3 Kukkamäki method 4 Japanese method	
Aim and focus the DiNi at staff A from position 1, press ⃝ to measure.	Förstner method 123 Adjust: A1 A 1 2 B Info →⊕	**TIP –** While the adjustment measurement a multiple measurement should be used.
Aim and focus the DiNi at staff B from position 1, press ⃝ to measure.	Förstner method 123 Adjust: B1 A 1 2 B Disp Info Rpt. →⊕	Disp. offers the possibility to show at every step all done measurements.
Aim and focus the DiNi at staff B from position 2, press ⃝ to measure.	Förstner method 123 Adjust: B2 A 1 2 B Disp Info Rpt. →⊕	
Aim and focus the DiNi at staff A from position 2, press ⃝ to measure.	Förstner method 123 Adjust: A2 A 1 2 B Disp Info Rpt. →⊕	

Actions	Screen	Comments
The result of the adjustment will be displayed. To accept the new value select **New** and confirm with ⏎ enter.	**Adjustment result** 123▯ Adjustment measurement result: △c: -3.4" Line of sight correction: old new c_: 13.8" 10.3" | Disp | Old | **New** | Rpt. | Inp. |	Select **Inp.** to input a value estimated by repetition of measurements Select **Old** to keep the old values and abort the adjustment. Select **Rpt.** to repeat the adjustment. Select **Disp.** to see all measured values.

Turn the staff A around or replace it with a metric graduated staff and compare the reading with the specified value **R**. If the difference exceeds 2 mm, the reticule position needs to be aligned.	**Adjustment** 123▯
	Adjustment measurement result:
	△ **Horiz. line adjustment**
	Lir Adjust horiz. Line
	      R: 2.000m
	      at rod A !
	c_ | Cont. |
	| Disp | Old | **New** | Rpt. | Inp. |	

Remove cap and adjust the setting screw below the eyepiece until the actual and nominal readings are identical.		⚠ **CAUTION –** Make sure that the cap is fixed again after this procedure.

Various adjustments of lines of sight carried out successively should differ only by some seconds. Prerequisites for reaching this result are stability of installation and unchanged environmental conditions. We recommend to prepare a set of chronological statistics including the adjustment values. In case of inexplicable differences within short periods, provided the measuring conditions remained unchanged, a workshop should be consulted.

Example:
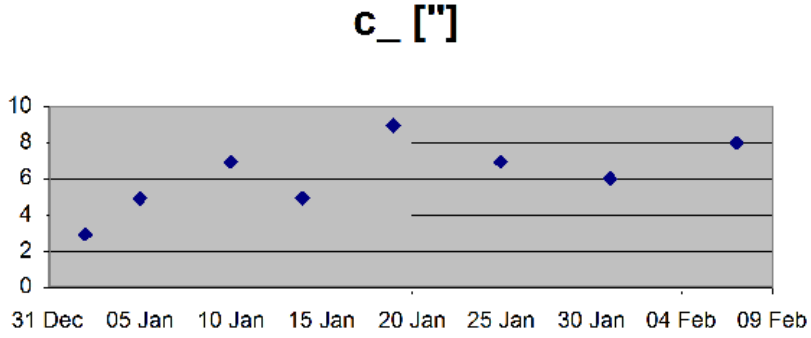
Change C_Value

Software Version

- Version R 2.1.0 (September 2013)

Content

The intention of this new feature is to implement the user capability to set the visible c_ value in the DiNi to zero. In some countries (especially China and the USA) the public authorities has set up a limit of 10" for the c_ value (line of sight correction). This definition for the c_ value is just a random selection for a threshold.

In relation to the environmental impact and the aging of the instrument over the time, the c_ value of 10" can be exceeded in some cases, e.g. when you had different temperature conditions or a hard handling on a trip. It is common that the setup of the instrument will differ to the initial state of the instrument setup after a couple of years.

If the user has done the instrument adjustment properly, the instrument will provide the right results in any case, it doesn't matter which value the c_ has.
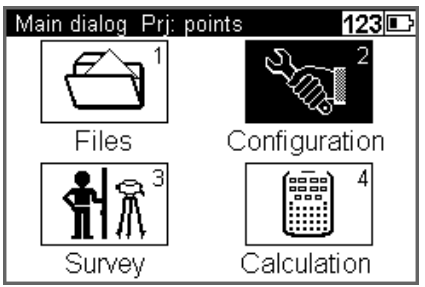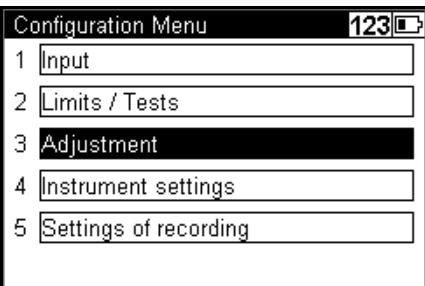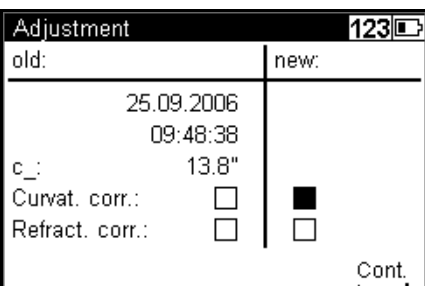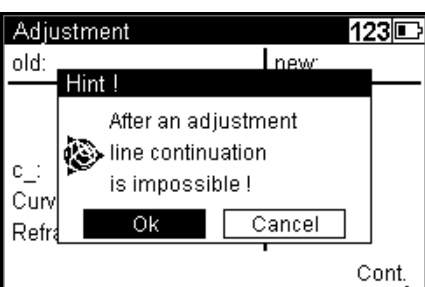
The user only need to change the c_ value of the DiNi if it is compulsory requested by the public authorities due some special limits for the line of sight correction c_, otherwise the user don't need to change the c_ value. This change of the c_ will not affect the leveling results.
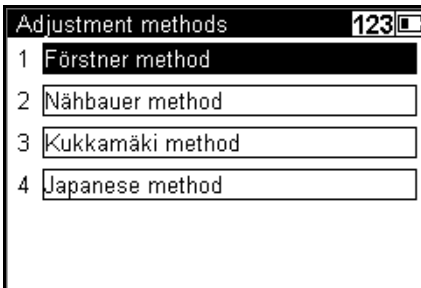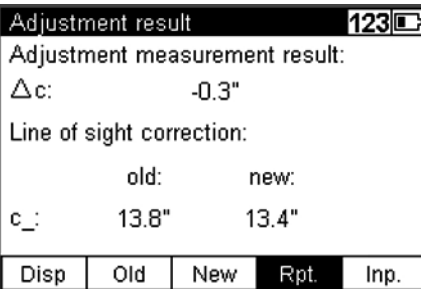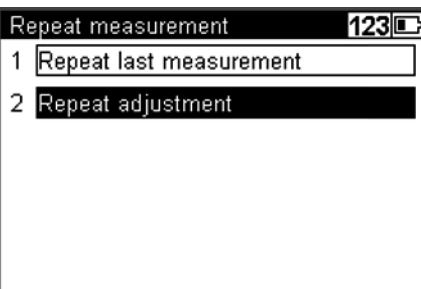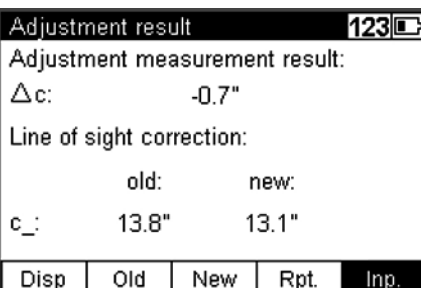
For this particular situation in these countries the user has now the capability to change the c_ value of the DiNi by himself. So far the change of the c_ value could only done by a Trimble Service Provider. The user can monitor the life time drift of the c_ value. For this topic, please see the notes at the end of this document.
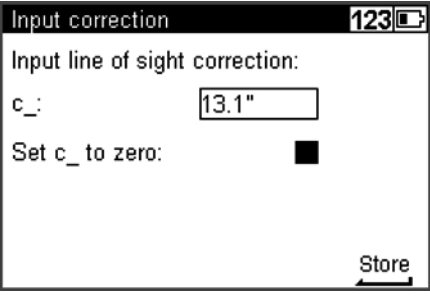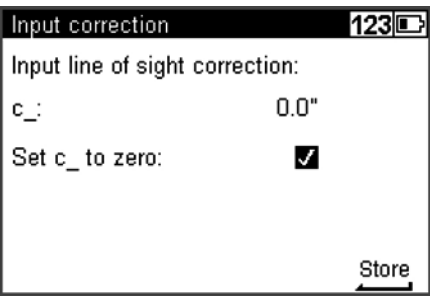
To avoid some confusion and unintended change of the c_ value, this feature is kind of hidden in the DiNi software. Please see the following work flow for a how to change the c_ value in the DiNi.

Work Flow with Trimble DiNi SW 2.1.0

NOTE – If the intention is to change the c_ value, one of the four adjustment methods needs to be done twice, in between 15min. For more information about the adjustment and how to do it, please see your user guide with the topic see .

Actions	Screen	Comments
Select **Configuration** from the Main Dialog.		
Select **Adjustment** from the Configuration menu.		
The old adjustment value and information are displayed. Select **Curvature** and/or **refraction** correction on or off during adjustment. Press ⏎ enter to **continue**.		
Press **Ok** to continue or **Cancel** to abort the adjustment.		**NOTE –** After an adjustment is made line continuation is impossible.

Actions	Screen	Comments
Select the adjustment method and **press** ↵ enter to **continue**.	Adjustment methods 123 1 Förstner method 2 Nähbauer method 3 Kukkamäki method 4 Japanese method	For more information about the different methods please see Adjusting the Line of Sight, page 121.
The result of the adjustment will be displayed. To repeat the adjustment select **Rpt.** and confirm with ↵ enter.	Adjustment result 123 Adjustment measurement result: △c: -0.3" Line of sight correction: old: new: c_: 13.8" 13.4" Disp Old New Rpt. Inp.	Select **Rpt.** to repeat the adjustment.
To repeat the adjustment select **Repeat adjustment**. and confirm with ↵ enter.	Repeat measurement 123 1 Repeat last measurement 2 Repeat adjustment	Select **Repeat adjustment** to repeat the adjustment for the second run of the adjustment in between 15min. For more information about the adjustment methods please see Adjusting the Line of Sight, page 121.
The result of the second adjustment will be displayed. To change the center pixel select **Inp.** and confirm with s enter.	Adjustment result 123 Adjustment measurement result: △c: -0.7" Line of sight correction: old: new: c_: 13.8" 13.1" Disp Old New Rpt. Inp.	Select **Inp.** to get the choice to change the c_ value.

Actions	Screen	Comments
The result of the second adjustment will be set as a default c_ correction.	Input correction 123▢ Input line of sight correction: c_: 13.1" Set c_ to zero: ■ Store	After the second adjustment in between 15min and when the results are in between 2", you will have the choice to **Set c_ to zero**.
Tick the checkbox with **Set c_ to zero** for the change of the center pixel and press ◄┘ to store.	Input correction 123▢ Input line of sight correction: c_: 0.0" Set c_ to zero: ☑ Store	When you tick the checkbox for the **Set c_ to zero** the input for the line of sight correction will be set to 0. The shift of the c_ value will be the line of sight correction of the second adjustment.

NOTE – Both results of the adjustments needs to be in between a range of 2" otherwise the user will be not prompt to the input correction screen with the checkbox for the Set c_ to zero. When there is more than 2" difference between both adjustments, only the screen for the "normal" input correction will appear. The user can check the value of the correction in the screen with the adjustment results. The shift for the c_ to zero will be the value of the second adjustment.

C_ Value Drift History File

There will be a file created in the DiNi for the history of the c_ value. Every change of the c_ will be stored in this file. This file is hidden for the user and can only be accessed by a Trimble Service Provider. The user can store the system info file when the DiNi is connected with a PC and the update program is started. Please see the manual under the topic software update for a how to store the system info file.

NOTE – If the internal memory will be formatted, the history file for the c_ will be gone and cannot be accessed by the Trimble Service Provider.

The user can create an own statistic for the drift of the c_ value like in the past:

Various adjustments of lines of sight carried out successively should differ only by some seconds. Prerequisites for reaching this result are stability of installation and unchanged environmental conditions. We recommend to prepare a set of chronological statistics including the adjustment values. In case of inexplicable differences within short periods, if the measuring conditions remained unchanged, a Trimble Service Provider should be consulted.

Check the Function of Circular Bubble

Automatic alignment of the compensator ensures that an inclined line of sight is automatically leveled within the working range both for visual observation and internal electronic measurement. When turning the instrument round the vertical axis, the circular bubble has to remain within the adjustment circle.

In precision measurements, the running center of the circular bubble has to be in the center of the adjustment circle. In case of any visible change readjustment is required.

1. Level the instrument with the 3 tribrach screws until the circular bubble runs centrally to the adjustment circle.

Circular bubble — Adjustment circle
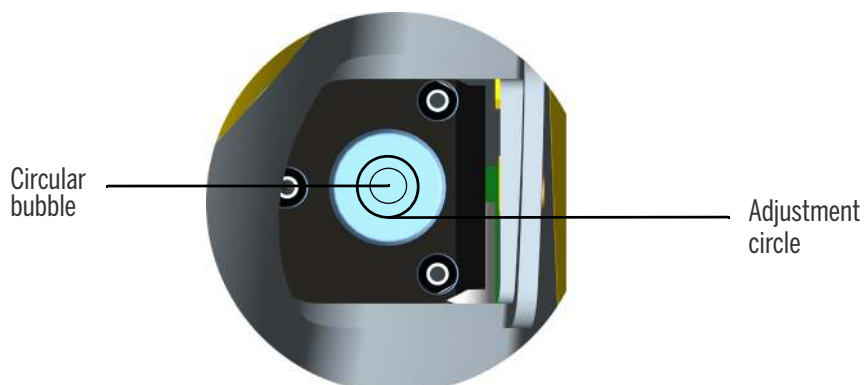
2. By turning the instrument 180° round the vertical axis the circular bubble has to remain within the circle.

Circular bubble Adjustment circle
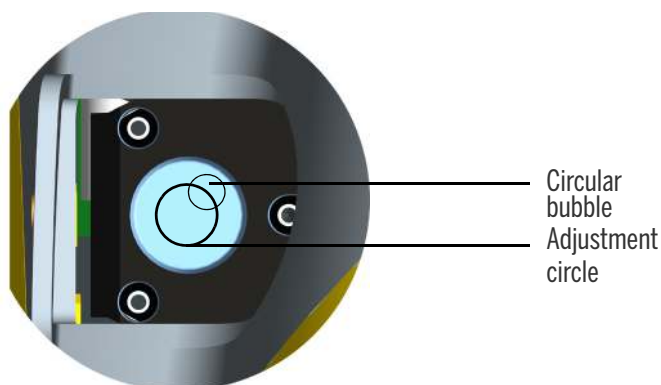
3. If the circular bubble left the adjustment circle it is necessary to adjust the circular level.

Adjustment of Circular Bubble
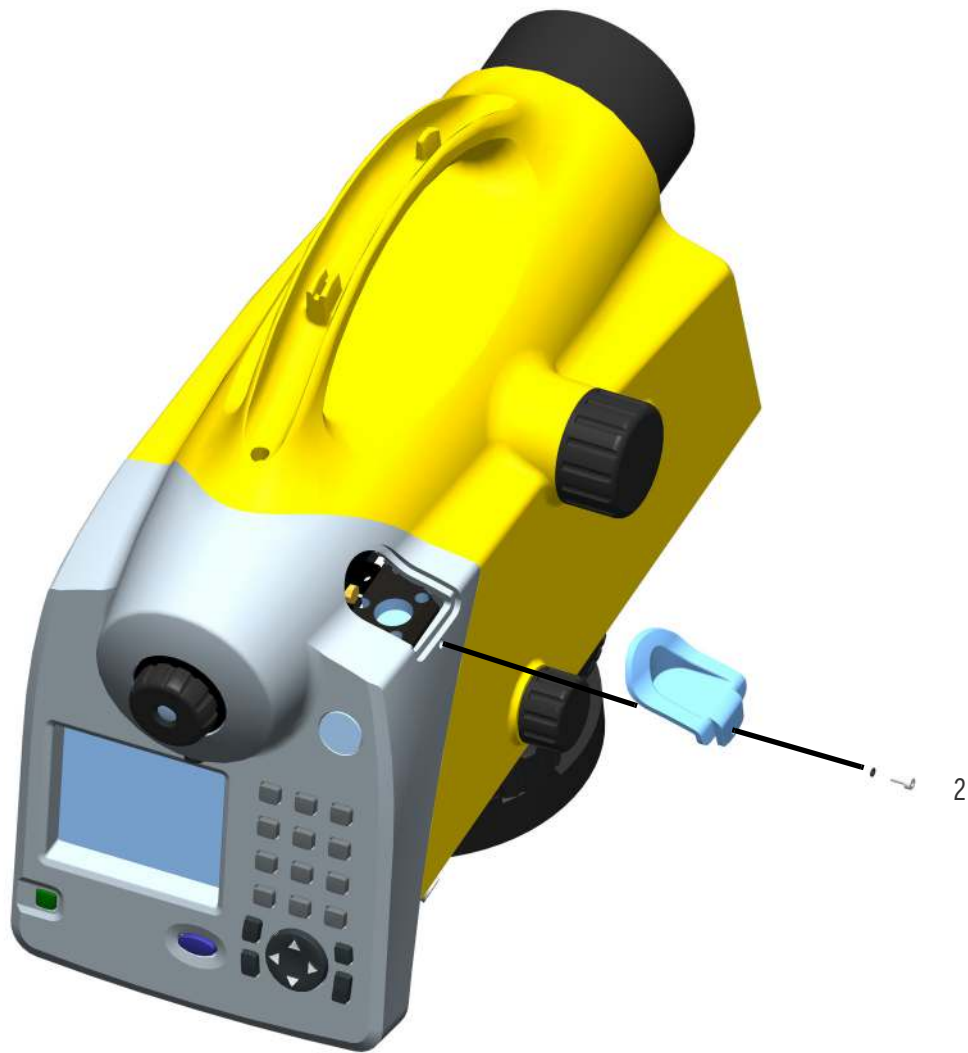
Figure 8.1   Removing the circular bubble protection cap

Position 1
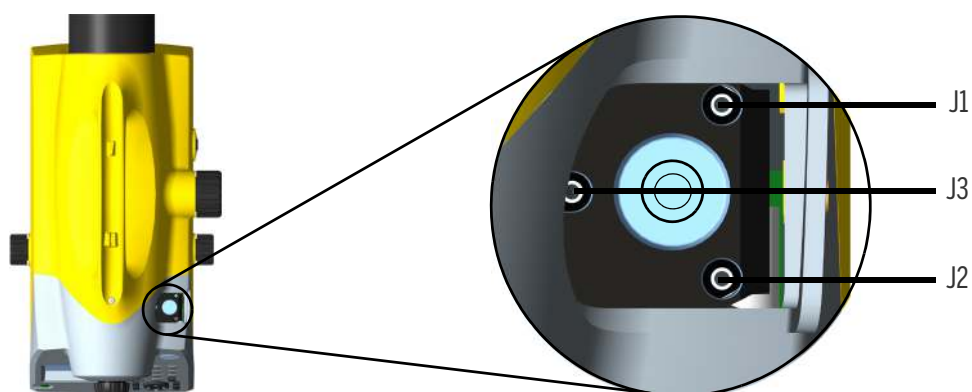
1. Remove the screw (2) of the protection cap with the adjusting tool and detach the protection-cap, see Figure 8.1.

2. Level the instrument with the 3 tribrach screws, Position 1.

3. Turn the instrument 180° round the vertical axis into position 2.

4. Eliminate half the residual deviation of the circular bubble by means of the tribrach screw and half by adjusting the circular bubble with the adjustment screws J1, J2, J3.

5. Repeat this procedure and check the residual deviation.

6. Fix the protection cap again. Make sure that the rubber joint is placed in the groove.

Position 2

A
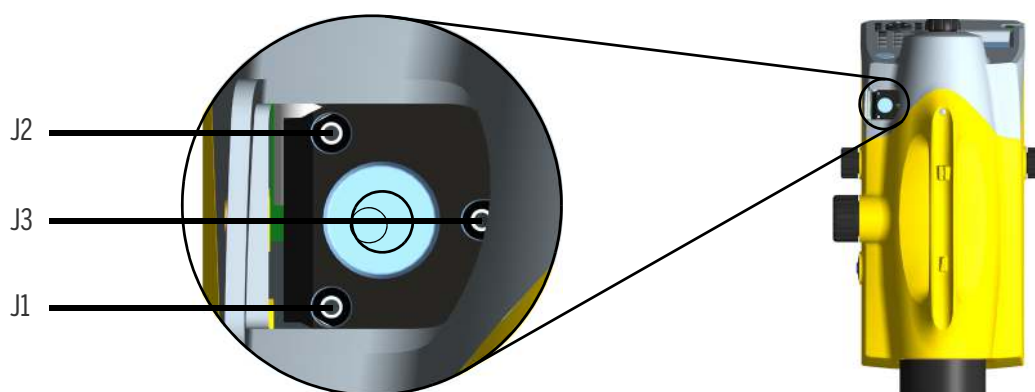
Appendix

- ► Technical Data
- ► Formulae and Constants
- ► Software Update
- ► Remote Control

Technical Data

Technical Data DiNi	0.3	0.7
Accuracy as per DIN 18723		
Standard deviation on 1 km of double leveling		
Electronic measurement:		
• invar precision bar code staff	0.3 mm	0.7 mm
• foldable bar code staff	1.0 mm	1.3 mm
Visual measurement		
• foldable staff, metric scale	1.5 mm	2.0 mm
Measuring range		
Electronic measurement		
• invar precision bar code staff	1.5 - 100 m	
• foldable bar code staff	1.5 - 100 m	
Visual measurement		
• foldable staff, metric scale	from 1.3 m	
Accuracy of distance measurement		
Electronic measurement with a 20 m sighting distance	20 mm	25 mm
• invar precision bar code staff	25 mm	30 mm
• foldable bar code staff		
Visual measurement:	0.2 m	0.3 m
• foldable staff, metric scale		
Least display unit		
Height measurement	0.01 mm//0.0001 ft/ 0.0001 in	0.1 mm//0.001 ft/0.001 in
Distance measurement	1 mm	10 mm
Measuring time		
Electronic measurement	3 s	2 s
Telescope		
Magnification	32 x	26 x
Aperture	40 mm	
Field of view at 100 m	2.2 m	
Electronic measurement field at 100 m	0.3 m	
Compensator		
Inclination range	± 15'	
Setting accuracy	± 0.2"	± 0.5"
Leveling		
Circular level	8'/2 mm with illumination	

Technical Data DiNi	0.3	0.7
Display		
Screen	240(W) x 160(H) pixel ; Black/White ; with illumination	
Horizontal circle		
Type of graduation	400 grads and 360 deg.	
Graduation interval	1 grad and 1 deg.	
Estimation down to	0.1 grad and 0.1 deg.	
Keyboard		
	19 keys, incl. 1 spider key for navigation	
Measuring programs		
	• Single measurement with and without stationing • Staking out • Line leveling with intermediate sight and stake out • Line adjustment	• Single measurement with and without stationing • Staking out • Line leveling with intermediate sight and stake out
Leveling methods (common)		
	BF, BFFB BFBF, BBFF, FBBF aBF, aBFFB, aBFBF, aBBFF, aFBBF	BF, BFFB aBF, aBFFB
Dual Lines Measurement		
	ChSp, ChAd, HQ, HQQH, HQHQ, HHQQ, QHHQ,aChAd, aHQ, aHQQH, aHQHQ, aHHQQ, aQHHQ	ChSp, ChAd, HQ, HQQH, aChAd, aHQ, aHQQH
Measured data correction		
	Compensation of earth curvature and refraction	
Recording		
Internal memory	up to 30000 data lines	
Data transfer	USB Interface for Data transfer to PC	
External memory	USB Flash drive support	
Real-time clock and temperature sensor		
	Recording of time or temperature	
Power supply		
	Internal battery, Li-Ion 7.4 V 2.4 Ah for three days working time without illumination	

Technical Data DiNi	0.3	0.7
Temperature range		
	-20 °C to +50 °C	
Dust- and waterproofness		
	IP55	
Dimensions (WxHxD)		
Instrument	155 mm x 235 mm x 300 mm	
Case	240 mm x 380 mm x 470 mm	
Weight		
Instrument / case	3.5 kg / 3.7 kg	

Formulae and Constants

Correction of Staff Reading and Sighting Distance

$L = L_o \pm L_x - K_1 + K_2 - K_3$

$K_1 = E^2 / (2 * R)$ earth curvature correction

$K_2 = rk * E^2 / (2 * R)$ refraction correction

$K_3 = c\_ * E / 206265"$ line of sight correction

where:

L_o	uncorrected staff reading
E	sighting distance
c_	line of sight correction in ["]
Lx	staff offset (+ Lx in normal measurement, - Lx in inverse measurement)
R	earth radius, R = 6380 000 m
rk	refraction coefficient

$E = E_o + A$

where:

E_o	uncorrected sighting distance
A	distance addition constant

Computation of the Line of Sight Correction

$c\_ = ((L_{a2} - L_{b2}) - (L_{a1} - L_{b1}))/((E_{a2} - E_{b2}) - (E_{a1} - E_{b1})) * 206265$ ["]

If refraction and/or earth curvature correction are activated prior to adjustment, the staff readings are corrected first (corrections K_1 and/or K_2).

Station Difference in Multiple Back- and Foresights

$dL = | (Lb_1 - Lf_1) - (Lb_2 - Lf_2) |$

Basis of Calculation for Line Adjustment

Line adjustment is always based on the measured and computed data recorded during leveling line measurement. Before the line adjustment, it is possible, however, that you enter the reference heights (start/end), if they had not been known in the measurement.

The heights of staff stations in line leveling and those of intermediate sights are modified proportionally to the passed distance as follows. For station n, the following equations apply:

Foresight:

$$E_n = E_{n-1} + E_b + E_f \qquad Z_f = Z_{fu} + \frac{E_n \cdot \Delta_z}{S_b + S_f}$$

Intermediate sight:

$$E_n = E_{n-1} + E_b + E_i \qquad Z Z = Z_{iu} + \frac{E_n \cdot \Delta_z}{S_B + S_F}$$

n	Number of station
E	Sighting distance
E_b	Backsight distance
E_f	Foresight distance
E_z	Intermediate sight distance
S_B	Total of all backsight distances of the line
S_f	Total of all foresight distances of the line
ΔZ	Line closing difference
Z_{fu}	Uncorrected height of foresight
Z_{iu}	Uncorrected height of intermediate sight

In the project, the values of Z_{fu} or Z_{iu} are overwritten by Z_f or Z_i.

Software Update

Download Updates

Software updates will be supplied from Trimble through the company website.

Please go to:

www.trimble.com

Please unpack the .zip file and copy the content to your hard disk. Please follow the instruction in the Support Note for the update process.

Download the System Info File

In the update program it is possible for the user to read out a system info file (.enc file) from the DiNi. The content of this file are status information (e.g. c_ history) from the DiNi. The system info file can be stored on your hard disk and can be forwarded to a Trimble Service Provider for further analysis, if needed.

Actions	Screen
Press the **System Info** button to get the system info file from the DiNi.	
To read out and store the system info file, please press the **Read System info and store to file** button.	

Remote Control

Software Version

- Version R 2.1.0 (September 2013)

The DiNi can largely be remote-controlled by the exchange of control commands between the periphery and the instrument via the interface. All commands and settings are designed to ensure a backwards compatibility for using Trimble DiNi with already existing customer PC programs.

Measurements can be triggered with Trimble DiNi by sending a function request via the PC RS 232 C interface or on the keyboard.

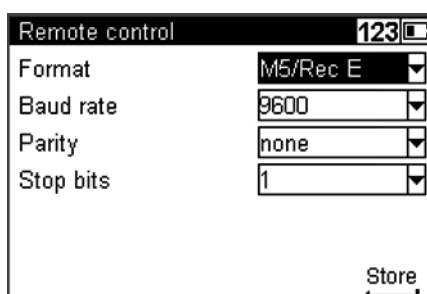**NOTE –** There is no Trimble support available for the remote control functions in the DiNi.

1. Connect for remote control.

   Connect instrument with a PC via cable No 53002021 (2.5m, Hirose 6 pin USB to DB9 female RS232).

Actions	Screen
This English screen pops up using every language:	

2. Display measuring results while using Remote Control.

   After accepting all settings with Enter, the menu for Single point measurement is visible. The user can now control the measurement results while using remote control. In this special case is a measurement possible without entering a point number (in difference to the general instrument rule).

   Do not enter point number and code in this mode, these details will be transferred with the measurement results to the external PC and this effect is not desired in this process!

3. Realization.

Interface settings (menu 2,6)

Instrument connected with cable will offer menu "Remote control" with settings:

- Format: M5 (RecE) or Rec500
- Baud rate: 300 to 115200
- Parity: none, odd, even
- Stop bits:1, 2

Data set content (menu 2,5):

Setting RMC	Setting R-M
Value 1: Staff reading	Value 1: Staff reading
Value 2: Distance, height difference	Value 2: Distance, height difference
Value 3: empty	Value 3: Standard deviation of mean staff reading (nM>2)

Command (function request) to be transmitted to:DiNi:

FML ↵   Triggers a measurement (staff reading and distance measurement)
                    The DiNi transmits a data record in the selected record format M5 or
                    Rec500.
SEO ↵   Shuts off the instrumen

Commands for reading and setting instrument parameters

Meanings of the Commands	Reading Command Type 1 Type 2	Response from Trimble DiNi and Setting Commands (no need to enter Δ)	Reading and Setting	
Instrument identification and software version	?0000↵	!0000ΔΔ|Δ701520Δ0000.000ΔΔΔΔΔ↵ (701520-Trimble DiNi 0.3mm/km 701510-Trimble DiNi 0.7mm/km)	?	-
Instrument number	?0100↵	!0100ΔΔ|ΔΔΔΔΔΔΔΔ0000008ΔΔΔΔΔ↵	?	-
Collimation error	?Kc_Δ↵	!Kc_ΔΔΔ|ΔΔΔΔΔΔΔΔΔ0.00033ΔDMSΔ↵	?	-
30 cm Test; 1 = on 0 = off	?KT30↵	!KT30ΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔ0Δbit Δ↵	?	!
Refraction coefficient	?Krk Δ↵	!KrKΔΔΔ|ΔΔΔΔΔΔΔΔΔΔ1.000Δm ΔΔΔ↵	?	-
Staff offset 0 ... 5.0m	?KLx Δ↵ ?KOf Δ↵	!KLxΔΔΔ|ΔΔΔΔΔΔΔΔ0.00000Δm ΔΔΔ↵ !KofΔΔΔ|ΔΔΔΔΔΔΔΔ0.00000Δm ΔΔΔ↵	?	!
Max. standard deviation for Repeat measurement 0 ... 0.01m	?KmL Δ↵ ?KmR Δ↵	!KmLΔΔΔ|ΔΔΔΔΔΔΔΔΔΔ0.005Δm ΔΔΔ↵ !KmRΔΔΔ|ΔΔΔΔΔΔΔΔΔΔ0.005Δm ΔΔΔ↵	?	!
Maximal number of Repeat. Measurements 1 ... 10	?KnM Δ↵	!KnMΔΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔ8ΔΔΔΔΔ↵	?	!
Earth curvature correction 1 = on 0 = off	?KEKR↵	!KEKRΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔ0Δbit Δ↵	?	-
Refraction correction 1 = on 0 = off	?KREF↵	!KREFΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔ1Δbit Δ↵	?	-
Registration additional information 0 = off 1 = time 2 = temperature	?KRAD↵	!KRADΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔ1Δbit Δ↵	?	!
Inverse measurement 1 = on 0 = off	?KFIR↵	!KFIRΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔ0Δbit Δ↵	?	!
Acoustic signal 1 = on 0 = off	?KSND↵	!KSNDΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔ1Δbit Δ↵	?	!
Automatic shutoff 1 = on 0 = off	?KAPO↵	!KAPOΔΔ|ΔΔΔΔΔΔΔΔΔΔΔΔΔΔ1Δbit Δ↵	?	!

|ASCII-character 124

ΔSymbol for space

Read- and setting commands language-dependent:

Type 1   D, NL, F

Type 2   all other languages

Response from DiNi to the function request:

Setting command acceptedQ↵

If the command syntax is not correct, the DiNi transmits the message:E↵

In the event of a DiNi functional error, the instrument sends the message: Exxx↵,

where xxx is the error code of the DiNi.

Exxx	
E202	Compensator out of range - Correct the leveling of instrument., otherwise contact the service
E320	Runtime error - Repeat the measurement
E321	Change of brightness too great - Repeat the measurement
E323	Staff cannot be read - Check the conditions of measurement process - Repeat measurement
E327	Staff section too small - Staff section is not symmetrical for measurement

Special aspects and multiple measurements

The collimation error $c\_$ is transferred in the measuring unit DMS (degrees, minutes, seconds). The value 0.00033 DMS corresponds to 0°00'03.3".

For measurement command FML, the current settings of repeat measurement apply. If you have set the parameters nM and mR before sending the measurement command, it is possible to trigger repeat measurements also via the interface.

The measurement result will be recorded anyway, even if the pre-set standard deviation was exceeded after the maximum number of measurements had been taken. Hence, you must compare the computed standard deviation with the pre-set one externally.

For setting repeat measurements, observe the following items:

- mR = 0 in any case, nM measurements are taken

- mR > 0 when sR < mR is reached, repeat measurements are aborted (min. 3 single shots). Maximally, nM measurements are carried out.

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