

# GEDO Track

- A measurement system for track recording -

**@Trimble Railway Industry**

**Version 2.3.2**

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# 1 Introduction

The track surveying system GEDO TRACK offers you the ability to record the position of the track using a track surveying trolley or a track measurement bar with electronic sensors. By transforming the continuously measured coordinates of the measurement points and through consideration of the track gauge and the inclination, the position of the rail can be determined at the time of the measurement. The deviations between the calculated positions to the said position are shown continuously.

The program runs on all Trimble TSC2 and TSC3 control units that run a Microsoft® Windows® Mobile 5 operating system as well as on a tablet PC with Microsoft® Windows® operating system. All instruments of the Trimble S Series are supported.

GEDO Track either uses the last stationing (coordinates, orientation, scale, instrument height) from a file that was exported from the Survey Controller Software (SC Software) or has its own stationing routine that is used for further coordinate calculation.

The layout of the software follows the Trimble Access software by means of design and usability. This means that the user can orient himself intuitively within the Software and may use the instrument's functions as he is used to. For a deeper insight into these functions the unpracticed user should read the Trimble Access user manual.

## 2 Installation and Licensing

### 2.1 Installation on a TSC2 or TSC3

1. Connect your control unit to a desktop PC. Before installing every file has to be copied to any directory on the device, e.g. *WinCE Device\Temp*
2. Install the file *SNP\_COM\_SERVER\_TSC2\_WM5.cab* resp. *SNP\_COM\_SERVER\_TSC3\_WM6X.cab*
3. Install the file *NETCFv2.wm.armv4i.cab* onto the controller
4. Run the file *GedoTrack\_vx.x.x\_TSC2.cab* resp. *GedoTrack\_vx.x.x\_TSC3.cab* on the controller. As soon as you open this file, the software and its components will be installed automatically into the folder *\Program Files\GedoTrack*. Further a shortcut in the Windows® start menu will be generated.
5. Copy the license file into the created program directory *\Program Files\GedoTrack*
6. If you want to use station setup from Trimble Access in GEDO Track you have to copy the style sheet *Stationierung.xml* or *Station report.xml* into the folder *\Trimble Data\System Files* on your controller.

Then the installation is finished. The program can be started easily by using the Windows® start menu.

All project relevant data will be stored in a separate folder (*\Gedo Data*) in the root directory (chapter 4).

### 2.2 Installation on a tablet PC (YUMA)

Before installing every file has to be copied to any directory on the PC, e.g. *C:\Temp*.

1. Extract the zip archive *SNP\_Service\_R4.7.16\_x32.zip*, open the directory and run *setup.exe*
2. Install *Win7\_USB\_Installer.exe*
3. Run *USBRadioDriver.exe*
4. Install *vcredist\_x86.exe*.
5. Start GEDO software installation by running *GedoTrack\_vx.x.x\_Win32.exe* and choose directory for installation (by default: *C:\Trimble\GedoTrack*). By default a shortcut in the Windows® start menu and a desktop icon are generated. If you run the program for the first time two DLLs are registered.

6. Copy the license file into the created program directory defined during installation (by default: *C:\Trimble\GedoTrack*).
7. If you want to use station setup from Trimble Access in GEDO Track you have to copy the style sheet *Stationierung.xsl* or *Station report.xsl* into the folder *\Trimble Data\System Files* on your tablet PC.

Then the installation is finished. The program can be started easily by using the Windows® start menu or the shortcut on the desktop.

All project relevant data will be stored in a separate folder (*\Gedo Data*) in the top level directory (chapter 4).

## 2.3 Licensing

If you want to use the program to its full extent a specific licensing file must be stored in the program directory on the controller. There will be a license check at every startup. Without this license file the program runs only in demo mode. Then measured points cannot be stored and evaluated. Further results are displayed in decimeter accuracy.

### 2.3.1 Licensing for a TSC2 or a TSC3

The GEDO Track license file is linked to the serial number of the controller the program is installed on. An installation on a different control unit requires the acquisition of an additional license.

The following steps have to be executed in order to get the license file:

1. Identify the serial number of the TSC2/3. For this purpose choose the menu entry *Settings* from the *Start* menu. Then select tab page *System* and click *About*. The serial number is then shown on tab page *Device ID* as *Device name*.
2. Send the displayed *Device name* to [info@trimble-railway.com](mailto:info@trimble-railway.com) and ask for a license file for program GEDO Track.
3. You will then receive a license file *SerialNumber.lic*. Finally copy this file into the installation directory of GEDO Track.

### 2.3.2 Licensing for a Tablet PC

The license for GEDO Track on a PC is linked to the computer.

The following steps have to be executed in order to get the license file:

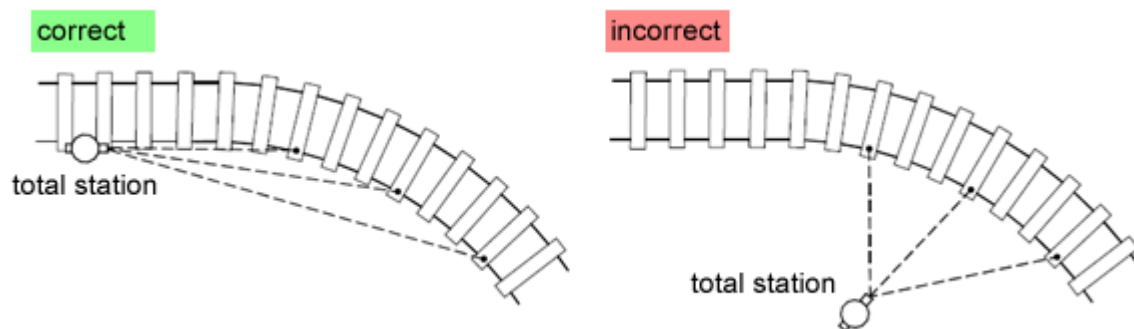
1. After first start of program copy the files *hardwareinfo.dat* and *keyfile.txt* from installation directory of GEDO Track.
2. Send these files to [info@trimble-railway.com](mailto:info@trimble-railway.com) and ask for a license file for program GEDO Track.
3. You will then receive a license file *GedoTrack.lic*. Finally copy this file into the installation directory of GEDO Track.



### 3 Basics

First off, the total station has to be set up on the side of the track on which the prism of the trolley is mounted. Usually the trolley is placed on the rails that the prism is set above the position reference rail. Based on the regulations of the German Railway Corporation (DB AG) that is the outer rail in curves and on the straight the outer rail of the following curve in ascending chainage direction.

However it is possible to change the setting of on what side the prism is mounted anytime within the software. It is essential that this setting is set right at any time to ensure that the further calculations are based on the right reference. Turning around the trolley at every change of the reference rail side is inconvenient and with that not necessary. This setting is described more thoroughly further down in this manual.



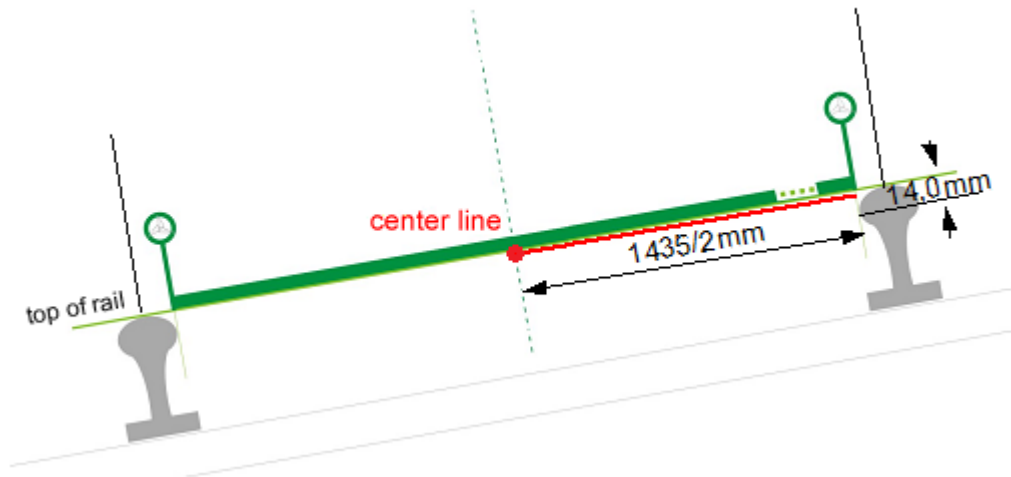
With a set up total station the prism on the trolley is permanently followed and its coordinates measured. The so measured coordinates and the calculated coordinates using the prism height, the gauge sensor, the cant sensor and the geometry of the trolley, reflect the actual position of the rail. This is then compared to the designed position. It is possible to measure either in tracking mode or in single measurement mode.

Due to error theoretical reasons; it is important to make sure that the measurement is done in direction to the total station.

The software uses ASCII files for the management of the geodetic information.

Please keep in mind, that the following values are exemplary values based on the regulations of the German Railway Corporation (DB AG). These can differ depending in the country and the tasks. Based on that fact, it is possible to edit these elements within the software settings to match any task.

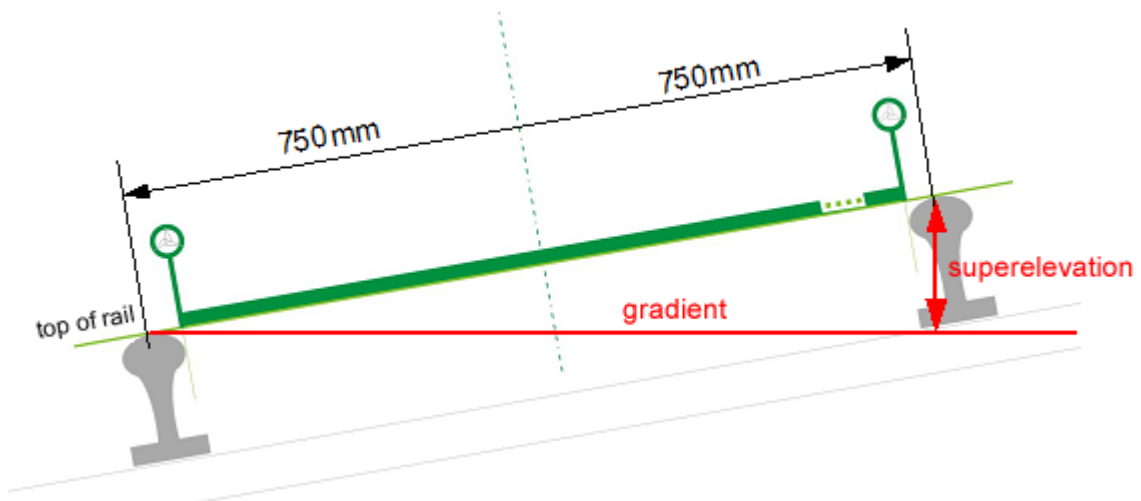
According to DB-Norm the center line (railroad line) runs parallel to the curve outer rail with a spacing of a half norm gauge at the level of connecting line between the rail heads. The gauge is defined by the shortest distance between the rail heads in the area of 0-14.3mm beneath the rails upper edge.



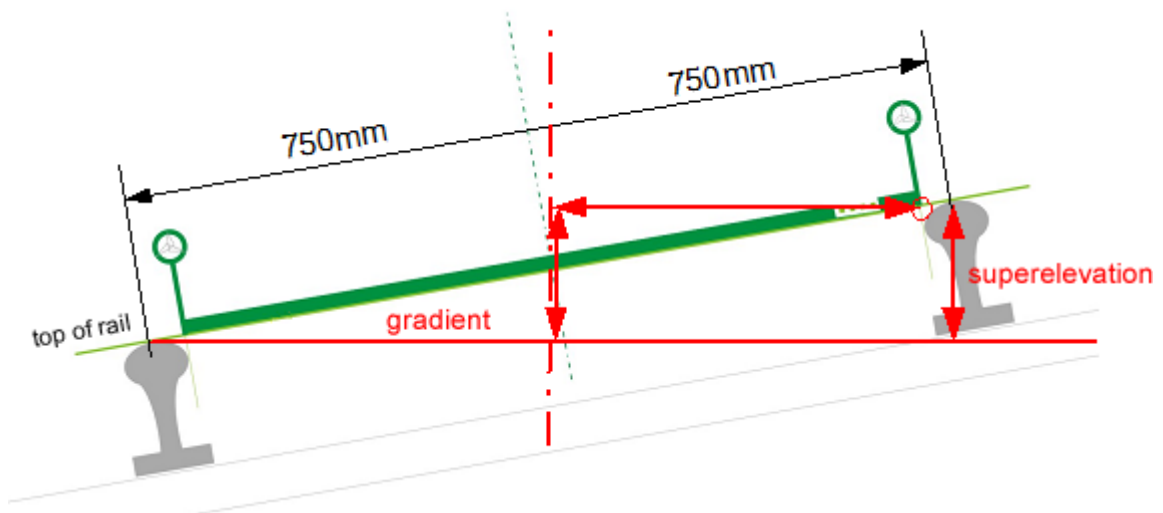
The reference rail for the height in DB-Norm is the curve inner rail (not the super elevated rail). Within a straight line the reference rail is the same as the one in the following curve in ascending chainage direction.

Differing from this common definition according to DB-Norm height reference can also match with the horizontal reference in center line. A gradient for center line is for example used in Switzerland. Further reference definitions like Singapore Metro define a different horizontal reference for planning reasons. In this case the center line is given as rotation point 1600mm vertically up from the center between the rails. Vertical information refers to the center of top of the rails horizon.

The superelevation (cant) is the vertical height difference between the rails based on the norm gauge of 1500mm connection the top of the rails.



The measured coordinates of the prism are recalculated down to the perpendicular foot point considering the measured cant. The foot point (actual value) is transformed onto the railway line (actual rail position). Using the cant value the superelevation (actual superelevation) and the gradient height (actual gradient height) are calculated. Using the chainage value calculated from the transformation, the set point, the set superelevation and the set gradient height are calculated. The set values are compared with the actual values and the deviations are shown on the display.



## 4 Project structure

All projects and their associated data are stored in the folder **\Gedo Data** in the root directory.

A project always consists of a main directory which carries the name of the project itself. Each project folder contains one project file with the ending *\*.pro* that contains the project-specific settings. Apart from that a measurement-file with the ending *\*.job* is stored in that directory as well. This file contains all measuring data collected in a GEDO Track measurement process.

If no project is available a default project with the name *default.pro* is created and loaded automatically by the software.

If the program starts up the previously loaded project will be opened automatically. If this project is no longer available or valid the default project will be opened instead.

In the subdirectory **\GEDO Data\project name\Export** you find the GEDO Track reports that were exported from the *\*.job*. These are saved as a comma separated file (\*.csv). Further processing in other software e.g. Microsoft Excel is therefore unproblematic.

The project directory of GEDO Track also contains a third subdirectory called **\GEDO data\project name\Alignment**. This subdirectory contains the data to describe the alignment. For 3D geometry at least a center line (horizontal alignment), vertical alignment and cant alignment is necessary. Double tracks usually have an additional chainage line. In specific cases also a gauge extension or precamber information (during construction) might be used. Following files contain the data:

- Centre line → \*.tdt
- Chainage line → \*.tdt
- Vertical alignment (gradient) → \*.hdt
- Cant alignment (superelevation) → \*.udt
- Gauge extension → \*.spa
- Precamber → \*.prc

In order to make it possible for the customer to use more than one trolley, every trolley and its specific settings are saved to a file that can be loaded through the software. This trolley file must have the file extension *\*.trl* and has to be located in the directory **\Common Files\Gedo\Trolley**.

## 5 Starting the program

For a more comfortable start of the software, an automatically generated shortcut in the start menu can be used.

If you do not want to use the stationing procedure of GEDO Track the stationing of the Trimble Access software must be used instead. It is not possible to use the program without any appropriate stationing. Proceed as follows:

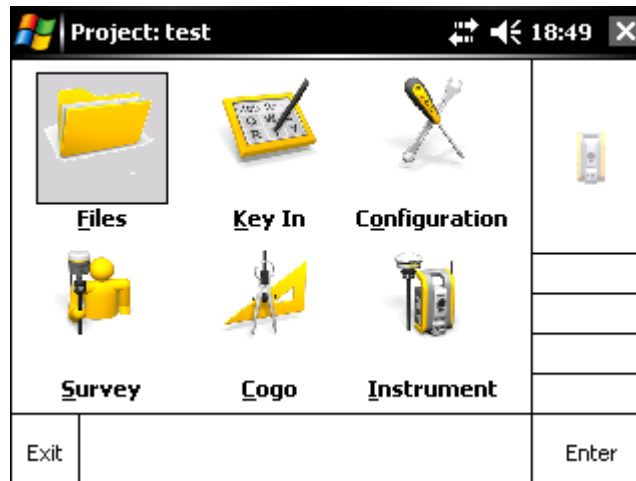
1. Start TA software and do the station setup as usual. The type of stationing can be chosen freely.
2. Export the current station setup into a text file using *Export/Custom format files*. The file format must be „**Station report**“.
3. After having successfully created the file, the SC software can be closed and GEDO Track can be started.

GEDO Track now uses this file to import the current valid station information.

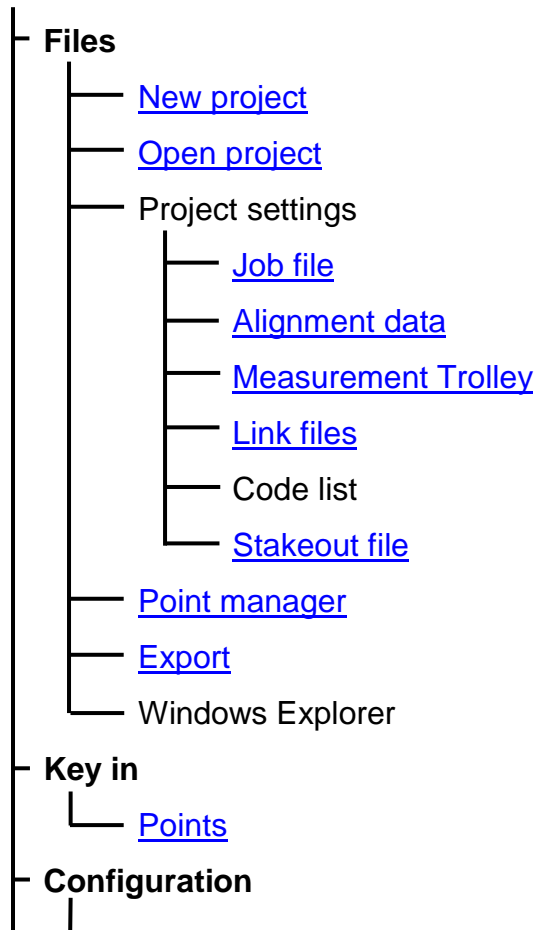
If there doesn't exist a single station file, a message dialog will show up and the station coordinates and the orientation will be set to zero.

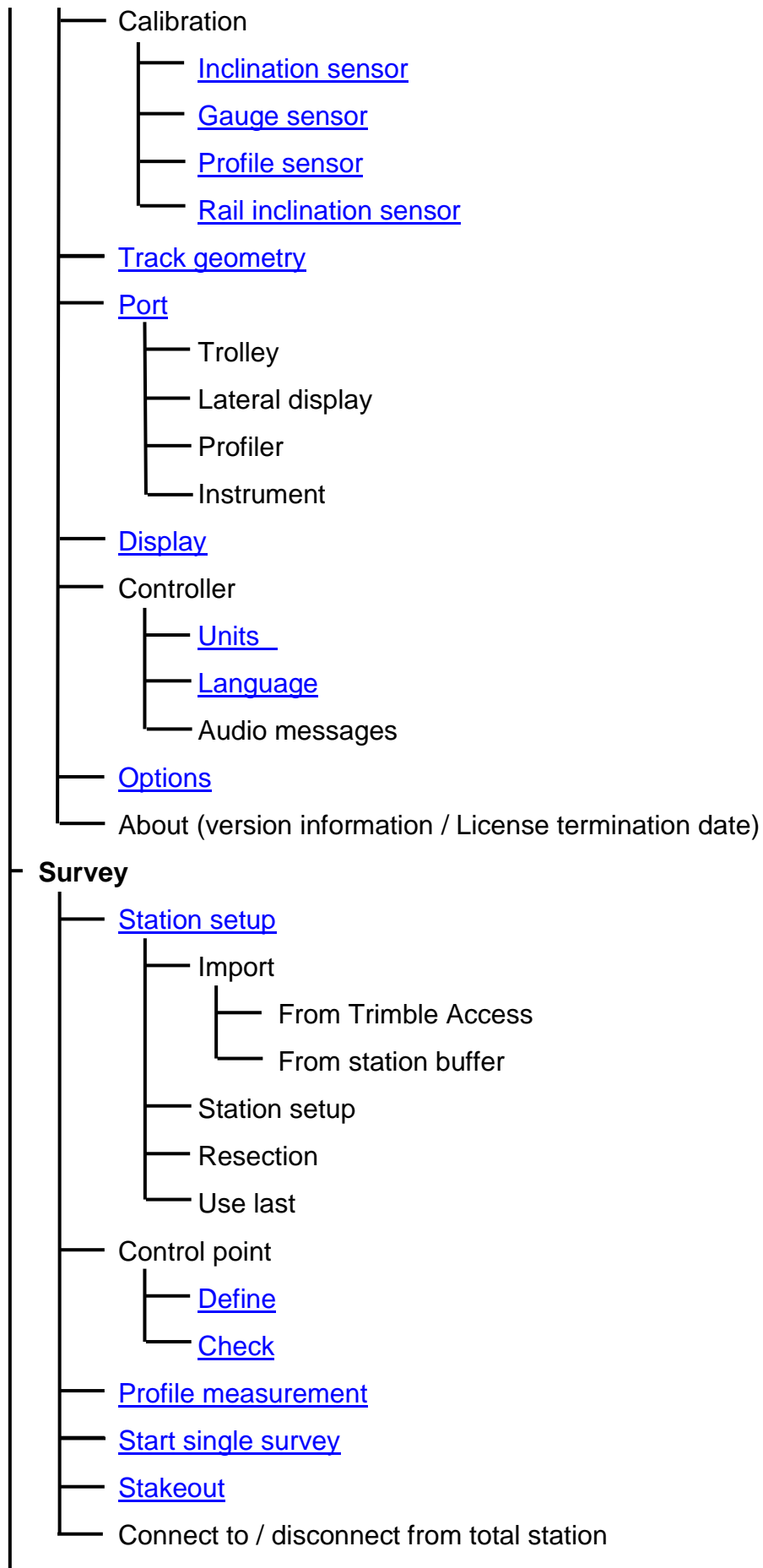
## 6 Main menu

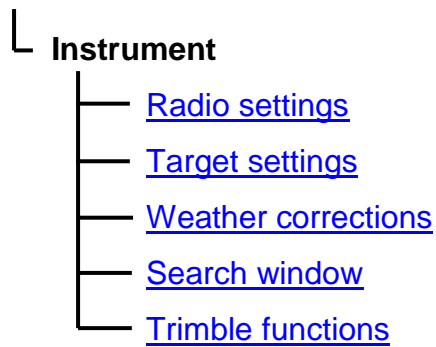
After a successful start of the program the main menu will automatically show up. The structure and the icons are quite similar to the Survey Controller software. Therefore the navigation is exactly the same as in the Survey Controller software. By clicking the *Exit* soft key the program will close. By pressing the “x” in the upper right corner in the task bar, the program will be minimized to the background but will not be closed.



The menu structure is as follows:

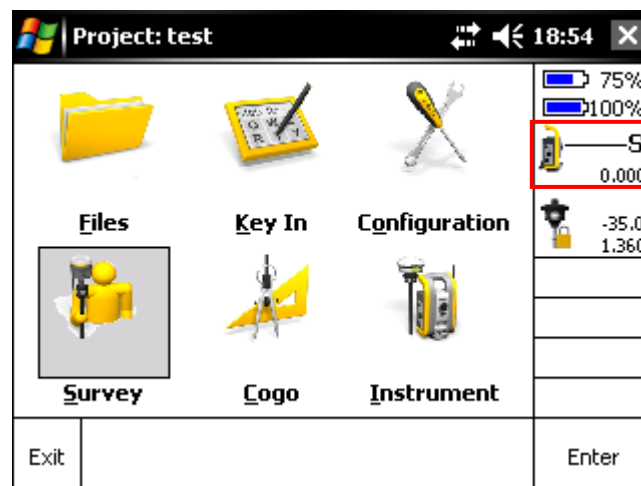






The menu **Cogo** is not allocated to any function.

If the controller is connected to an instrument the current instrument state and settings are displayed in the upper right part of the window and can be changed by clicking on this window part.



During the connection process a bar will show up in the lower part of the window and show the progress of the connection. Later on the angle values will be displayed here.

Directly after a successful connection a dialog with the currently valid station information (-> p. 50, Context menu Survey) will be displayed automatically.

Beside that the instrument will be switched into *Autolock* mode.

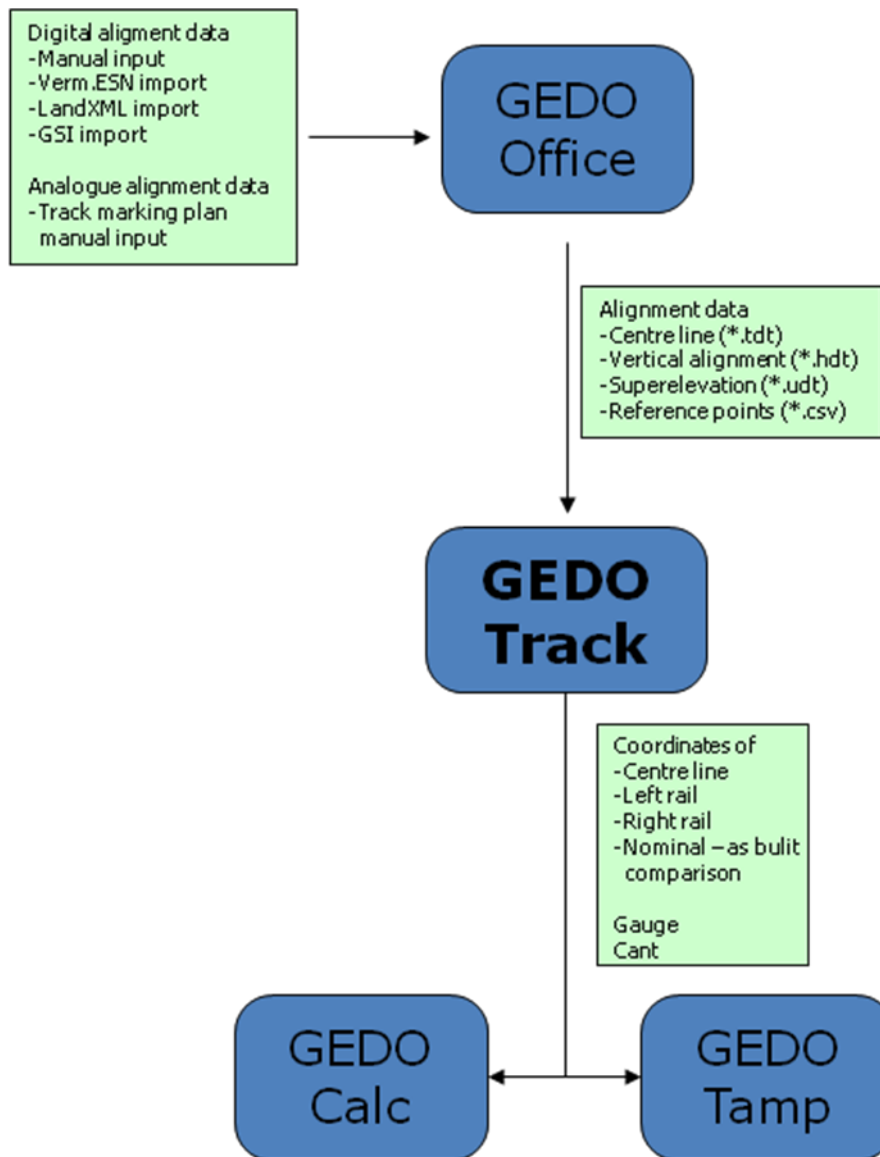


## 7 The Typical Workflow

In this chapter a typical workflow will be shown. In most instances the workflow will be the same as the following.

1. Create a new project (Chapter 9.1)
2. Select the line data (Chapter 9.3.1)
3. Choose or create a new measurement file (Chapter 9.3.2)
4. Link the reference point file to the project (Chapter 9.3.4)
5. Place the trolley onto the railway
6. Calibrate the inclination sensor (usually done by measurement in two faces) (Chapter 11.1.1)
7. Calibrate the gauge sensor (Chapter 11.1.2)
8. Connect the system to the total station
9. Stationing the total station either on a known point or a free stationing (Chapter 13.1)
10. Start measurement (Chapter 13.3)
11. Measure and save points
12. End measurement
13. Export points into the desired format (Chapter 9.5)
14. End program

## 8 Data flow



## 9 Context Menu Files

### 9.1 Dialog New Project

By using the text box *Project name* the user can enter any project name except “Trolley”.

Further the settings for Norm gauge, Cant base and Reference system for alignment has to be defined as base for all calculations. Template is always the values from previous opened project.

By pressing *Accept* the new project will be created in the project directory. If the project already exists, the user will be prompted to overwrite this project.

New project		09:50
<b>Project name:</b>	<input <="" input="" type="text" value="?"/>	AC 100%
Norm gauge:	<input type="text" value="1435.0mm"/>	S 0.000
Cant base:	<input type="text" value="1500.0mm"/>	-35.0 0.000
Reference system:	<input type="text" value="DB-Norm"/>	
Esc		Accept



## 9.3 Project settings

### 9.3.1 Alignment data

#### 9.3.1.1 Lines

In the line data screen the line data is assigned to the project. Choose the respective data in the dropdown menus for the horizontal alignment (\*.tdt), the chainage alignment (\*.tdt), the vertical alignment (\*.hdt) and the cant alignment (\*.udt). The files are needed in GEDO format and must be located in directory “Gedo Data\[project name]\Alignment”.

Using the check boxes on the right side of the vertical alignment and the cant alignment, determines if the respective alignments are oriented using the chainage alignment, or not. If a chainage alignment is used its checkbox is checked automatically. In case there is no chainage alignment chosen, the check boxes are not shown.

To do the online calculation of the measurements with the GEDO Track system it is necessary to at least select a horizontal alignment, a vertical alignment and a cant alignment.

In addition to the alignments, a file for track widening (gauge extension) (\*.spa) in areas with tight curves and high speed switches can be chosen. In these areas the norm gauge will not be considered.

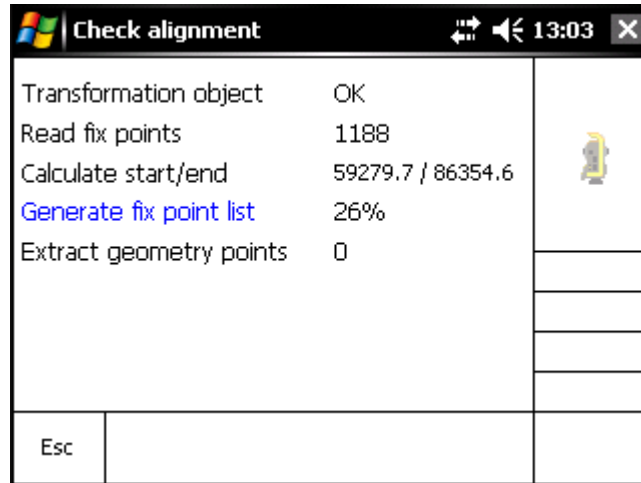
Further geometry file for precamber definition (\*.prc) can be selected. This allows to modify the vertical alignment with additional parabolic camber values which might be necessary during construction in bridge sections. Chainage information for precamber always needs to refer to horizontal alignment.

After selecting all necessary data, assure yourself if the selections are made properly by performing an alignment check.

Measurement				10:57
Horizontal alignment:		1435_UE_0,0		
Chainage alignment:		1435_UE_MAX-km	<input checked="" type="checkbox"/> Chainage reference: chainage alignment	
Vertical alignment:		1435_UE_0,0	<input type="checkbox"/> Vertical reference: chainage alignment	
Cant alignment:		1435_UE_0,0	<input type="checkbox"/> Cant reference: chainage alignment	
			<b>1/2</b>	
Esc	Check	Main Pts.	Accept	

### 9.3.1.2 Alignment check

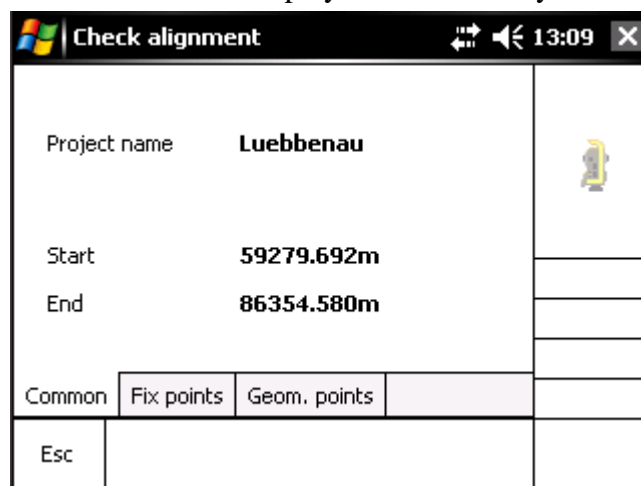
Pressing the *Check* soft key starts the alignment check procedure to check whether all alignment components are defined correctly.



In a first step a dialog show the calculation progress. It is divided into

- Read all alignment files and check for correct format
- Read all fix points that have been loaded in advance from a file (see ch. 9.3.4)
- Calculate start and end of alignment
- Convert all fix points to alignment based coordinates (chainage, lateral offset, vertical offset)
- Extract all geometry points from horizontal, vertical and cant alignment.

If the calculation process fails at some point, the whole process is cancelled. If the process was successful, the calculated results will be displayed automatically.



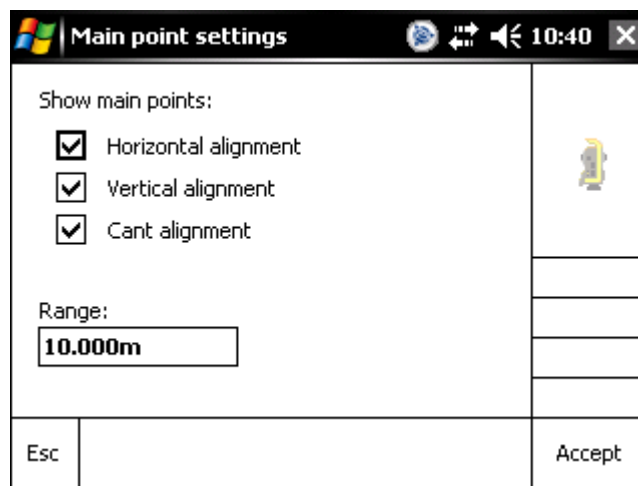
The three tabs show start and end of the project data. In that area the calculation will be possible during later measurements. Additionally, a list of all fix points and geometry points in that area are shown.

*Note: If the alignment is very long or the project contains a lot of fix points calculating and displaying takes a noticeable amount of time. By clicking the 'Esc' button the procedure can be stopped at all times.*

### 9.3.1.3 Main points

Pressing the **Main Pts.** soft key brings you to a new dialog window for the definition of the main point handling

Routing main points are the points on the route between two routing elements. GEDO Track can display the nearby main points during measurement. In this dialog window you can determine the displaying options.

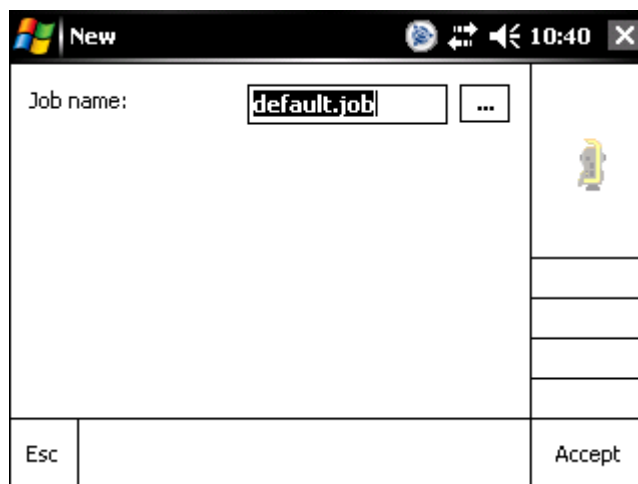


By checking the check boxes for Horizontal alignment, Vertical alignment and Cant alignment you determine for which alignment element the main points should be shown. Enter a Value into the Range input field to determine in what range from the last measured point a main point should be searched for.

### 9.3.2 Job File

Within one project file you can create any desired number of job files. In this way you can divide your project into smaller subsections. For example you can create an own file for every day of measurement. As so you can better organize the following computation.

A click onto the button [...] opens the *open file* dialog that opens existing files. This dialog is in function and appearance similar to the *linked files* dialog (p. 26).

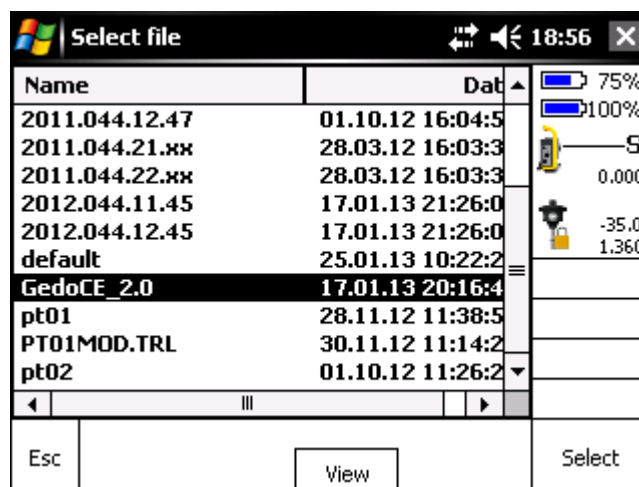




### 9.3.3 Measurement Trolley

A list shows all trolley definition files with their name and creation date. These files contain the geometric trolley parameters the scale and calibration values of the sensors as well as some communication parameters. The currently loaded trolley is highlighted if in the list. By clicking the *Select* soft key, the selected trolley file will be opened and loaded.

If a trolley of the latest generation shall be used, the list entry “GedoCE\_2.0” has to be selected. In this case the trolley parameters are stored directly on the trolley and no longer in a file.

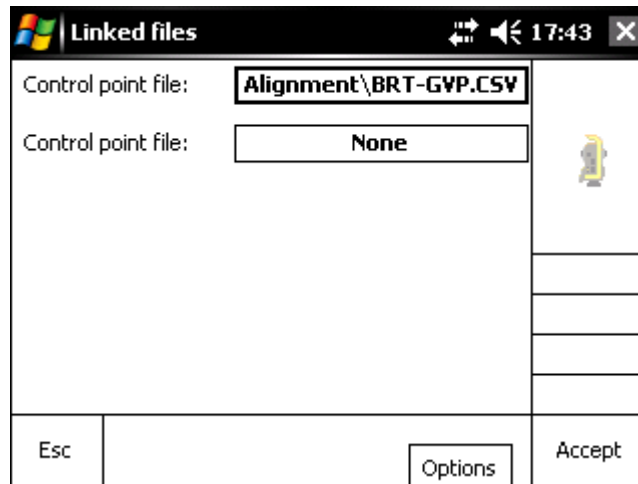


Using the *View* button displays the trolley file content in an external editor.

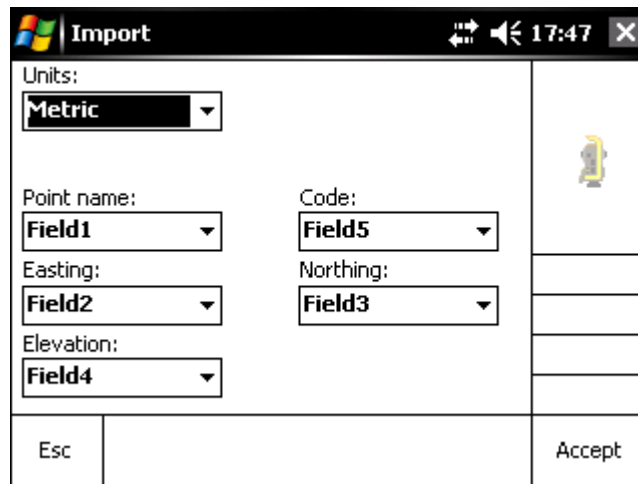
Attention: Editing a trolley definition file will lead to wrong measurement results!

### 9.3.4 Linked Files

Reference point files can be used for station setups and control point definition. As these files may have a certainly bigger size, they are not imported into the project but linked to the project instead. A maximum of two files can be selected parallel by selecting one of the files from a shown list. Only files with the ending \*.csv within the project folder are displayed.



By pressing one of the two buttons a select dialog will be opened where all the available csv files within the current project are displayed. The name of the currently linked file is displayed on the button as a text. Under *Options* the input file format can be defined.



The units (Metric, International Feet, U.S. Survey Feet) that the coordinates are given in can as well be defined as the assignment of all fields of the comma separated file. Up to six fields within one line can be dedicated to the respective information. If information is not included in the data set *Not used* can be selected instead of a field.

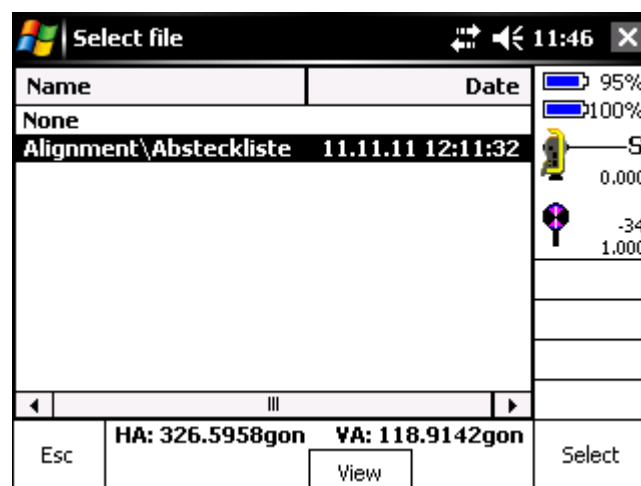
### 9.3.5 Stakeout file

The software also offers a stakeout functionality to mark points (without a trolley) in the field. Beside of alignment main points or an interval function points can be selected from an external file. The file must have the extension \*.txt and the following format:

- Point name
- Chainage
- Lateral offset from horizontal alignment
- Geometric reference of lateral offset (0: Horizontally / 1: Parallel to canted rails)
- Height above top of rail or datum face
- Geometric reference of height (0: Plumb-vertical / 1: Perpendicular on cant / 2: Plumb-vertical above datum face)

Field delimiter: comma

Decimal separator: point



With a click onto View you see the content of the selected file in an external text editor.

## 9.4 Point Manager

The point manager lists all stored points with their coordinates and code in chronological order. The source of this list is the \*.job file of the currently loaded project. By pressing the **Delete** soft key selected points can be deleted. These points are only deleted temporarily and will not be deleted permanently until the project is closed. Up to then the point will be displayed in red letters and can be undeleted by clicking the **Delete** soft key again.

Name	Easting	Northing	E
2001	999.553	2002.919	
2002	1001.239	2005.776	
2003	1002.932	2003.190	
1000	1000.000	2000.000	
1	1001.239	2005.776	
2	1000.864	2001.995	
3	1000.869	2001.990	
4	1000.869	2001.990	
Calib	?	?	
Calib	?	?	

Esc      Delete      Accept

Control point measurements are also displayed in green letters in the list.

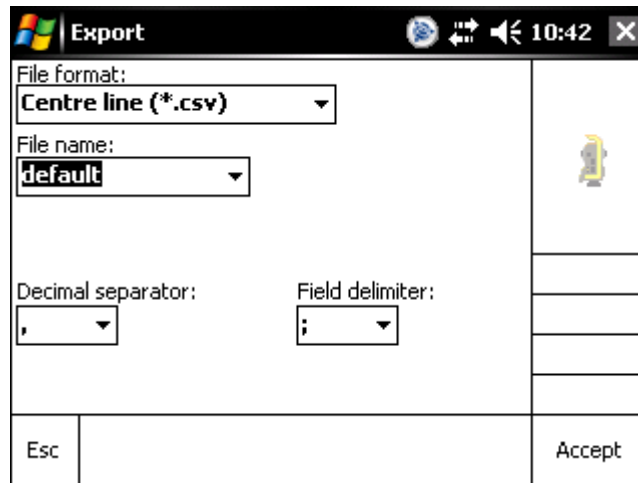
Topographical points (points outside the measurement line) are marked blue.

By pressing the **Accept** or **Esc** soft key the dialog is closed again.

***Note:** Within large projects containing a whole bunch of measured points using the point manager is not recommended because the loading and displaying of all points takes a noticeable period of time.*

## 9.5 Export

Using the Export dialog the user can on the one hand create the lines out of the collected data and on the other hand export these lines in the desired format for further processing. For example a comma separated format (\*.csv), a Zeiss-M5 format (\*.dat) and a Geodimeter format (\*.are) are available. This list will be extended consequently.



Before starting the export process, the file name has to be determined. By default the exported file has the same name than the project. Using the pull down menu you can choose a filename out of already existing files that can be overwritten. A status bar at the bottom of the screen shows the export progress. To ensure that no errors appear in further processing, the decimal separator and the field delimiter can be determined to match international standards.

To export topographical points the user has to select **TopoPoints** as file format. The data will then be exported automatically into a \*.csv format.

*Note:* The angle output format will be the one that is set within the program while the export process is executed and NOT the one that was set during the measurement!

## 9.6 Menu item Windows Explorer

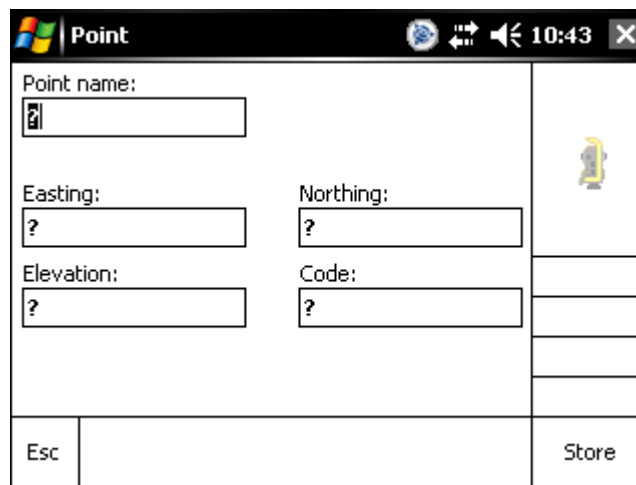
Pressing the Windows Explorer soft key opens the standard Windows CE explorer. Here you can move, rename and delete files.





## 10 Context menu Key In

### 10.1 Key in points

Additionally to the import functionality for reference points the user can add reference points manually to the project. These points can then be used for example for stationing or to defining a control point. These points will be stored inside the project file and not inside of the linked reference point file.



Point name: <input <="" td="" type="text" value="?"/> <td rowspan="5"></td>		
Easting: <input <="" td="" type="text" value="?"/> <td>Northing: <input <="" td="" type="text" value="?"/></td>	Northing: <input <="" td="" type="text" value="?"/>	
Elevation: <input <="" td="" type="text" value="?"/> <td>Code: <input <="" td="" type="text" value="?"/></td>	Code: <input <="" td="" type="text" value="?"/>	
Esc	Store	

*Note: Points may also be entered without elevation and/or code information.*

# 11 Context menu Configuration

## 11.1 Calibration

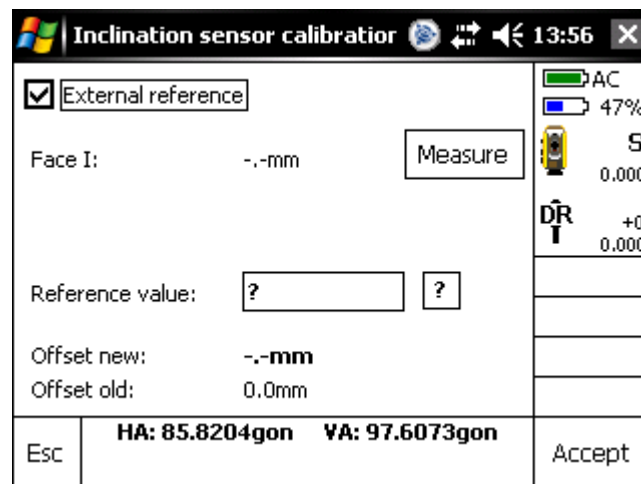
### 11.1.1 Inclination sensor

The inclination sensor is calibrated either by comparing the sensor value with an external reference value that is entered into the corresponding text box **or** by measuring the current inclination in two faces turning the trolley around.

#### 11.1.1.1 Calibration by external reference

If the checkbox 'External reference' is checked the calibration is done by entering a reference value.

*Note:* The reference value must be entered with a positive sign if the movable side of the trolley is on the higher rail and the fix side is on the lower rail. Otherwise the sign must be negative.



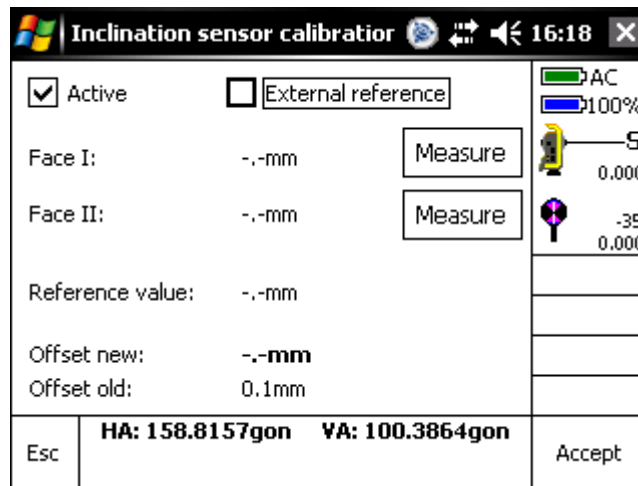
By pressing the soft key **Measure** the current sensor value is read out including the currently valid calibration and presented as current value. The default value, for example the value determined by a track rod will be entered in the provided field and therefore the new offset is calculated. **Accept** saves the new offset into the corresponding configuration file.

After re-entering the dialog and pressing Measure the current sensor value must correspond to the previously entered reference value. This is a sign that the calibration procedure was successful.



### 11.1.1.2 Internal calibration

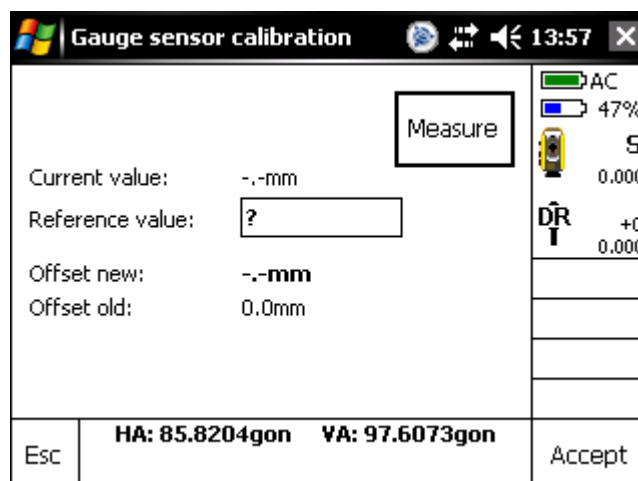
By pressing the soft key *Measure* in face I the current sensor value is read out including the currently valid calibration and presented as current value. This must be repeated now turning the trolley around and pressing the *Measure* button at face II. The software now calculates the average value and therefore the new offset is calculated. Pressing *Accept* saves the new offset into the corresponding configuration file.



*Note:* If no sensor value can be received, this may have several reasons: The sensors get no or insufficient power (check the batteries, turn on the box), the wrong serial port is selected or the port parameters are wrong, the Bluetooth connection has a poor reception or is not setup correctly (terminate program, check settings of the operating system).

### 11.1.2 Gauge sensor

The dialog for the gauge sensor calibration is identical to the inclination sensor calibration in layout and functionality. However calibration always needs to be done with an external reference value.

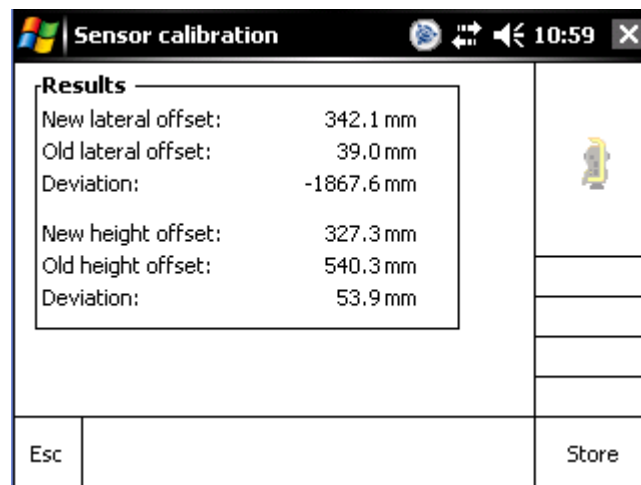


### 11.1.3 Profile sensor

The profiler is mounted easily in the middle of the trolley. The mechanism usually is very stable and the repeatability after dismounting and remounting again is less than 0.5mm. Therefore it is not necessary to calibrate the sensor after every remounting. Only before the first usage or after loss of the calibration file the calibration should be redone.



#### 11.1.3.1 Profile measuring unit for GEDO CE 1.0

After the profiler is mounted correctly and connected to the controller the calibration procedure can be started. Therefore the calibration plate is mounted onto the prism holder above the fixed trolley side. Target with the laser pointer the calibration plate and press the **Measure** button. Now the plate is mounted on the movable side and likewise the laser pointer is targeted at the calibration plate. After the **Measure** button is pressed again the result screen is displayed. This dialog shows the new as well as the previous lateral and height offsets. Pressing **Store** will save the settings permanently in the configuration file. **Esc** will cancel the calibration process.



#### 11.1.3.2 Profile measuring unit for GEDO CE 2.0

After the profiler is mounted correctly and connected to the controller the calibration procedure can be started. Besides settings for track geometry have to be right and calibration of gauge sensor has to be checked.

Profiler calibration			 16:52	
Top direction:	-.-		Measure	
	gon	m		
Face I:	-.-	-.-	Measure	
Face II:	-.-	-.-	Measure	
Value new:	-.-			
Value old:	29.2325gon			
Esc				

Roughly current orientation of profiler has to be defined after positioning the trolley in the track. Therefore measure with laser at the zenith (straight up, perpendicular to superelevation).

For calibration a point next to the track has to be chosen. It has to be clear to target with the laser. The distance to this point should be at least in the same distance like all other points, which should be documented with the profiler. For calibration accuracy a minimum distance of 2m is required. Furthermore, the direction needs to be different than the profilers' axis, so that the measurement orientation varies at least 5gon from top of the rails parallel horizon and its perpendicular. Measure the appropriate calibration point with current orientation of trolley in face I. Afterwards trolley has to be turned around 180°, laser focused the same target and stored as face II. The dialog shows the new orientation which can be compared with the previous one. Pressing **Store** will save the settings permanently in the profiler. **Esc** will cancel the calibration process.

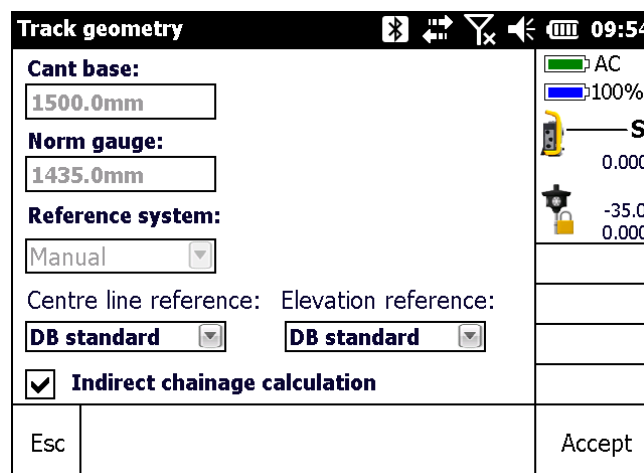
#### 11.1.4 Rail inclination sensor

The dialog for the rail inclination sensor calibration is identical to the standard inclination sensor calibration in layout and functionality. An additional combo box lets you select whether the sensor at the fix trolley side or at the movable trolley side should be calibrated. The calibration can only be done in two faces. The input of a reference value is not possible.

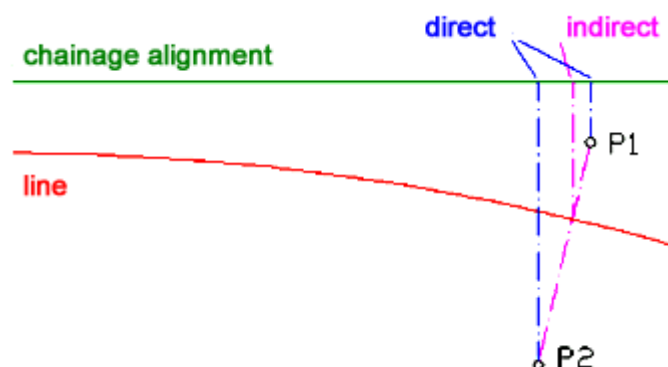
## 11.2 Track geometry

The standard values for the given track are displayed in this dialogue. These parameters are the cant base to convert the inclination angle into a millimeter value, the norm gauge and the reference system for center line and gradient. All values are shown in millimeters.

These values are already set during the project definition and can only be changed for project created with previous versions and having definition until now. If project was created with reference system manual, center line reference and elevation reference can always be changed here individually.

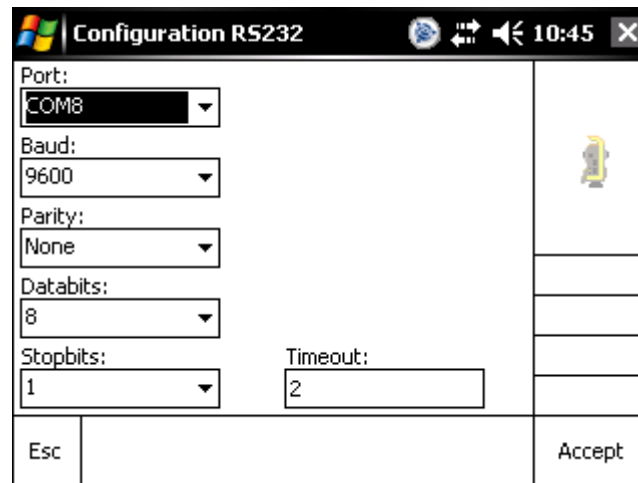


Beside the cant base and the norm gauge it has to be set, if the calculated chainage for the measured points refer directly or indirectly to the chainage. Using the indirect calculation the measured point is first calculated into a line point. Then it is plumbed onto the chainage line. See the picture below for a descriptive image.



## 11.3 Ports

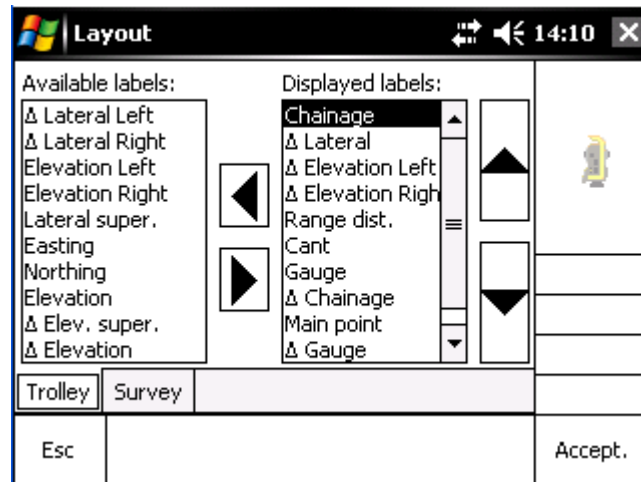
The communication with the sensors can be realized by both a cable connection through the physical port (COM1) of the TSC2 and a preconfigured Bluetooth virtual port (COM8 or COM9). Accordingly choose the desired port setting in this dialog. Apart from that the timeout can be set also. The other parameters should not be edited because the sensors are adjusted to these settings.



In addition the port of the profiler (see chap. 13.9 Profile measurement) and an additional lateral display can be edited. This just concerns the port name. Beside this the sensor may be activated and deactivated as well.

## 11.4 Layout

In this dialog window you can set which labels are shown in the results screen during measurement (see chap. 13.4). In the results screen it is only possible to show four values at once. If you choose more than four labels for the result screen, you can see the next set of values by using the page buttons at the bottom of the screen.



To get the labels to be displayed in the result screen, they have to be arranged under the heading „Displayed labels“. The order of the label names in this list reflects the order of the labels that are shown in the results screen. The order of the labels can be edited by using the „up“ and „down“ buttons on the right side of the screen.

The “Survey” tab sets the label order for the stakeout screen.

The settings for displayed labels are stored individually for each project. Template for a new project will always be the definition of previous opened project.

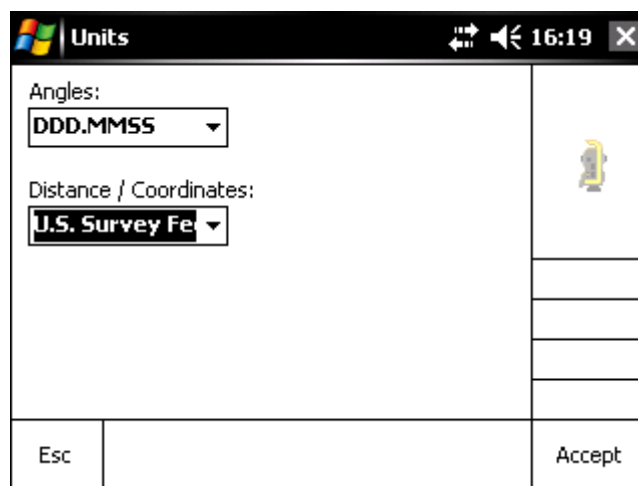
## 11.5 Units

The visualization and export format of any angle value can be selected between

- DDD.dddd    decimal degrees
- DDD.MMSS    degrees, minutes, seconds
- Gon          decimal gon

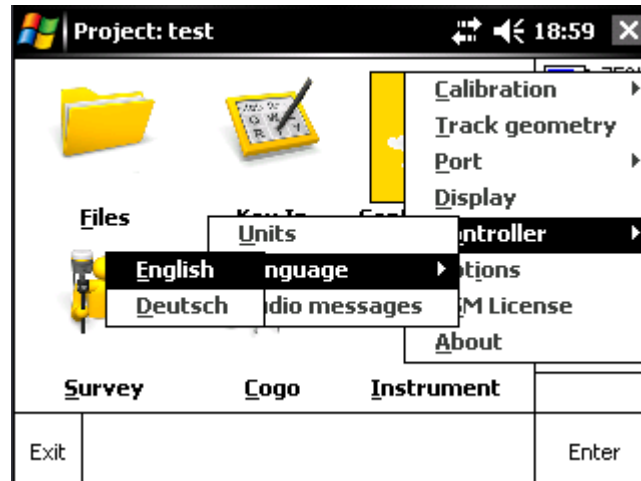
The visualization and export format of any distance or coordinate value can be selected between

- Metric                  Metric system
- Internat. Feet          International feet
- U.S. Survey Feet      The length of a foot as used in U.S. Land Surveying



## 11.6 Language

Choose between the available language files to display the menus and the description in your language.



Other language files need to be placed in program directory *GedoTrack\Languages* to have the option available for selection.



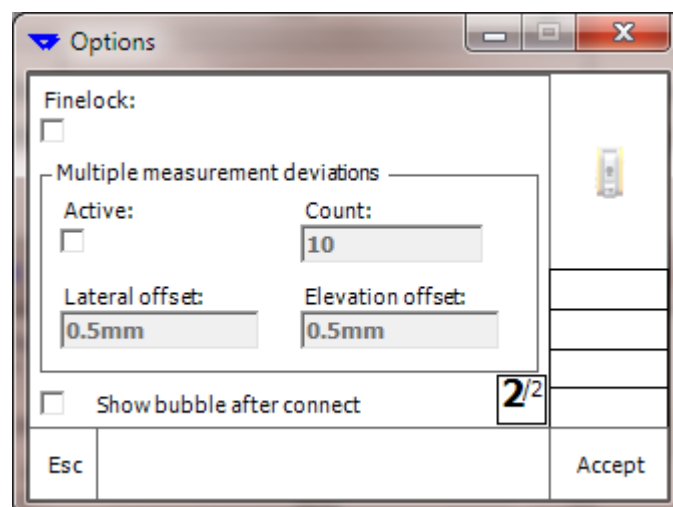
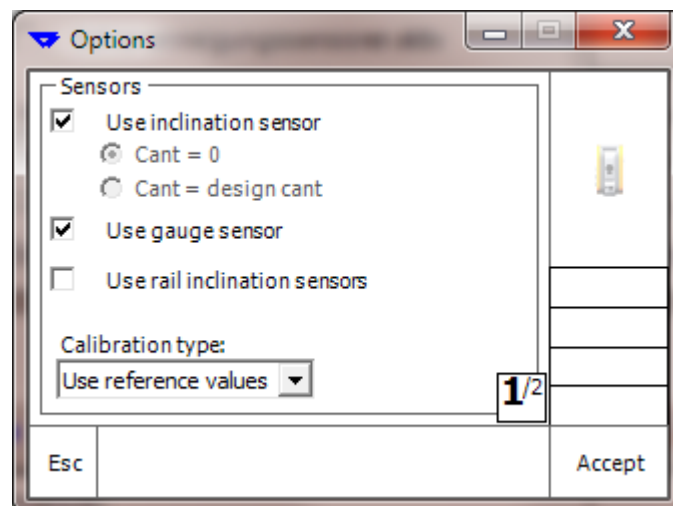
## 11.7 Options

In this dialog the sensors can be activated respectively be deactivated if this is necessary for some case of application. If you deactivate the inclination sensor, you may select what is used as default value instead:

- Cant value is always Zero
- Cant value is the reference value at that chainage from the design data.

If you deactivate the gauge sensor, the value that was entered in the track geometry dialog is used as the sensor value.

If both values are deactivated the software runs in “No sensors mode”. For the measurement no trolley is required and it is assumed that a prism rod is used instead. All calculations will be done plumb-vertical in this mode. A special license is required for that option.



Additionally, the Finelock functionality may be enabled instead of the Autolock functionality. This may be sensible if several prisms are located very close to each other. But, the measurement procedure may take a bit longer in this mode.

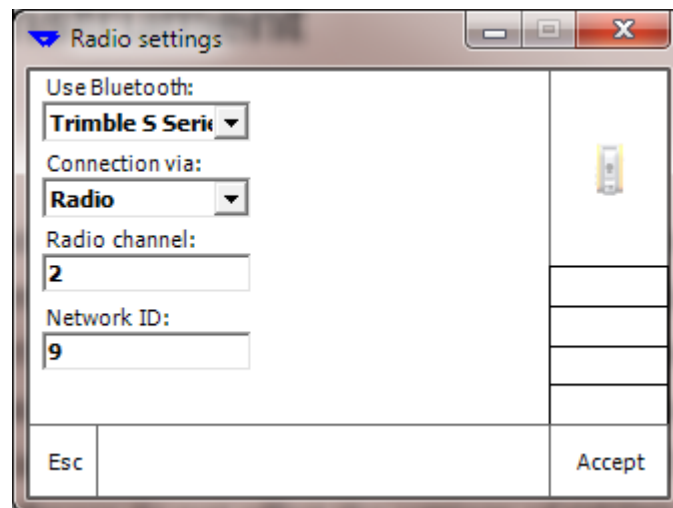
In case of strong sun shine, it may be necessary to carry out multiple measurements instead of only one to statistically improve the measurement quality. The previous  $n$  measurements will be used to calculate an average result. If a Trimble S8 is used in 10Hz mode, then the averaging of 10 values would equal 1 second of measurements. If the calculated standard deviation is less than the given standard deviation then green squares will indicate this in the measurement screen. If not, the squares will be red and the user has to explicitly decide that this measurement should be stored, anyway.

Additionally, it may be selected that the electronic bubble is displayed automatically each time the connection to a total station was successful.

## 12 Context menu Instrument

### 12.1 Radio settings

The communication with the instrument is normally done by using the internal radio of the controller or in case of a laptop the external 2.4GHz Trimble radio. Despite from that USB, Bluetooth or serial connection may be used instead. If using a radio, it is necessary to set the correct radio channel and network ID before connecting to the instrument. The current settings can be seen and/or edited by using the instrument's 2<sup>nd</sup> face display. Incorrect settings make it impossible to connect to the instrument. The settings made within the Trimble Access software do not affect the settings of GEDO Track.



Press the **OK** soft key to accept the settings.

*Note: The parameters are only editable if not connected to the instrument.*

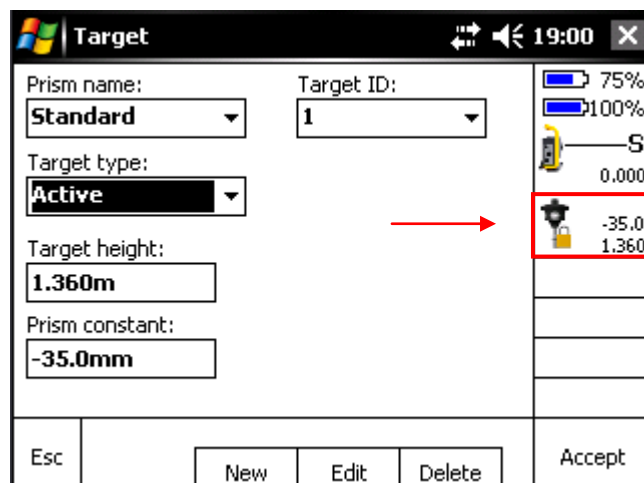
## 12.2 Target settings

This dialog can be accessed either through the main menu or by clicking on the marked part of the status panel.

Three parameters are editable for the following measurements: the prism type, the target height (in meters) and the prism constant (in millimeters). The point of origin for the target height is the plane on the trolley pole where the prism is mounted. The rest of the height from the top of the rail is part of the trolley geometry and therefore stored in the trolley file.

Available prism types are:

- Passive (no ID) - if a standard prism is in use
- Passive (with ID) - standard prism with TargetID (will only be used when searching for a prism)
- Active - Trimble MultiTrack® Prism



By clicking the *New* soft key a new prism definition can be added to the list. The name must not be equal to an already existing prism. The *Edit* soft key makes it possible to change the name of a prism additionally to target height and prism constant. *Delete* removes a prism from the list. Press *Accept* to apply the settings.

*Note:* A prism with the name „**DR**“ can neither be deleted nor has its name changed. It will be selected automatically when the DR mode is activated.

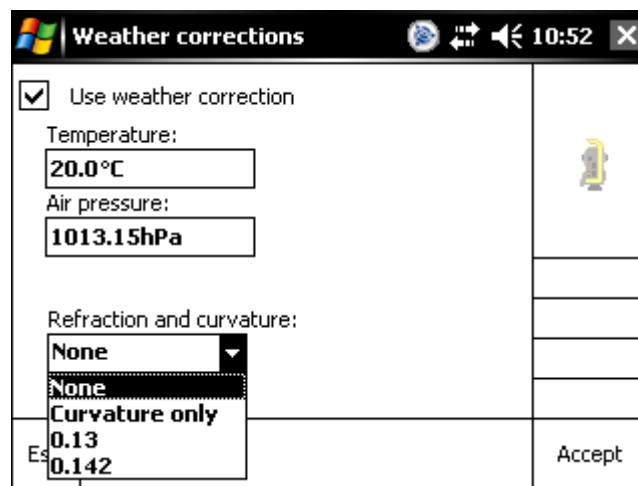
The prism definitions are stored independently of the project and therefore are also available when a new project is defined.

## 12.3 Weather corrections

The parameters for evaluation of the ppm value from atmospheric influences are determined in the dialog window *Weather corrections*.

The temperature has to be entered in degree Celsius and the air pressure has to be entered in hectopascal. If the option '*Use weather correction*' is activated, the measured slope distance will be corrected by the calculated ppm value.

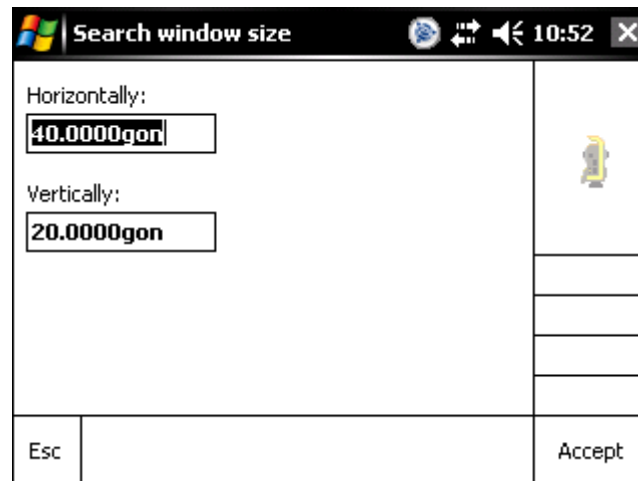
Besides the influence of the temperature and the atmospheric pressure, it is possible to apply corrections caused by refraction and curvature. There are two calculation models at choice; a refraction coefficient of 0.13 and one of 0.142. It is also possible to only use the curvature to correct the slope distance.



Press the *Accept* soft key to accept and save the changes.

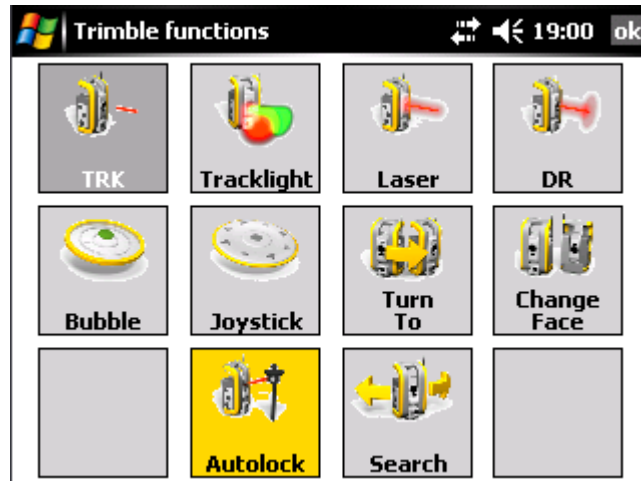
## 12.4 Search window

If a search is started, the instrument starts scanning for a prism in a defined window. The size of this window can be edited in this dialog by indicating the horizontal and vertical component of the search window in gon.



## 12.5 Trimble functions

This dialog is almost identical to the one in the Survey Controller software. It controls the instrument's functions. It is as well as the target settings dialog available through the main menu and the status panel.



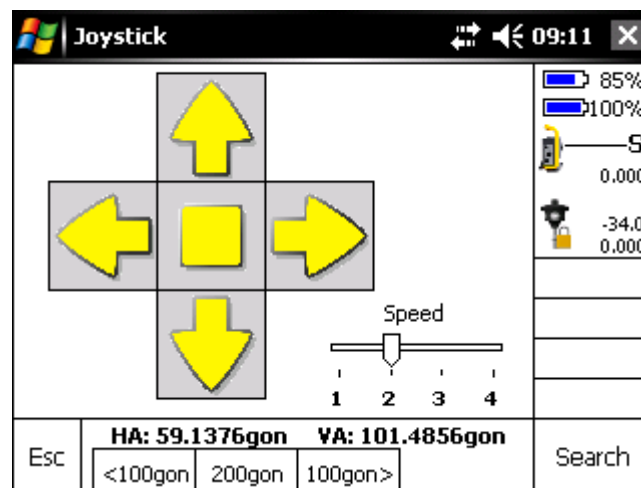
The buttons and their functionality:

<b>TRK</b>	Switch between tracking- und standard measurement mode
<b>Tracklight</b>	Tracklight on/off
<b>Laser</b>	Laser pointer on/off (automatically switches to DR mode)
<b>DR</b>	Switch between prism mode and reflectorless measurement mode
<b>Electronic Level</b>	Shows the compensator values in a circular level
<b>Joystick</b>	Turns the telescope into any desired direction
<b>Turn to</b>	no function
<b>Change Face</b>	Change face
<b>Autolock</b>	Autolock on/off
<b>Search</b>	Starts a prism search in a defined search window symmetrically around the momentary telescope position. If a target id is defined then only the corresponding prism will be found.

## 12.6 Joystick

This dialog controls the movement of the telescope. It can be turned at a defined speed level. If an arrow button is pressed the telescope moves into the corresponding direction. The user can also use the joystick keys on the controller instead of the soft keys. Therefore the joystick must have the focus and not the sector size slider. For guidance with the keyboard instrument will turn during the joystick button is pressed and stop its movement when button is let go. Pushing a direction on the display will start the movement and a click onto the button in the middle of the cross will stop the movement.

The soft key *Search* starts a prism search in the designed search window.



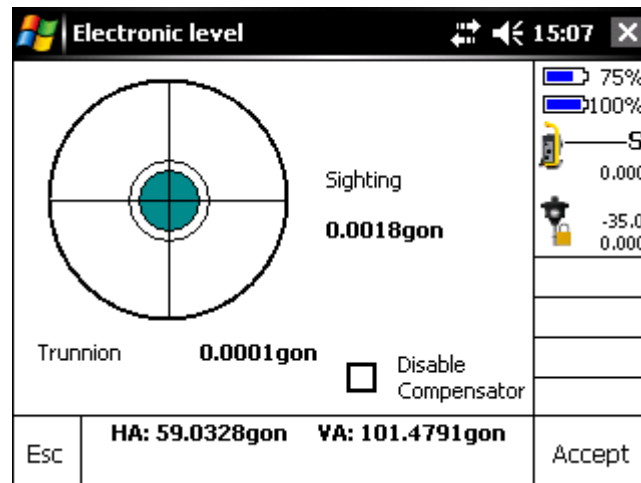
With the help of the soft keys below it is possible to turn the telescope by 100gon to the left or to the right or by 200gon.



## 12.7 Electronic level

In this dialog field it is possible to view the current compensator values. The deviations values are shown as numerical values and by a graphical circular level.

The compensator of the total station can be deactivated by ticking “*Deactivate compensator*“. However, it is not recommended to deactivate the compensator.



Pressing the “*Accept*” soft key applies the settings. Return to the main menu with “*Esc*”.

## 13 Context menu Survey

### 13.1 Stationing

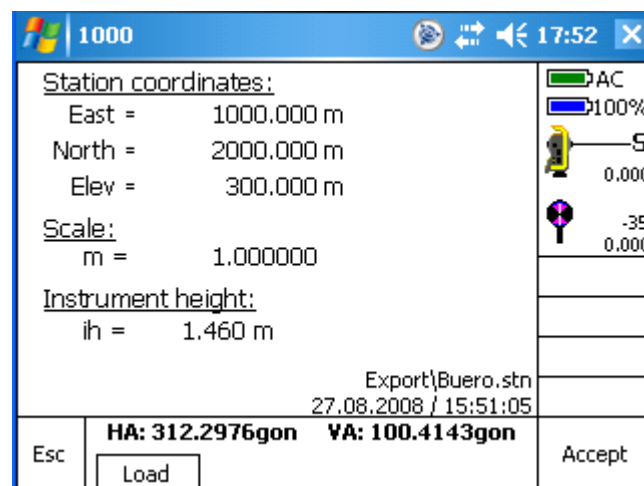
#### 13.1.1 Stationing from Trimble Access file

In this dialog a station setup from Trimble Access can be imported. The last station setting will be found, that was measured within the Trimble Access software and that has been exported using the right style sheet ("*Station report*") in a text file with the extension \*.stn. The stationing details that resulted from the latest Trimble Access positioning will be shown.

*Note:* Once the station info is loaded the currently used stationing will become invalid. It is not possible to undo this process again!

The positioning coordinates, the scale and the instrument height are displayed. Furthermore, the position number is shown in the menu bar of the program. All these parameters cannot be edited any more in GEDO Track and may be changed only by carrying out a new stationing.

To check if the correct file has been loaded, the software displays the stationing information as of the name of the file, the creation date and time.



*Note:* The software will always load the latest stationing file. Therefore it is recommended to have the system date and time adjusted to the correct time and date. After a reset the system clock may no longer show the correct values!

### 13.1.2 Stationing from station buffer

If the instrument has an internal station buffer the result of a stationing, done according to chapter 13.1.3, is stored on the instrument automatically. Using the import function, the stationing could be used with a different controller. This is very helpful for measuring with two instruments for more productivity.

Just like import from Trimble Access file information of station (coordinates, scale, instrument height, date and time of storage) are displayed. The station name is in the headline of the program. All parameters cannot be edited in GEDO Track and will be overwritten only with new stationing.

2000		
<u>Station coordinates:</u>		53%
East =	4380800.5890m	76%
North =	5517978.1020m	<b>S</b>
Elev =	253.9090m	0.000
<u>Scale:</u>		+0.0
m =	1.000000	0.000
<u>Instrument height:</u>		
ih =	0.0000m	
26.06.2014 / 08:57:38		
Esc	<b>HA: 85.8437gon VA: 100.4755gon</b>	Accept

### 13.1.3 Stationing on a know Point / Resection

GEDO Track comes along with a stationing routine allowing the user to choose between stationing on a known point and a free stationing. The procedure, however, is the same for both types.

In the start-up screen the user has to enter a station name and the instrument height. If you are stationing on a known point the entered name must be listed in the reference point list.

If the check box **Compute station height** is active the software will calculate the height out of measurements to reference points, otherwise height given in linked file will be used. **Instrument height** is describing the distance between the instrument's trunnion axis (top mark) and the ground marker. This can be typed in directly as true height or as measured slope distance to the bottom of notch. If bottom of notch is selected the software automatically calculates the true vertical height when changing to next dialogue and displays the calculated value for instrument height.

Known Station		12:58	
Instrument point name:	Code:	35%	61%
9001 (FP) ...	10	S	0.000
Instrument height:	Height reference		
0.000m	True height		
Compute station height:			
<input checked="" type="checkbox"/>			
HA: 47.9545gon VA: 103.6215gon			
Esc	Options		Accept

Fix point can also be selected using the list with button [...]. The list displays chainage, delta lateral and delta height value of the reference point by transformation to the linked alignment data. Further the points can be sorted by their details.

Name	Type	Chainage ▲	Lateral	Height
9001	FP	1000,000	0,000	-0,007
3	FP	1000,954	-3,156	-0,530
2	FP	1001,643	1,821	0,017
1	FP	1004,659	0,000	-0,007

Esc.
OK

In the Options the user can select if the station should be calculated with or without a scale. If you select calculation the station without a scale, the scale is set to 1.000000 automatically.

The only available resection type at the moment is the Helmert resection based on coordinates.

**Face order** defines if rounds to several targets are measured only in one face, all targets first in first face then in second face backwards or each target is measured in both faces directly (F1 only, F1...F2, F1/F2).

The **observation order** defines if all targets in each round are measured in the same order in both faces or in the opposite way in second face (123...123 or 123...321).

The **number of rounds** may be specified as well. The number must be between 1 and 50.

Normally, the points available for a stationing are fix points linked from a file or entered manually. But sometimes it may be necessary to use measured and stored topographic points or previous station setups (from resection) as well. If the respective check boxes are checked then station setups will be added to the point list marked as SP. Topo points are shown with label TP, Stakeout points with AP and Normal fix points are marked as FP.

Options	
Scale factor type: <b>Fixed</b>	Scale factor: <b>1.000000</b>
Face order: <b>F1... F2...</b>	Use as backsight: <input type="checkbox"/> Station setups <input type="checkbox"/> Topo points <input type="checkbox"/> Stakeout points
Observation order: <b>123... 321</b>	Number of rounds: <b>1</b>
<b>HA: 384.1743gon VA: 103.0940gon</b>	
Esc	Accept

After all settings have been made and the user continues to the next dialog he has to enter the point name of the first target. The point can also be chosen from the reference point list. *Method* defines if the point is measured with or without distance measurement (and therefore may be used only for orientation calculation). Press *Measure* to start the measurement.

Target - Face 1		07:28	
Point name:	Code:	AC	73%
3 (FP)	13	S	0.000
Method:		-35.0	0.000
Angles and distance			
Target height:	Azimuth (computed):		
0.000m	318.0677 gon		
HA: 277.9961 gon VA: 94.8892 gon			
Esc	Options	Measure	

If the stationing type is “on a known point” the *Residuals dialog* will come up automatically after the first successful measurement. If the stationing type is set to “free stationing”, an additional reference point has to be measured before the residuals dialog is displayed.

The residuals dialog shows the residuals for each reference point measurement. The user can switch between two displaying types:

- The differences of raw measured angles and distance values
- Coordinate differences delta East, delta North and delta Elevation

Apart from that the calculated or fixed scale is displayed in the lower part of the window constantly

Residuals				10:21	
Name	ΔHA	ΔVA	ΔSD	AC	61%
3	-0.0209...	0.0011...	0.001m	S	0.000
1	0.0114...	-0.0008...	0.001m	-35.0	0.000
Δ HA VA SD					
Fixed Scale: 1.00000					
Esc	+ Point	End face	Details	Options	Results

Using + **Point** adds an additional observation to the list of measured points. Therefore the measurement dialog is displayed again. It is not possible to add an already used reference point to the stationing unless it is previously deleted (see **Details**).

**End face** starts the automated round measurement as set in the **Options** dialog. After completing the round measurement, the residuals dialog is shown again.

The **Details** soft key shows the dialog shown below, showing details of the respective point in the list. Target height and prism constant can be edited. The point can be deactivated or it can be set to be used as an elevation point (1D), only for orientation (2D) or it can be used for both (3D). The point can also be deleted. On page 2 of this dialog window the current standard deviations are displayed.

Point		10:22	
Point name:	Code:	AC	61%
<b>1</b>	<input type="text" value="11"/>	S	0.000
Use:	Used for:	-35.0	0.000
<input type="text" value="Yes"/>	<input type="text" value="3D"/>		
Target height:			
<input type="text" value="0.000m"/>			
Prism constant:			
<input type="text" value="-35.0mm"/>			
Esc	HA: 384.1742gon	VA: 103.0939gon	Accept
		Delete	

After all measurements are made and the points are activated or deactivated correctly the user can use the **Results** button in the **Residuals dialog**.

Station results		10:23	
Point name:	Code:	AC	61%
<b>9001</b>	<input type="text" value="10"/>	S	0.000
Easting:	Northing:	-35.0	0.000
<b>1000.1921m</b>	<b>1999.9383m</b>		
Elevation:			
<b>99.9263m</b>			
Scale:	Orientation correction:		
<b>1.000000</b>	<b>13.2255gon</b>		
Standard errors			
Esc	HA: 35.3237gon	VA: 100.7177gon	Store

Station results		10:23	
σ East:	σ North:	AC	61%
<b>0.0008m</b>	<b>0.0008m</b>	S	0.000
σ Elevation:	Mean point error:	-35.0	0.000
<b>0.0004m</b>	<b>0.0012m</b>		
σ Scale:	σ Orientation correction:		
<b>?</b>	<b>0.0146gon</b>		
Esc	HA: 35.3236gon	VA: 100.7178gon	Store

The software now displays the results of the stationing as of the coordinates of the total stations position, the orientation correction and the station scale. On page 2 you can see the standard deviations for the calculated values. The mean point error is displayed as well.

Press the *Store* button, if the stationing is alright. If the instrument has an internal station buffer the result of a stationing will be stored on the instrument automatically as well. After the stationing is stored, the program returns to the main menu and the standard measurement can be started.



## 13.2 Control point measurement

### 13.2.1 Define control points

To check if the orientation of the instrument has changed during the measurement a number of points can be defined as control points. Measuring these control points every few minutes, shows if there were changes in the orientation. These points can either be imported reference points that can be selected in the reference point list or completely unknown points. After entering a point name in the corresponding text field and setting the target height the **Measure** soft key performs a measurement and stores the coordinates of the point as a reference measurement. After the measurement the coordinates are displayed as information. When remeasuring a reference point the coordinate differences are displayed as well.

Control point measurement		09:33
Point name:		AC
1 (FP)		71%
<b>East</b>	<b>1000.0000m</b>	S
dEast	0.0000m	0.000
dLong	0.0013m	-35.0
<b>North</b>	<b>2004.6577m</b>	0.000
dNorth	0.0013m	
dLat	0.0000m	
<b>Elev</b>	<b>99.6964m</b>	
dElev	0.0006m	
Esc	<b>HA: 384.1741gon</b>	<b>VA: 103.0944gon</b>
	Turn	Store

By pressing the **Turn** soft key you can turn the instrument automatically towards a selected reference point.

### 13.2.2 Check control points

As soon as at least one definition measurement is available, the point can be remeasured using this dialog. By pressing the *Measure* soft key the telescope automatically positions itself directing towards the prism, targets the prism and start the measurement. The target height for the control measurement will be set to the same height that has been set for the definition measurement. When you exit this dialog the prism settings will be readjusted to the previous values.

Control point measurement				13:03	
Point name:				AC	
1				24%	
				S	
				0.000	
				-35.0	
				0.000	
dl	0.0004m	dEast	-0.0001m		
		dLong	0.0000m		
da	-0.0002gon	dNorth	0.0000m		
		dLat	-0.0001m		
dq	0.0000m	dElev	0.0000m		
Esc		<b>HA: 384.1747gon VA: 103.0942gon</b>		Store	

The results are displayed in the next dialog and are stored immediately. The following results are displayed.

- the slope distance deviation **dl**,
- the horizontal angle measurement deviation **da**,
- the orthogonal offset **dq**,
- the coordinate deviations (**dEast**, **dNorth**),
- the offsets in direction of a previously selected alignment in longitudinal and lateral direction (**dLong**, **dLat**)
- the height deviation **dElev**.

By pressing the *Store* soft key the results are stored in the project file. As long as the currently used station is valid the control points can be remeasured, even if the project or the application was closed for any reason.

### 13.3 Single measurement survey

This dialog is used to measure single points. The user can decide if he wants to measure in standard or in tracking mode. The program checks the serial port settings when it is opened. If a port is invalid or unavailable, the dialog cannot be opened.

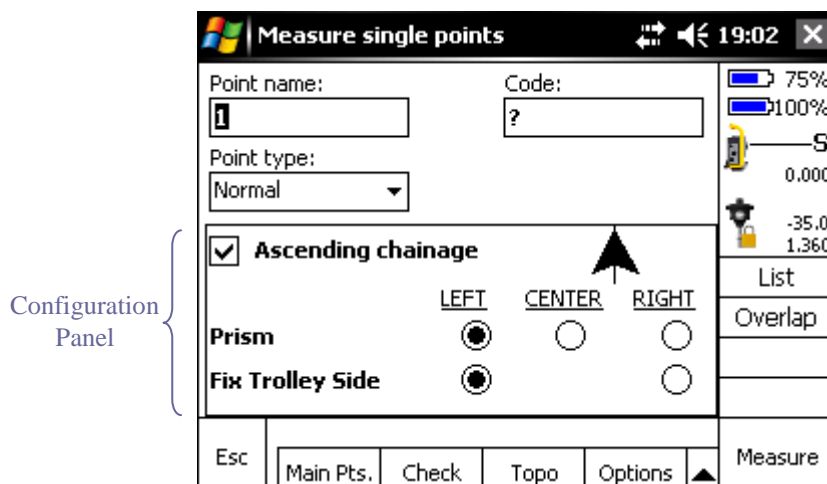
At the start of every new measurement the name of the current measurement line, the point name and code have to be entered into the designated text fields. Make sure that the target height and prism constant have been entered correctly.

Before starting a measurement the trolley-track configuration has to be set up. Therefore the user has to define:

- The position of the prism on the trolley (LEFT – RIGHT),
- The position of the fix trolley side (LEFT - RIGHT).

Additionally the user has to select whether he pushes the trolley in ascending or descending chainage direction. All definitions have to be made according to the moving direction indicated by the arrow.

These settings are extremely important for all following calculations. Wrong settings will cause incorrect results! The prism adapter in the center position is only available if a GedoCE\_2.0 trolley type is in use. But this position cannot be selected within GEDO Track. Further with this trolley type prims side is always the fix trolley side.



The **GHP** soft key opens the Main point info dialog (Ch. 13.7)

The **Check** soft key starts the control point measurement (Ch. 13.2.2)

The **Topo** soft key starts a topographical measurement off the track (Ch.13.6)

The **Options** soft key opens the options dialog (Ch. 13.5)

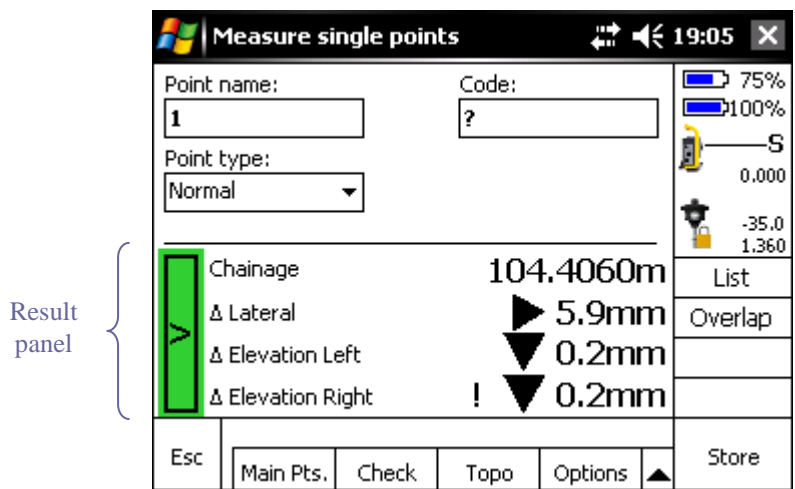
The **Profile** soft key starts a measurement with the Profiler using last stored point as reference (Ch. 13.9.1) (using ▲ soft key)

The **Laser** soft key switches on and off the Profiler’s laser pointer (via ▲-key)The **List** soft key displays a list with the last 10 stored points

The **Overlap** soft key opens the Overlap dialog (Ch. 13.8)

After all settings are made correctly the measurement can be started by pressing the **Measure** soft key.

The configuration panel will then be replaced by the result panel. By pressing the “>” soft key you can scroll through the predetermined labels (Ch. 11.4). The different labels are explained further down (Ch. 13.4).



Clicking the **Esc** soft key cancels the current measurement and brings up the configuration panel again. Clicking the **Store** soft key stores the point and brings up the configuration panel again. If the measurement mode is set to “tracking” the result panel will still be displayed and the next point can be stored right away. The cursor will in both cases automatically jump back to the code field.

If the > soft key shows a green background color this means that a main point is within the predefined range. Further information then is available through the **GHP** soft key.

The exclamation mark that either appears on front of the left or of the right height value indicates the current position of the height reference rail.

The selection of Point type (Normal, Pole and Constraint) only influences the later visualization in GedoTamp.

*Note: If the sensor values are not available, a point cannot be stored. In that case the sensor communication should be checked by using the sensor calibration (-> p. 32) dialogs.*

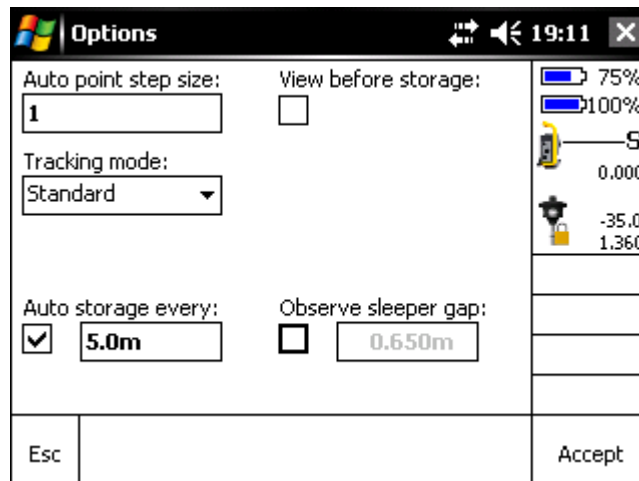
## 13.4 The different Labels

All available Labels are described here with their names and their meanings. They can be chosen to be displayed in the results screen during the measurement. Therefore see chapter 11.4.

<b>Chainage</b>	Chainage value [m] on the chainage line
<b>Chainage (local)</b>	Chainage value [m] on the horizontal alignment
<b>Δ Lateral</b>	Horizontal lateral distance [mm] to design position
<b>Δ Lateral canted</b>	Lateral distance [mm] to design position in the cant plane
<b>Δ Lateral Left</b>	Horizontal lateral distance [mm] from the left rail to design position
<b>Δ Lateral Right</b>	Horizontal lateral distance [mm] from the right rail to design position
<b>Δ Elevation Left</b>	Vertical height deviation [mm] referred to the left rail design position
<b>Δ Elevation Right</b>	Vertical height deviation [mm] referred to the right rail design position
<b>Δ Elevation</b>	Vertical height deviation [mm] referred to the current height reference rail [mm]
<b>Δ Elev. canted</b>	Height deviation between gradient and the rail head connection [mm]
<b>Range dist.</b>	Current distance [m] to the last saved point
<b>Cant</b>	Current cant value [mm]
<b>Δ Cant</b>	Deviation between the current cant and the designed cant [mm]
<b>Gauge</b>	Current gauge value [mm]
<b>Δ Gauge</b>	Deviation between the current gauge and the designed gauge [mm]
<b>Elevation Left</b>	(absolute) Height of the left rail over the reference plane [m]
<b>Elevation Right</b>	(absolute) Height of the right rail over the reference plane [m]
<b>Easting</b>	Ordinate within the reference system [m]
<b>Northing</b>	Abscissa within the reference system [m]
<b>Elevation</b>	(absolute) height of measured position [m] (reduced to ground for topo points)
<b>Main point</b>	Name resp. type of the next main point
<b>Δ Chainage</b>	Distance to the next main point on the chainage line [m]
<b>Rail inc. Left</b>	Inclination of the left rail in syntax 1: x
<b>Rail inc. Right</b>	Inclination of the right rail in syntax 1: x

## 13.5 Options

In this dialog advanced measurement settings can be made. The user can choose if and what size the automatic point step increment should be. Negative numbers correspond to a decrement and the value zero leaves the point name as it is.



The Tracking mode can be switched from *Standard* to *Precise* measurement mode. With that option selected when the user pushes the store button the tracking mode is automatically stopped, a single measurement is carried out, the point is stored and the tracking mode is started again. The distance measurement accuracy is therefore a little higher but on the other hand the measuring performance is lowered.

By using the checkbox “**View before storage**” the user can choose if the result of a measured point should be displayed before it is stored or if the point should be stored automatically without seeing the results. In tracking mode that leads to a temporary storage or “freezing” of the currently measured values. Only when the user again pushes the store button the point is stored for real.

The textbox “**Auto storage every**” sets the step size after which in cases of a continuous survey the point is stored automatically. If this option is enabled, the options *View before storage* and *Observe sleeper gap* will automatically be disabled.

When measuring slab track each sleeper needs to be measured. None must be forgotten. To avoid this, the gap between the previously stored point and the current point is observed and if the gap is smaller or bigger (tolerance +/- 0.15m) than the defined *sleeper gap* a warning message pops up whether the storage is done on purpose. The same happens when the gap between those two points is any smaller than 0.15m because that indicates the point is stored twice. This will create serious problems when doing the chord calculation afterwards with GedoCalc.

Use the *Accept* soft key to save the settings. Using the *Esc* soft key brings you back to the Main menu without saving.

## 13.6 Topo Points

Topographical points that are off the track can be recorded in this dialog. After entering the point name and code into the respective text fields a measurement can be started by using the **Measure** soft key. Analogical to the dialog for the single survey the results will be displayed after a successful measurement and the point can be stored. If the user changed the prism definition during the topographical measurement, the previously used definition is automatically loaded again on quitting the dialog with the **Esc** soft key. Topographical points have to be exported separately.

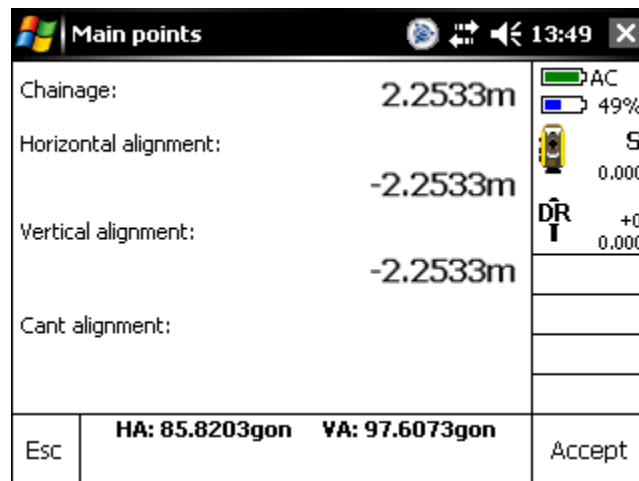
Topographical points are if possible transformed to the alignment and chainage and offsets are displayed. The label order cannot be customized in this dialog.

Measure topo		
Point name:	Code:	AC
<input type="text" value="2"/>	<input type="text" value="?"/>	70%
Target height:		S
<input type="text" value="0.000"/>		0.000
		-27
		0.000
Esc	HA: 85.8228gon VA: 97.6434gon	Measure



## 13.7 Main points

In the main points dialog window it is possible to display the distance to the next main point using the settings made in chapter 13.5. The main point labels mainly correlate with those of the Deutsche Bahn.



Station shows the current chainage value. Line, gradient and superelevation line show the distance to the next main point of the respective alignments.

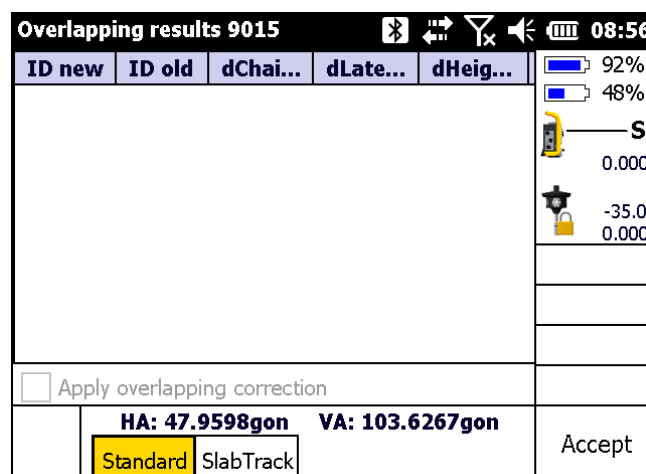
Using the *Esc* soft key or the *Accept* soft key brings you back to the measurement menu.

### 13.8 Overlapping

Measuring extensive objects as of railroads and roads, the object has to be measured using various station setups. Due to network tensions, a from two or more setup points measured point can differ in chainage, lateral distance and height.

To have an evaluation criterion concerning the effects of the setup accuracy, in this dialog all residuals of double measured (identical) points are displayed.

The points have to be measured and saved from the current setup point and are detected as identical with previous measured points using the chainage value of booth measurements.



Method “Standard” is displaying the offsets between closest points in chainage direction, lateral and height.

Method “Slab Track” will be used, when instrument was mounted at the track and all points are measured in one direction. Resulting overlapping offsets can be applied for stations orientations correction to avoid offsets in slab adjustment. In this case the chainage distance between two identical points must not be farther than 0.25m.

Using the *Accept* soft key soft key brings you back to the measurement screen.

## 13.9 Profile measurement

The profile measuring unit consists of a distance meter and an angle sensor that allows to measure points or structures sideways off the existing track. Therefore it can be used to check clearance profiles. The profiler measures single points.

The first generation of profiler for GEDO CE 1.0 is also motorized which allows to measure scan mode. Then numbers of points are densely in a row. Of course, this is not a laser scanner so be prepared that the scan speed varies with the width of the scan sector and the rotation speed.

There are two possibilities to do a profile measurement – relative or absolute (geo referenced). Relative means that only local coordinates in the profile plane are stored. If all measured points should receive absolute coordinates then the position and orientation of the trolley must be known and therefore measured with the total station and stored before.

When the profile measurement dialog is opened the laser pointer is automatically turned on. It will be turned off again after the measurement is finished.

Points recorded with profiler can be exported into a separate file. Therefore use export format “Profile points (\*.csv)”.

*Note:*            *The profiler can only be mounted on the trolley in one configuration. Do not try to mount it in any other way!*

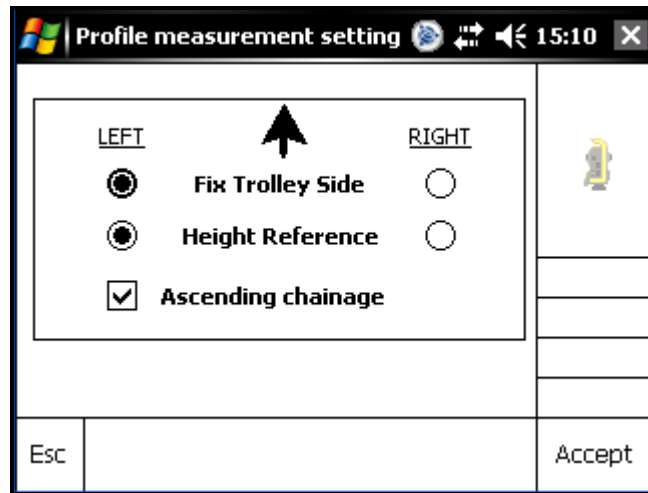
### 13.9.1 Absolute measurement

An absolute measurement can only be started from the Single measurement dialog (p. 59), if a track point has been measured and stored as reference point. User interface is slightly different according to which trolley is used. Graphics are shown in chapter 13.9.3 (p. 68) respectively 13.9.4 (p.71).

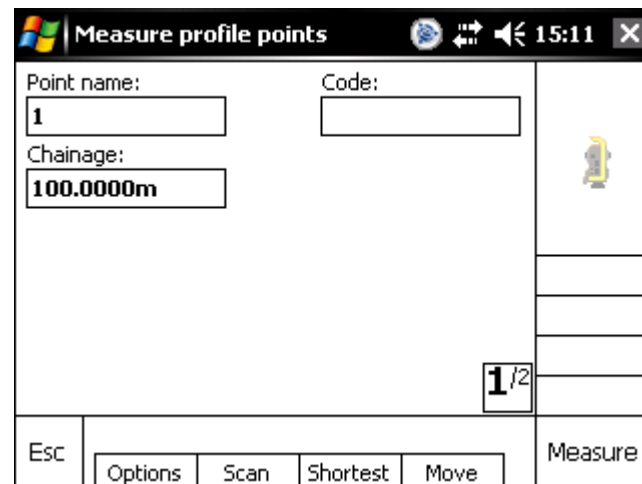
In the measurement dialog the user has to enter a point name that is incremented automatically and a code if needed. The chainage value is deduced from the currently valid reference point and therefore should not be edited. This is different compared with relative measurement. The **Measure** soft key starts a single measurement and afterwards displays the results. GEDO CE 2.0 trolley movement during the measurement will be observed with the odometer. Absolute reference will be lost when trolley has moved too much.

### 13.9.2 Relative measurement

The only difference to an absolute measurement is that the trolley position and orientation is unknown. Therefore an additional startup screen will prompt the user to enter the current trolley orientation. The arrow defines the current working direction. **Accept** will apply the settings and display the same screen as the screen for the absolute measurement. The only difference here is that the user has to enter the current chainage value for the profile by hand.

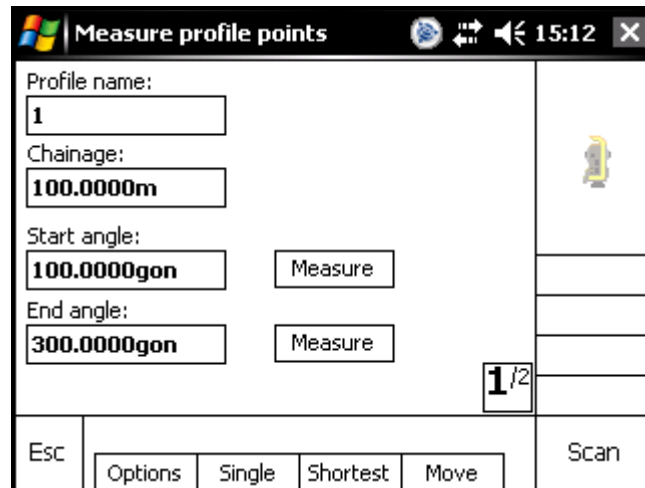


### 13.9.3 User interface for Profiler with GEDO CE 1.0



The **Scan** soft key located in the lower center of the screen enables the scan mode. As soon as a reasonable start and end angle were defined the scan will be started by pressing the **Scan** soft key.

*Note:* The Profiler has a dead sector in which it is not possible to scan to keep the cable from curling in. This sector is between 150° and 210°.



The *Options* soft key opens the Profile options (see p. 0) dialog

The angles can either be entered manually or they can be automatically added by aiming at the respective target directions and pressing the *Measure* button.

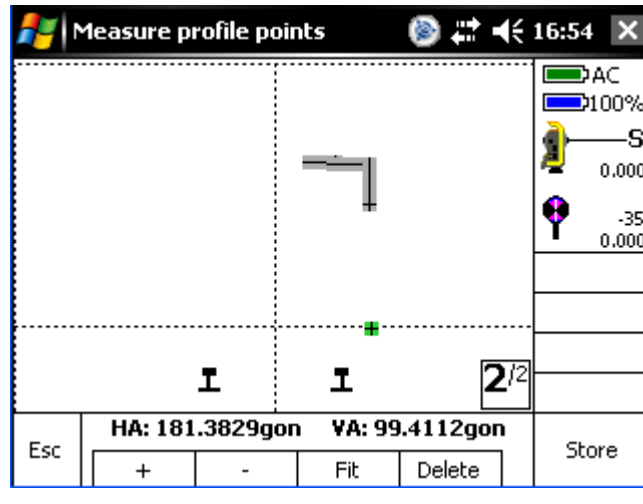
The *Shortest* soft key starts a mode in which the distance meter measures in tracking mode and only the point with the currently shortest distance is shown. The profiler has to be moved by hand. This functionality is used only, if the point of a structure closest to the track is of interest.

The soft key *Move* opens the Move profiler dialog (see p. 13.9.3.2).

After each successful measurement the results are displayed. These are the lateral offset from the trolleys centre line and the height offset above reference rail. Additionally the point is drawn in a simple graph on page two showing all so far stored points in grey and the last measured point in green.

The two rails are outlined and the intersection of the two dashed lines marks the profiler's point of origin. The frame width is 3 metres by default. There are soft keys to zoom in (+) and out (-) and a soft key (Fit) to fit the frame to the default size again. The drawing can also be moved by moving the mouse over the display.

When the user clicks onto a profile point the point is highlighted red and the point name is displayed. It is also possible to mark more than one point.

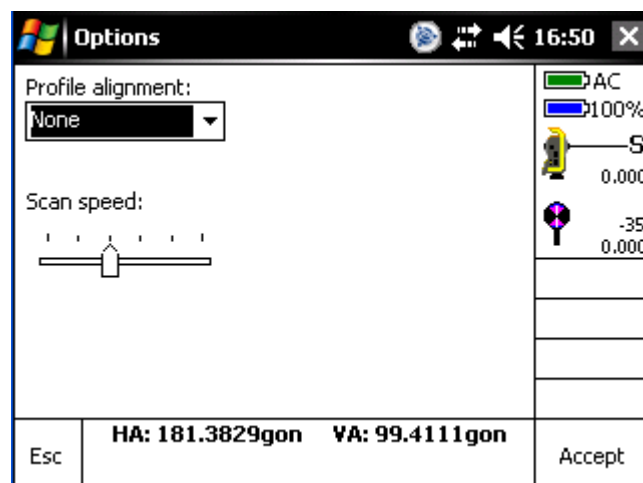


*Delete* will remove all selected points permanently. The *Store* soft key stores all new (green) points. If only a single point has been measured, the point is stored in the project's job file. If a scan has been performed, the points are stored in a separate file named after the current chainage (KM123+456.789) with the ending \*.scn. All files are stored in the subdirectory \Scans in the current project directory.

### 13.9.3.1 Profiler options

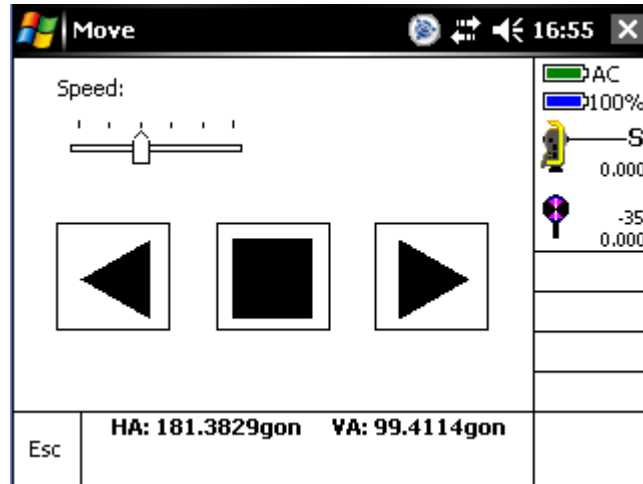
In the profile options dialog the rotation speed of the profiler can be set to six different speeds ranging from very slow to very fast. Of course, the point density will vary depending on the speed.

The profile alignment option is not available yet.



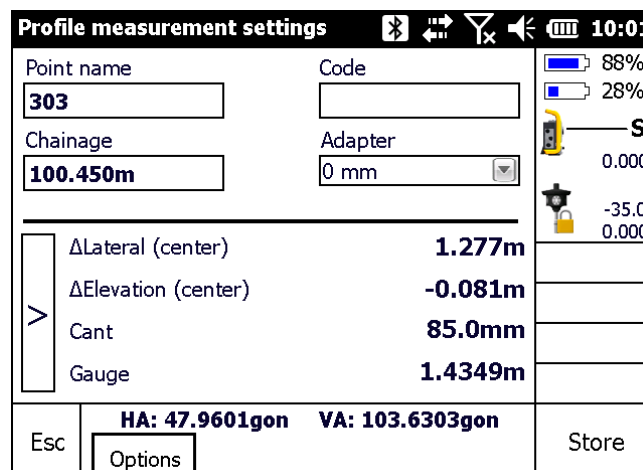
### 13.9.3.2 Profile sensor movement

To make it easier to bring the profiler into the right position the movement can be controlled using this dialog. The speed can be changed independently from the current set general rotating speed. A click on the right button lets the profiler move clockwise and a click on the left button counter clockwise.



### 13.9.4 User interface for Profiler with GEDO CE 2.0

User interface for profiler measurement is similar either it is called as relative measurement or as absolute out of single measurement. Only chainage value can be defined individual when working in relative mode. Chainage value is also updated automatically by the odometer measurement when the trolley is moving. Picture shows relative measurement with enabled label for chainage value.



Each profile point has to be named. Code is optional.

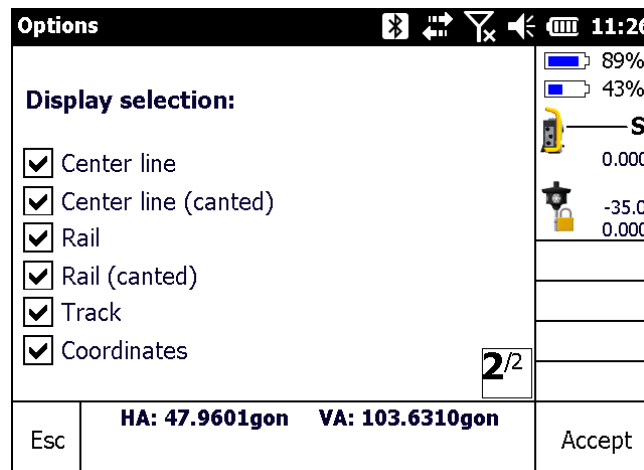
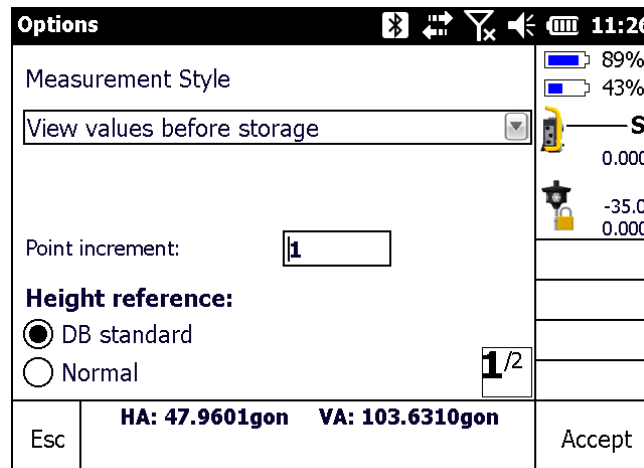
Use soft key [ > ] to change between different offsets to display.

The **Options** soft key opens the Profile options dialog with general settings for profiler measurement.

If the profiler is used with an additional height adapter, this value can be defined in box *Adapter*.

### 13.9.4.1 Profiler options dialog

The dialog options includes setting for calculation and display within profiler measurement menu. They are split into two pages.



Measurement style can be selected in first box. Method **Auto store** should be used to be ready directly for next measurement without having a look at the measurement results. **View values before storage** will display the measured offsets in various dialogues defined on options second page. **Nom./As built measurement** will compare the measured offsets with linked point file (details see chapter 13.9.4.3).

The user can choose what size the automatic point step increment should be. Negative numbers correspond to a decrement and the value zero leaves the point name as it is.

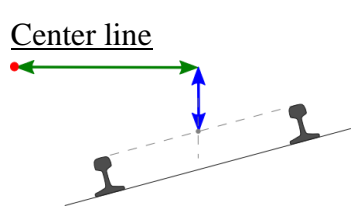
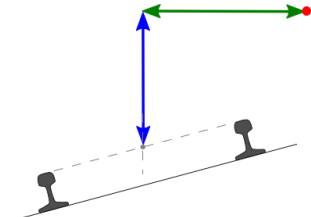
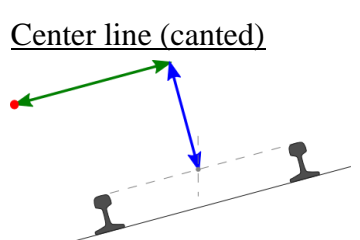
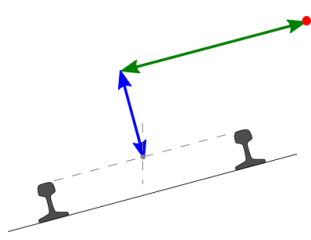
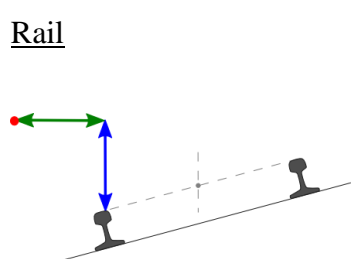
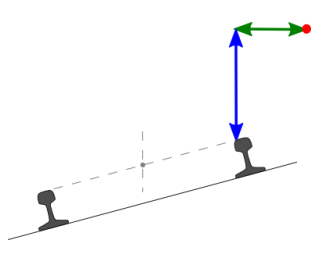
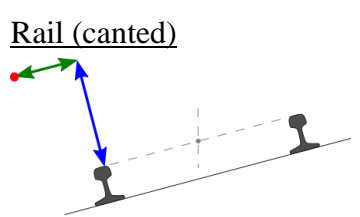
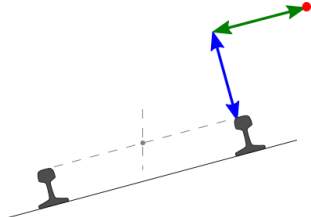
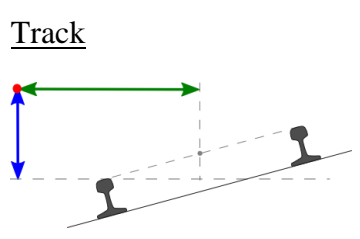
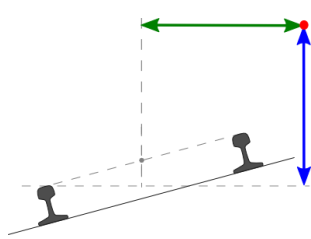


There are two options for height reference for offset calculation between rail and measured point. Detailed definition of both options is explained in chapter 13.9.4.2.

Page two lists all displays which could be switched via soft key [>]. A deactivated element will be skipped. See following chapter 13.9.4.2 for detailed explanation of calculated offsets. Additionally to offsets current gauge and cant will be displayed. For absolute measurement also coordinates in global display can be shown.

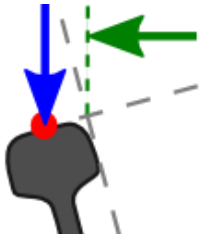
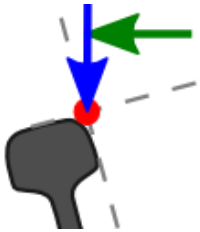
### 13.9.4.2 Definitions for calculation of offsets

Depending on application different offsets could be interesting. Therefore following variations are integrated.

<p><u>Center line</u></p> 		<p><math>\Delta Lateral</math>: horizontal distance to center line  <math>\Delta Elevation</math>: vertical distance to center line</p>
<p><u>Center line (canted)</u></p> 		<p><math>\Delta Lateral</math>: distance in cant plane to center line  <math>\Delta Elevation</math>: distance perpendicular to cant</p>
<p><u>Rail</u></p> 		<p><math>\Delta Lateral</math>: horizontal distance to running edge of closer rail  <math>\Delta Elevation</math>: vertical distance to closer rail (regarding height reference in options)</p>
<p><u>Rail (canted)</u></p> 		<p><math>\Delta Lateral</math>: distance in cant plane to running edge of closer rail  <math>\Delta Elevation</math>: distance perpendicular to cant</p>
<p><u>Track</u></p> 		<p><math>\Delta Lateral</math>: horizontal distance to center line  <math>\Delta Elevation</math>: vertical distance to vertical alignment (regarding height reference in options)</p>

All distance values refer to the as build track position. Lateral offsets (shown in graphic as green lines) are defined in ascending chainage direction. A positive value describes a point on the right hand side of reference point (center line or running edge of rail). Points with negative lateral offset are on the left hand side.

Delta height is positive if point is above reference point and negative for below. Reference for height offset is calculated regarding setting in options dialog (chapter 13.9.4.1) for rail and track. Center line as reference is not affected by this setting. Graphic shows height offset as blue line.

<p><u>DB standard</u></p> 	<p>Height reference is middle of head of rail. This is similar to definition of track alignment data and standard in Germany.</p> <p>Lateral Offset is measured in relation to running edge of rail. (similar to “Normal”)</p>
<p><u>Normal</u></p> 	<p>Reference for Lateral offset is identical to elevation.</p> <p>Reference point is defined as intersection of top of rails and running edge of rail.</p>

### 13.9.4.3 *Nominal/As built measurement*

The standard profiler measurement dialogue will be a little bit different if Nom./As built measurement is selected in options dialogue. Instead of usually displayed offsets are now only offsets to the track are displayed. Displayed labels can be changed between reference offset, measured offset and deviation between design and measurement. Reference value is given by points in linked files transformed to the currently selected alignment.

Options		11:39													
Point name	Code	88%	40%												
303 (FP) [v] [...] [...]		S	0.000												
Chainage	Adapter	-35.0	0.000												
1000.450m	0 mm [v]														
<table border="0"> <tr> <td>&gt;</td> <td>ΔChainage</td> <td>-0.010m</td> </tr> <tr> <td></td> <td>ΔLateral</td> <td>-0.002m</td> </tr> <tr> <td></td> <td>ΔElevation</td> <td>-0.008m</td> </tr> <tr> <td></td> <td>ΔCant</td> <td>-1.1mm</td> </tr> </table>		>	ΔChainage	-0.010m		ΔLateral	-0.002m		ΔElevation	-0.008m		ΔCant	-1.1mm		
>	ΔChainage	-0.010m													
	ΔLateral	-0.002m													
	ΔElevation	-0.008m													
	ΔCant	-1.1mm													
Esc		HA: 47.9599gon VA: 103.6313gon													
Options		Store													

Only adapter height and for relative measurement also chainage value can be defined before starting the measurement. Point name will be automatically selected from the list of linked points. Therefore the current chainage and measured offsets with minimum deviation are used. Point name can be change by selecting from the list if the automatic selection does not fit. Further the button [...] can be used to display all points from linked files (chapter 9.3.4) with their alignment based coordinates (Chainage, Lateral, Height) and customize the reference point.

Options		11:40		
Name	Type	Chain...	Lateral	Heigh
21	FP	994,...	-0,724	-0,21
101	FP	975,...	-6,950	1,72
201	FP	994,...	-7,951	-0,43
202	FP	994,...	1,516	-0,13
301	FP	1000...	-7,955	-0,47
302	FP	1000...	-3,852	-0,35
303	FP	1000...	1,274	-0,04
401	FP	1003...	-7,945	-0,48
402	FP	1002...	-3,828	-0,37
Esc.		HA: 47.9599gon VA: 103.6312gon		OK

Nominal/as built measurements can be exported in format “Nom./as built comp. (\*.txt)” for protocol. Export file format “Profiler as-built report (\*.csv)” will only export measured offset stored with this measurement style.

## 13.10 Stakeout measurement

In this dialog, points may be staked out that have a relation to an existing alignment. These points can be defined by four ways:

- In a text file
- As interval points with a defined grid width at the chainage line
- All alignment intersection points
- Manually.

For each of these points chainage, horizontal offset from centre line and height offset must be defined as stakeout values. The user may choose whether the values will be given horizontally resp. perpendicularly or whether they will be given plumb-vertical in a superelevated local track coordinate system (dialog Options, ch. 13.10.1). Depending on the selected settings the label texts will change in order to not end up in confusion about the current mode. The label “Lateral offset” will change to “Canted Lat. offset” and the label “Vertical offset” will change to “Canted Vert. offset”. Additionally, the vertical offset may be given as an absolute value from datum surface. Then the label text will be displayed as “Elevation”.

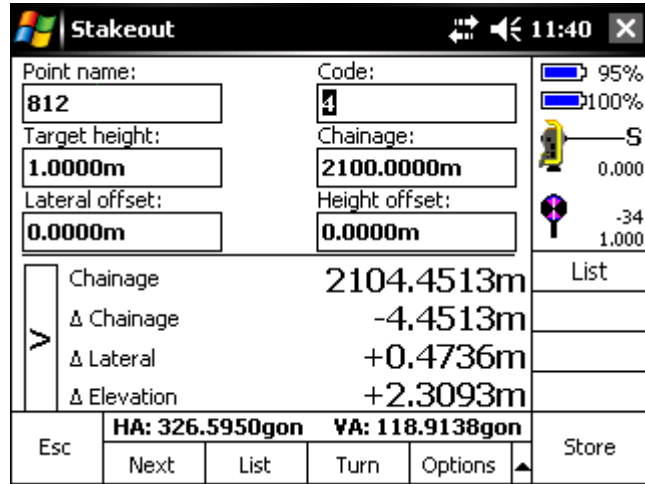
If a point is selected from the text file, the current settings will be overwritten by the settings in the text file.

A stakeout mode based merely on coordinates is not provided.

Point name:		Code:		95%	
812		4		100%	
Target height:		Chainage:		0.000	
1.0000m		2100.0000m		-34	
Lateral offset:		Height offset:		1.000	
0.0000m		0.0000m		List	
Esc		HA: 326.5956gon		VA: 118.9137gon	
Next		List		Turn	
Options		Measure			

- Next** - Jump to next point in the stakeout list.
- List** - Shows all points of the stakeout list (Ch.13.10.2)
- Turn** - Turns the instrument in direction of the stakeout point
- Options** - select stakeout options (Ch.13.10.1)
- Prev** - Jump to previous point in the stakeout list

After all settings are made correctly the measurement can be started by either clicking the soft key *Measure* or by starting the tracking mode in the Trimble functions dialog. If the measurement was successful the results will be displayed in the predefined order.



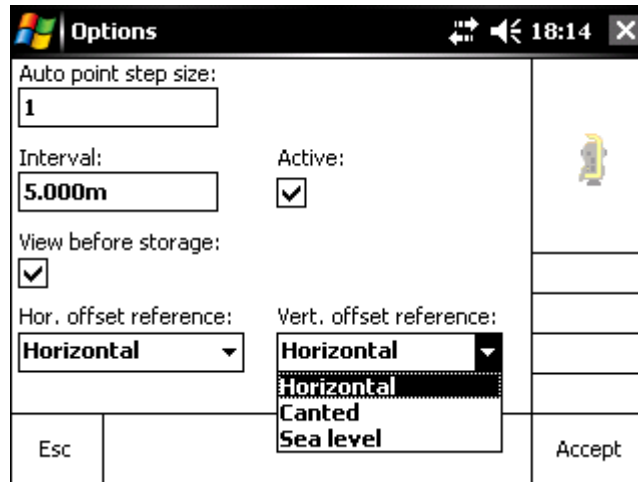
**Positive** signs (+) represent for the single measurement results:

- **Chainage:** The stakeout point is behind the current position (assuming viewing direction is in ascending chainage direction).
- **Horizontal:** The stakeout point is further to the right (assuming viewing direction is in ascending chainage direction).
- **Vertical:** The stakeout point is above the current position.

A click on the **Esc** soft key cancels the current measurement. A click on the **Store** soft key stores the point and hides the results panel. If the instrument is in tracking mode, the results panel stays displayed and the following point could be stored. After storage the next point in the stakeout list is automatically selected. The cursor jumps back to the point name field.

### 13.10.1 Dialog Options

In this dialog base settings for the stakeout measurement can be made. The automatic step size for interval points can be set. Negative numbers result in a decrement, if the value is set to zero the point number will not be changed.

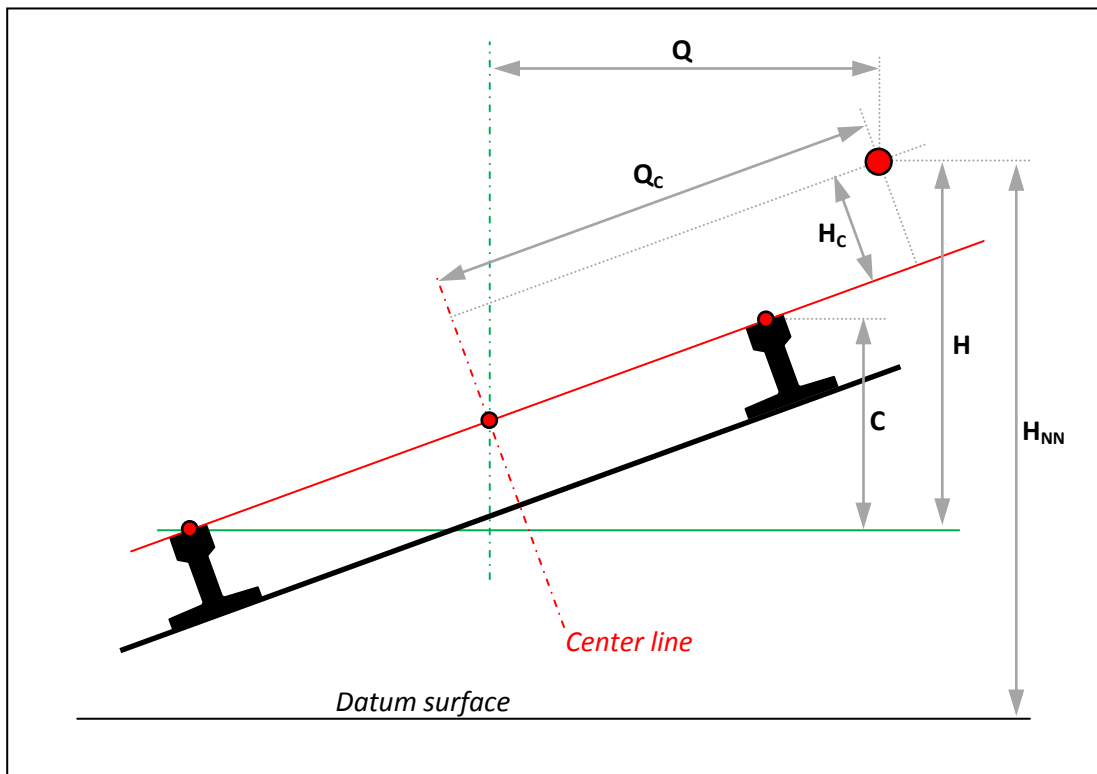


For the stakeout in a pre-defined chainage interval the required offset or gap can be entered in the text field *Interval*. The displayed stakeout chainage value will then automatically be increased by that value after storage. If that functionality is not demanded, it can easily be deactivated by unchecking the box beneath.

By using the checkbox *View before storage* the user can choose if the result of a measured point should be displayed before it is stored or if the point should be stored automatically without seeing the results. In tracking mode this has no relevance as results are always displayed and storage needs confirmation.

With the two selection lists at the bottom the references for both horizontal and vertical offset can be set. You can choose from “Horizontal” and “Canted”. Additionally, for the vertical “Sea level” can be chosen if absolute elevations should be used instead of vertical offsets.

A click on *Accept* stores the settings. With *Esc* you return to the measurement menu.



- Q Horizontal offset to center line
- H Plumb-vertical offset to vertical alignment
- H<sub>NN</sub> Elevation above datum surface (Z coordinate)
- Q<sub>C</sub> Offset to center line in superelevated track coordinate system
- H<sub>C</sub> Offset from vertical alignment perpendicular on superelevated rails
- C Cant





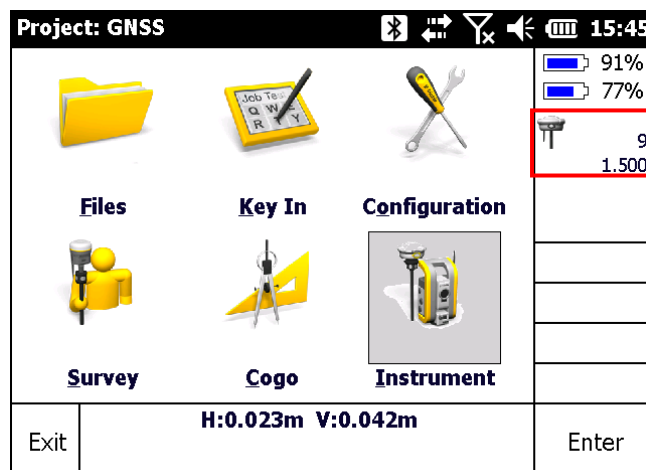
## 14 GedoTrack and GNSS

GedoTrack supports the usage of GNSS receivers through an internal connection to the Trimble Access software. That means that the whole receiver configuration (coordinate system, base-rover or VRS, radio settings or internet connection parameters) is done in Trimble Access. Additionally, a small application must be started instead of *GeneralSurvey* in Trimble Access, named GedoGNSS. This application has to run in the background all the time. It is very important to note explicitly that GedoTrack has no direct connection to or control of any receiver at all. For a detailed description the official Trimble Access user manual should be read.

The functionality and usage of GedoTrack is more or less the same as when using a total station. Just a few things are different and those will be outlined in the following section.

To change the instrument type in GedoTrack to GNSS, the menu *Configuration > Port > Instrument* (chap. 11.3) has to be called and instead of TSMServer *GNSS* has to be selected as instrument type.

After a successful connection to the receiver or rather the GNSS app in Trimble Access the status bar show the current standard deviations instead of the total station angle values and in the upper right corner the satellite count and antenna height are displayed.



By clicking this field, the dialog for receiver settings will open analogue to chap. 12.2. The antenna type and the length of the pole that were selected in Trimble Access can be seen and the user may enter an additional height offset. The final pole length will result as the summation of both offsets. Additionally, an offset orthogonal to the horizontal alignment can be entered if that may become necessary for certain applications.

Receiver		15:52	
Receiver name:	<b>R10 Internal</b>	91%	76%
Pole length:	<b>1.500m</b>		9
Vertical offset:	<input type="text" value="0.0000m"/>		1.500
Tracking:	<input type="checkbox"/>		
Esc	<b>H:0.022m V:0.039m</b>		Accept

If the check box **Tracking** is activated and one of the many measurement dialogs is opened, the same characteristics as if a total station was used, is copied and the measurement results are updated automatically every second.

In the options dialog (chap. 13.5) another tiny difference can be found. Tolerances for the maximum allowed standard deviations may be entered. If a GPS measurement exceeds those tolerances it is an invalid measurement and may not be accepted. The accidental storage of a measurement with a weak quality can be avoided.

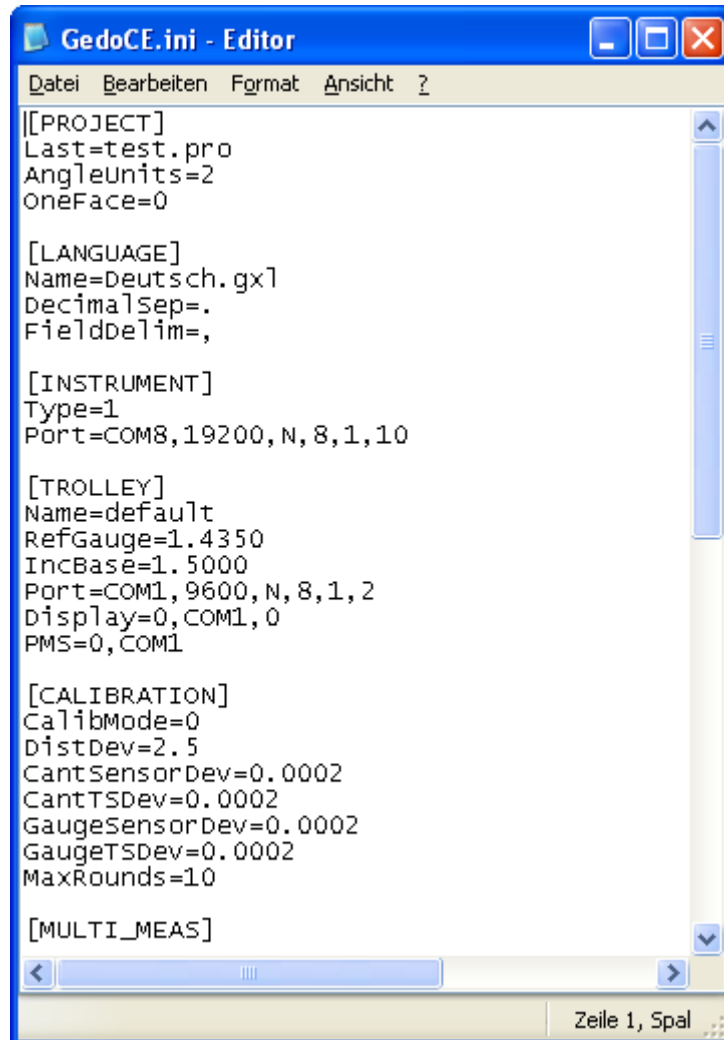
Options		15:46	
Auto point step size:	<input type="text" value="1"/>	View before storage:	<input checked="" type="checkbox"/>
Tracking mode:	Standard	Measure mean value:	<input checked="" type="checkbox"/>
Clear code field after storage:	<input checked="" type="checkbox"/>		
Horiz. tolerance:	<input type="text" value="0.050m"/>	Vert. tolerance:	<input type="text" value="0.080m"/>
Auto storage every:	<input type="checkbox"/> <input type="text" value="1.0m"/>	Observe sleeper gap:	<input type="checkbox"/> <input type="text" value="0.650m"/>
Esc	<b>H:0.023m V:0.042m</b>		Accept

When the option **Measure mean value** is active, then several measurements are recorded in a row and the mean value and its standard deviations are computed. As soon as the **Measure** button is pressed in one of the measure dialogs (Standard, Topo and Stakeout) another dialog is opened displaying live the current average coordinates and deviations. If the **Accept** button is clicked, the dialog is closed and the computed results are transferred back to the respective measure dialog. If the **Reset** soft key is pressed, the current values are deleted and the averaging starts again from zero.

Measure				
Easting:	$\sigma$ Easting:			91%
<b>4380798,217m</b>	<b><math>\pm 0,001m</math></b>			76%
Northing:	$\sigma$ Northing:			10
<b>5517951,067m</b>	<b><math>\pm 0,001m</math></b>			1.500
Elevation:	$\sigma$ Elevation:			
<b>252,076m</b>	<b><math>\pm 0,003m</math></b>			
Observation time:	Observations stored:			
<b>20s</b>	<b>20</b>			
		<b>H:0.021m V:0.038m</b>		
Esc	Reset		Accept	

## 15 Files and Formats

### 1. Configuration file GedoTrack.ini:



```

GedoCE.ini - Editor
Datei Bearbeiten Format Ansicht ?
[[PROJECT]
Last=test.pro
AngleUnits=2
OneFace=0

[LANGUAGE]
Name=Deutsch.gxl
DecimalSep=.
FieldDelim,

[INSTRUMENT]
Type=1
Port=COM8,19200,N,8,1,10

[TROLLEY]
Name=default
RefGauge=1.4350
IncBase=1.5000
Port=COM1,9600,N,8,1,2
Display=0,COM1,0
PMS=0,COM1

[CALIBRATION]
CalibMode=0
DistDev=2.5
CantSensorDev=0.0002
CantTSDev=0.0002
GaugeSensorDev=0.0002
GaugeTSDev=0.0002
MaxRounds=10

[MULTI_MEAS]

```

In the configuration file the global settings are stored. This file should only be edited, if it is absolutely necessary. When editing, do so with highest attention as a corrupt file might make a program start impossible.

### 2. Trolley definition file (\*.trl)

This file contains the trolley settings as geometry, sensor and communication settings.

It may only be edited by the manufacturer in case of a recalibration!

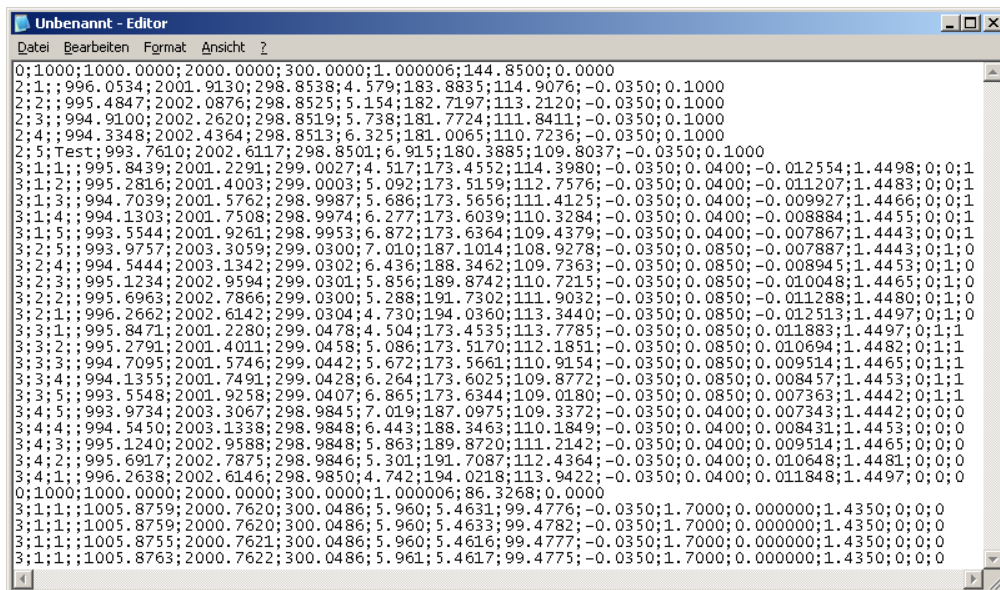
### 3. Project file (\*.pro)

The file contains all project specific settings, i.e. radio channel, auto storage size and so on.

It should not be edited externally.

#### 4. Measurement file (\*.job):

In this file all measurements are stored. Every row starts with a leading number that indicates which information the row contains. All station information start with a “0”, control point measurements start with a “1”, topographical measurements start with a “2” and usual line measurements start with a “3”.



```

0;1000;1000.0000;2000.0000;300.0000;1.000006;144.8500;0.0000
2;1;:996.0534;2001.9130;298.8538;4.579;183.8835;114.9076;-0.0350;0.1000
2;2;:995.4847;2002.0876;298.8525;5.154;182.7197;113.2120;-0.0350;0.1000
2;3;:994.9100;2002.2620;298.8519;5.738;181.7724;111.8411;-0.0350;0.1000
2;4;:994.3348;2002.4364;298.8513;6.325;181.0065;110.7236;-0.0350;0.1000
2;5;Test;993.7610;2002.6117;298.8501;6.915;180.3885;109.8037;-0.0350;0.1000
3;1;1;:995.8439;2001.2291;299.0027;4.517;173.4552;114.3980;-0.0350;0.0400;-0.012554;1.4498;0;0;1
3;1;2;:995.2816;2001.4003;299.0003;5.092;173.5159;112.7576;-0.0350;0.0400;-0.011207;1.4483;0;0;1
3;1;3;:994.7039;2001.5762;298.9987;5.686;173.5656;111.4125;-0.0350;0.0400;-0.009927;1.4466;0;0;1
3;1;4;:994.1303;2001.7508;298.9974;6.277;173.6039;110.3284;-0.0350;0.0400;-0.008884;1.4455;0;0;1
3;1;5;:993.5544;2001.9261;298.9953;6.872;173.6364;109.4379;-0.0350;0.0400;-0.007867;1.4443;0;0;1
3;2;5;:993.9757;2003.3059;299.0300;7.010;187.1014;108.9278;-0.0350;0.0850;-0.007887;1.4443;0;1;0
3;2;4;:994.5444;2003.1342;299.0302;6.436;188.3462;109.7363;-0.0350;0.0850;-0.008945;1.4453;0;1;0
3;2;3;:995.1234;2002.9594;299.0301;5.856;189.8742;110.7215;-0.0350;0.0850;-0.010048;1.4465;0;1;0
3;2;2;:995.6963;2002.7866;299.0300;5.288;191.7302;111.9032;-0.0350;0.0850;-0.011288;1.4480;0;1;0
3;2;1;:996.2662;2002.6142;299.0304;4.730;194.0360;113.3440;-0.0350;0.0850;-0.012513;1.4497;0;1;0
3;3;1;:995.8471;2001.2280;299.0478;4.504;173.4535;113.7785;-0.0350;0.0850;0.011883;1.4497;0;1;1
3;3;2;:995.2791;2001.4011;299.0458;5.086;173.5170;112.1851;-0.0350;0.0850;0.010694;1.4482;0;1;1
3;3;3;:994.7095;2001.5746;299.0442;5.672;173.5661;110.9154;-0.0350;0.0850;0.009514;1.4465;0;1;1
3;3;4;:994.1355;2001.7491;299.0428;6.264;173.6025;109.8772;-0.0350;0.0850;0.008457;1.4453;0;1;1
3;3;5;:993.5548;2001.9258;299.0407;6.865;173.6344;109.0180;-0.0350;0.0850;0.007363;1.4442;0;1;1
3;4;5;:993.9734;2003.3067;298.9845;7.019;187.0975;109.3372;-0.0350;0.0400;0.007343;1.4442;0;0;0
3;4;4;:994.5450;2003.1338;298.9848;6.443;188.3463;110.1849;-0.0350;0.0400;0.008431;1.4453;0;0;0
3;4;3;:995.1240;2002.9588;298.9848;5.863;189.8720;111.2142;-0.0350;0.0400;0.009514;1.4465;0;0;0
3;4;2;:995.6917;2002.7875;298.9846;5.301;191.7087;112.4364;-0.0350;0.0400;0.010648;1.4481;0;0;0
3;4;1;:996.2638;2002.6146;298.9850;4.742;194.0218;113.9422;-0.0350;0.0400;0.011848;1.4497;0;0;0
0;1000;1000.0000;2000.0000;300.0000;1.000006;86.3268;0.0000
3;1;1;:1005.8759;2000.7620;300.0486;5.960;5.4631;99.4776;-0.0350;1.7000;0.000000;1.4350;0;0;0
3;1;1;:1005.8759;2000.7620;300.0486;5.960;5.4633;99.4782;-0.0350;1.7000;0.000000;1.4350;0;0;0
3;1;1;:1005.8755;2000.7621;300.0486;5.960;5.4616;99.4777;-0.0350;1.7000;0.000000;1.4350;0;0;0
3;1;1;:1005.8763;2000.7622;300.0486;5.961;5.4617;99.4775;-0.0350;1.7000;0.000000;1.4350;0;0;0

```

Station information (0): (*units in brackets*)

- Station name
- Easting[m]; Northing[m]; Elevation[m]
- Scale
- orientation[gon];
- Instrument height[m]

Control point (1):

- Point name
- Easting[m]; Nothing[m]; Elevation[m]
- Slope distance[m] - *Raw distance without prism constant and scale!*
- Horizontal angle [gon]; vertical angle [gon] of the prism
- Prism ID; prism constant[m]; target height[m]

- Offset Easting[m]; Offset Northing[m]; Offset Elevation[m]
- Offset slope distance[m];
- Offset horizontal angle measurements [gon]
- Orthogonal offset[m]

Topo point (2):

- Point name; point code
- Easting[m]; Northing[m]; Elevation[m]
- Slope distance[m] - *Raw distance without prism constant and scale!*
- Horizontal angle[gon]; vertical angle[gon] of the prism
- Prism constant[m]; target height[m]
- Chainage, lateral offset, height offset, lateral offset super elevated, height offset super elevated

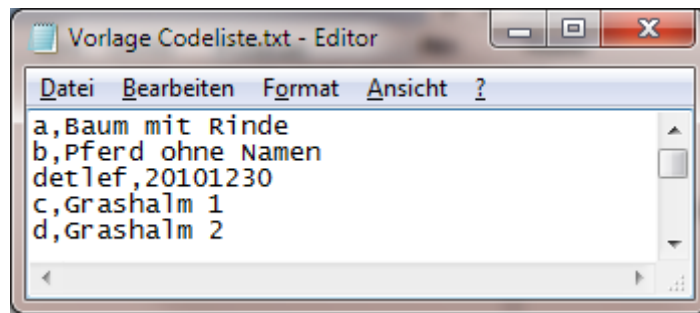
Measured line points (3):

- Measurement line name; point name; point code
- Easting[m]; Northing[m]; Elevation[m]
- Slope distance[m] - *Raw distance without prism constant and scale!*
- Horizontal angle[gon]; vertical angle[gon] of the prism
- Prism constant[m]; target height[m]
- Inclination sensor value [in radiant!!!]
- Gauge sensor value[m]
- Prism Left / Right [0 / 1]
- Fix trolley side Left / Right [0 / 1]
- Height reference string Left / Right [0 / 1].

5. Code list (\*.txt):

The code list may be used to substitute an entered code (e.g. 23) in the code field of a measurement dialog with a description given in the text file (e.g. “end of switch”). The file must be stored in \Common Files\Gedo Data and is available for all projects in \Gedo Data\ directory.

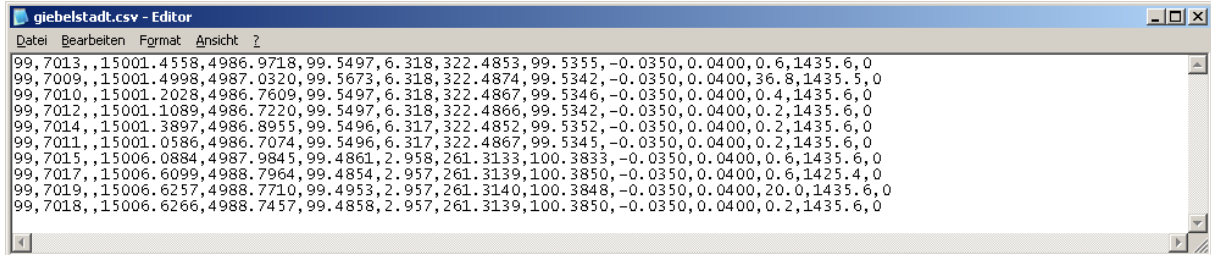
Each line contains a new pair of code and description. The code is separated from the description by comma.



# 16 Appendix

## 16.1 Formats

Sample file, comma delimited:

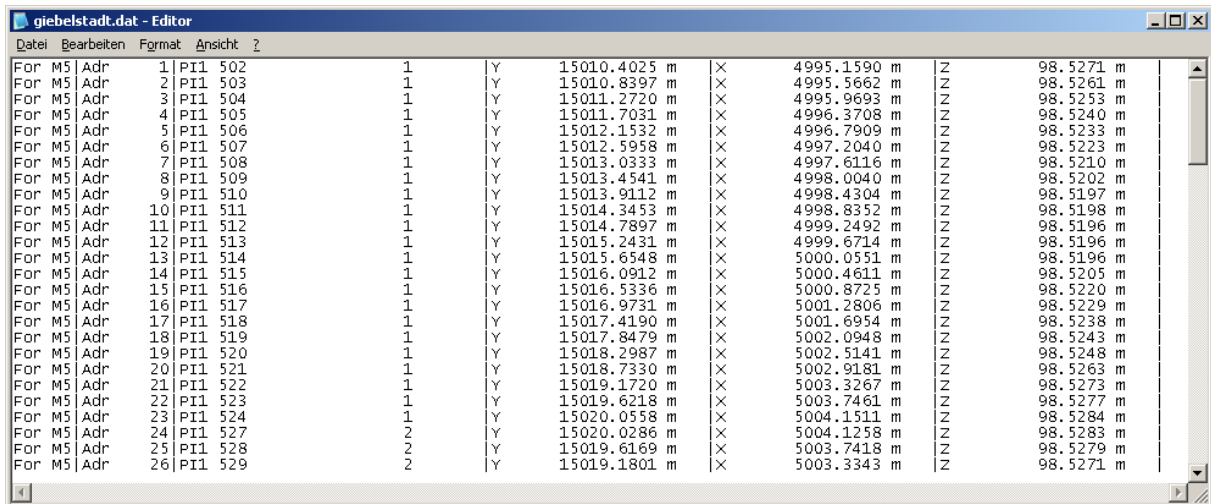


```

giebelstadt.csv - Editor
Datei Bearbeiten Format Ansicht ?
99,7013,,15001.4558,4986.9718,99.5497,6.318,322.4853,99.5355,-0.0350,0.0400,0.6,1435.6,0
99,7009,,15001.4998,4987.0320,99.5673,6.318,322.4874,99.5342,-0.0350,0.0400,36.8,1435.5,0
99,7010,,15001.2028,4986.7609,99.5497,6.318,322.4867,99.5346,-0.0350,0.0400,0.4,1435.6,0
99,7012,,15001.1089,4986.7220,99.5497,6.318,322.4866,99.5342,-0.0350,0.0400,0.2,1435.6,0
99,7014,,15001.3897,4986.8955,99.5496,6.317,322.4852,99.5352,-0.0350,0.0400,0.2,1435.6,0
99,7011,,15001.0586,4986.7074,99.5496,6.317,322.4867,99.5345,-0.0350,0.0400,0.2,1435.6,0
99,7015,,15006.0884,4987.9845,99.4861,2.958,261.3133,100.3833,-0.0350,0.0400,0.6,1435.6,0
99,7017,,15006.6099,4988.7964,99.4854,2.957,261.3139,100.3850,-0.0350,0.0400,0.6,1425.4,0
99,7019,,15006.6257,4988.7710,99.4953,2.957,261.3140,100.3848,-0.0350,0.0400,20.0,1435.6,0
99,7018,,15006.6266,4988.7457,99.4858,2.957,261.3139,100.3850,-0.0350,0.0400,0.2,1435.6,0

```

M5 Sample file:

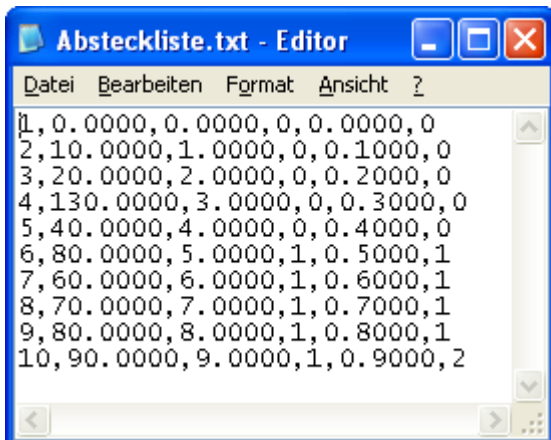


```

giebelstadt.dat - Editor
Datei Bearbeiten Format Ansicht ?
For M5 Adr 1 PII 502 1 Y 15010.4025 m X 4995.1590 m Z 98.5271 m
For M5 Adr 2 PII 503 1 Y 15010.8397 m X 4995.5662 m Z 98.5261 m
For M5 Adr 3 PII 504 1 Y 15011.2720 m X 4995.9693 m Z 98.5253 m
For M5 Adr 4 PII 505 1 Y 15011.7031 m X 4996.3708 m Z 98.5240 m
For M5 Adr 5 PII 506 1 Y 15012.1532 m X 4996.7909 m Z 98.5233 m
For M5 Adr 6 PII 507 1 Y 15012.5958 m X 4997.2040 m Z 98.5223 m
For M5 Adr 7 PII 508 1 Y 15013.0333 m X 4997.6116 m Z 98.5210 m
For M5 Adr 8 PII 509 1 Y 15013.4541 m X 4998.0040 m Z 98.5202 m
For M5 Adr 9 PII 510 1 Y 15013.9112 m X 4998.4304 m Z 98.5197 m
For M5 Adr 10 PII 511 1 Y 15014.3453 m X 4998.8352 m Z 98.5198 m
For M5 Adr 11 PII 512 1 Y 15014.7897 m X 4999.2492 m Z 98.5196 m
For M5 Adr 12 PII 513 1 Y 15015.2431 m X 4999.6714 m Z 98.5196 m
For M5 Adr 13 PII 514 1 Y 15015.6548 m X 5000.0551 m Z 98.5196 m
For M5 Adr 14 PII 515 1 Y 15016.0912 m X 5000.4611 m Z 98.5205 m
For M5 Adr 15 PII 516 1 Y 15016.5336 m X 5000.8725 m Z 98.5220 m
For M5 Adr 16 PII 517 1 Y 15016.9731 m X 5001.2806 m Z 98.5229 m
For M5 Adr 17 PII 518 1 Y 15017.4190 m X 5001.6954 m Z 98.5238 m
For M5 Adr 18 PII 519 1 Y 15017.8479 m X 5002.0948 m Z 98.5243 m
For M5 Adr 19 PII 520 1 Y 15018.2987 m X 5002.5141 m Z 98.5248 m
For M5 Adr 20 PII 521 1 Y 15018.7330 m X 5002.9181 m Z 98.5263 m
For M5 Adr 21 PII 522 1 Y 15019.1720 m X 5003.3267 m Z 98.5273 m
For M5 Adr 22 PII 523 1 Y 15019.6218 m X 5003.7461 m Z 98.5277 m
For M5 Adr 23 PII 524 1 Y 15020.0558 m X 5004.1511 m Z 98.5284 m
For M5 Adr 24 PII 527 2 Y 15020.0286 m X 5004.1258 m Z 98.5283 m
For M5 Adr 25 PII 528 2 Y 15019.6169 m X 5003.7418 m Z 98.5279 m
For M5 Adr 26 PII 529 2 Y 15019.1801 m X 5003.3343 m Z 98.5271 m

```

Stakeout file



```

Absteckliste.txt - Editor
Datei Bearbeiten Format Ansicht ?
1, 0.0000, 0.0000, 0, 0.0000, 0
2, 10.0000, 1.0000, 0, 0.1000, 0
3, 20.0000, 2.0000, 0, 0.2000, 0
4, 130.0000, 3.0000, 0, 0.3000, 0
5, 40.0000, 4.0000, 0, 0.4000, 0
6, 80.0000, 5.0000, 1, 0.5000, 1
7, 60.0000, 6.0000, 1, 0.6000, 1
8, 70.0000, 7.0000, 1, 0.7000, 1
9, 80.0000, 8.0000, 1, 0.8000, 1
10, 90.0000, 9.0000, 1, 0.9000, 2

```



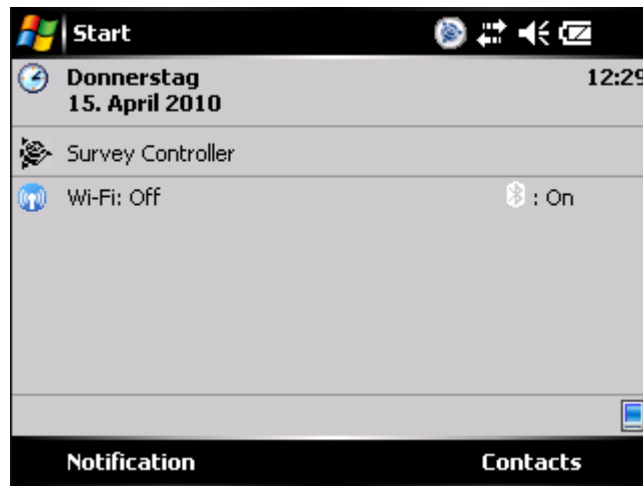
## 16.2 Release Notes

Detailed updates in GEDO Track are documented separately. You can get the release notes if necessary. Please send a request to [info@trimble-railway.com](mailto:info@trimble-railway.com) and ask for Release Notes of GEDO Track.

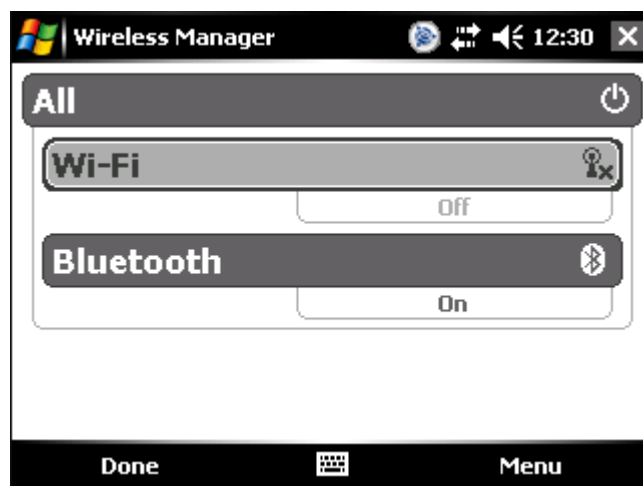
## 16.3 Bluetooth Installation

*Note: Make sure that Bluetooth is enabled. Without enabling Bluetooth, it is not possible to connect to the Dongle.*

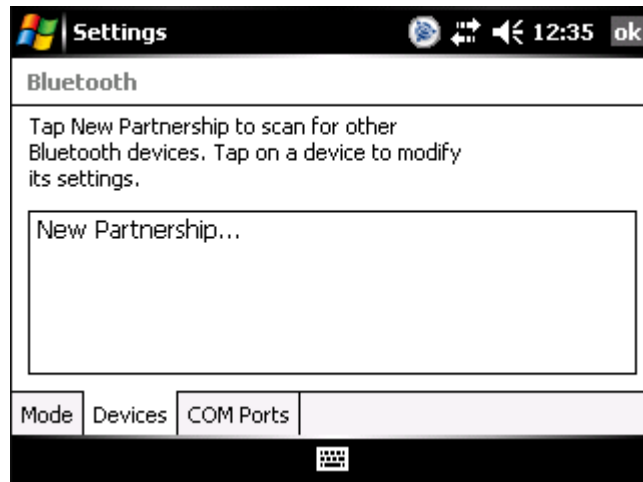
*It happens that Bluetooth is disabled automatically after a reboot. Make sure to enable it again manually.*



Click the Bluetooth symbol on the desktop of the controller as it is shown above.  
In the window now showing up click onto: "Menu > Bluetooth Settings".



Go to the Devices index and choose a "New Partnership...".

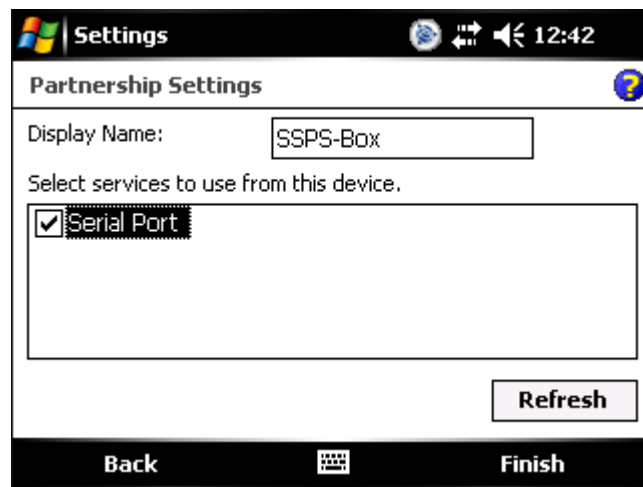


Now the controller searches for near Bluetooth devices.

The search for the Bluetooth dongle shouldn't last longer than 20 seconds. Make sure that the dongle is supplied with power and turned on.

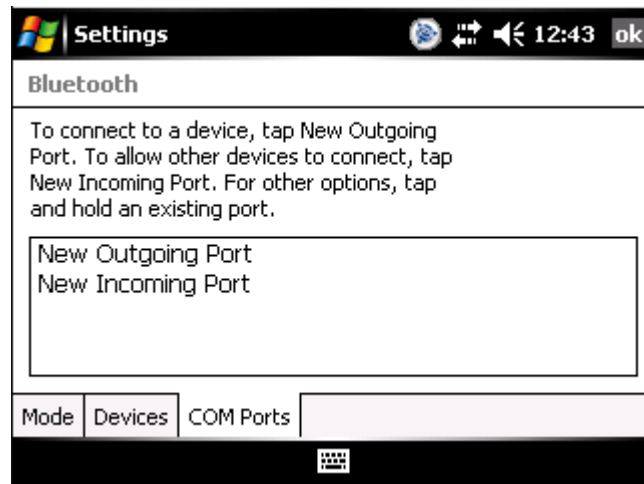
After the device is found, choose the device from the list and click "Next".

Now enter the password for the Bluetooth device. In this case it is "1234". Now click "Next".

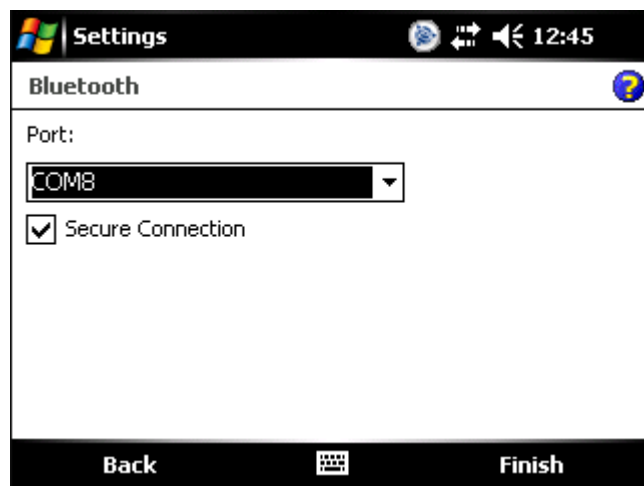


Check the Serial Port Device from the List and click "Finish". Now a virtual COM Port has to be assigned.

Go to the "COM Ports" index and choose "New Outgoing Port".



Choose the Bluetooth dongle from the list and click “Next”.  
 Then choose a port name (we recommend Port 8) and click “Finish”.



The connection to the Bluetooth dongle is now established and is saved within the OS. As shown in the chapter 11.3 you can choose the COM port that was selected here in the OS Settings.