TopoSurv manual ENU

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Installation

TopoSurv is a plug-in to ArcGIS. You will start TopoSurv from your ArcGIS application.

1. Download TopoSurv installation file from Adtollo web site http://adtollo.se/en/surveying-mapping/download.
2. Install TopoSurv.
3. Start your ArcGIS application and use your registration key to register.

Registration can be made on-line or manual if no Internet connection is available.

On-line registration
Select the option On-Line, use your registration key to register your license.

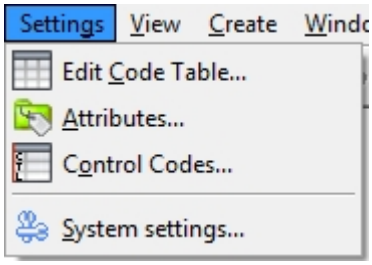
Manual registration
Type your license number and necessary field information. Click Ok. You will be able to print a registration form to send us. Adtollo needs the lock code shown on the registration form to activate your license and send you an authorization code back to you.

Note! TopoSurv requires ArcGIS 10, it will not work in ArcGIS 9.

Support
You reach our support at support@adtollo.se or by phone to +46 8 290 660

Settings

- Edit code table
- Attributes
- Control codes
- System settings
    - Angle
    - Language
    - Directories
    - Decimals
    - Threshold values
    - Survey
    - Known points
    - Instruments
    - Database/ArcGIS



Edit code table

Settings|Edit code table

Settings for the code table can be found under *Settings - Edit code table.*
The code table contains the field codes that are used. A number of different settings may be applied for each code.
Point codes can be numerical, alphanumerical and alphabetical, and there is no maximum limit for the number of characters in point codes.
A code description is made to be able to more easily view the codes.

Point types

There are a number of different functions for point types. There are functions such as for whether that point is included in station set up or not, and there are functions in the point type for what type of geometry the point has.

- **Back Sight**
  For station set up. Is entered if the point with this code is used as a back object in the layout. This is just a way to mark back objects for Topocad.

- **Temporary point**
  For station set up. Point that is read from one station and can be used as a temporary known point from another station. Temporary point cannot be saved.

- **Known point**
  For station set up. Point that is to be read as a new known point. Can be used as a back object or station in a future station set up. As opposed to temporary point, this point is saved in the current file for known points. See System settings - Surveying.

- **Check point**
  The check point's position is compared with the other point's position at the same point time.

- **Point**
  Detailed point information. If a point is indicated as a point, then, as a standard, it will be a point (and not a line). Can be overridden with a control code.

- **Line**
  Detailed point information. If a point is indicated as a line, it will form a line together with the next point if it has the same code. Can be overridden with a control code.

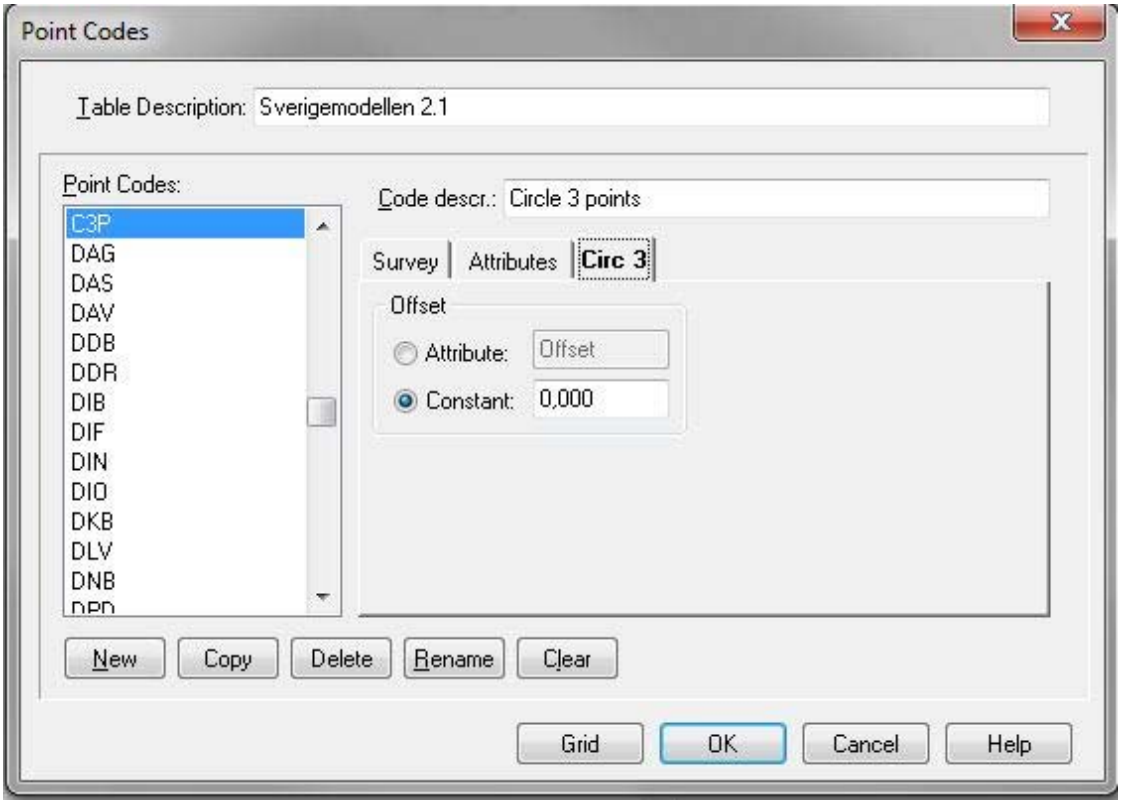
- **Construction point**
  Detailed point information. To break a line as above when you use the same code, a reading with a code with the point type Construction point may be used to break the line in the previous point. This point will not be included in the survey sketch.

Calculation functions

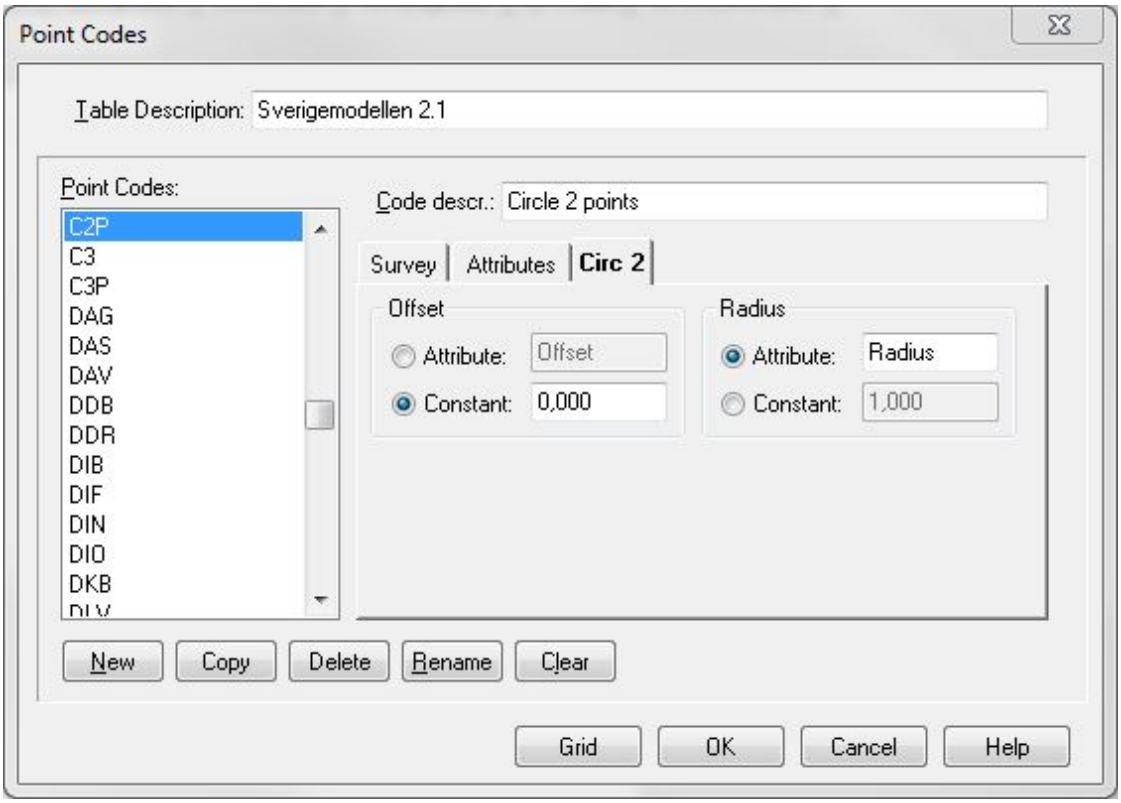
Calculation functions have functions similar to control codes, but there are not as many of them and they are directly connected to the point code.

There are calculation functions for:

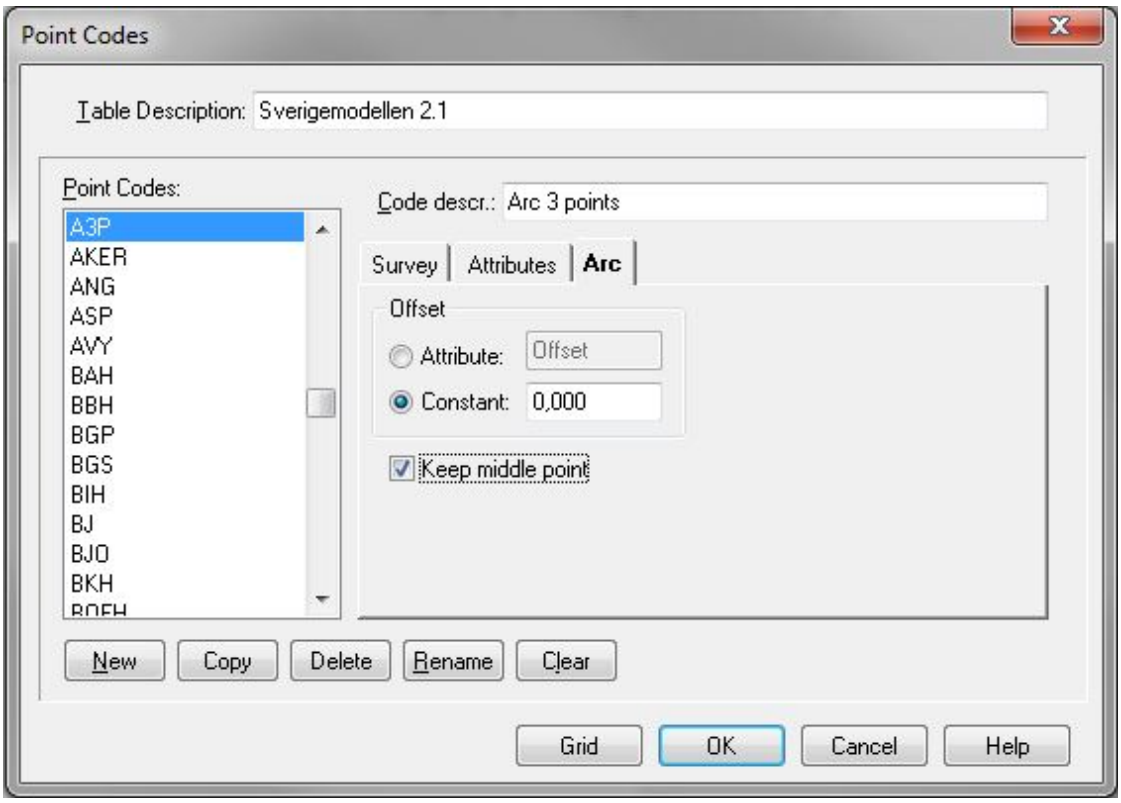
- **Circle from three points**
  Three point reading creating a circle. An offset measurement can be indicated from read points to the edge of the circle.



- **Circle from two points**
  Circle measured from two points. You need to enter a radius as *attribute* or *constant*.

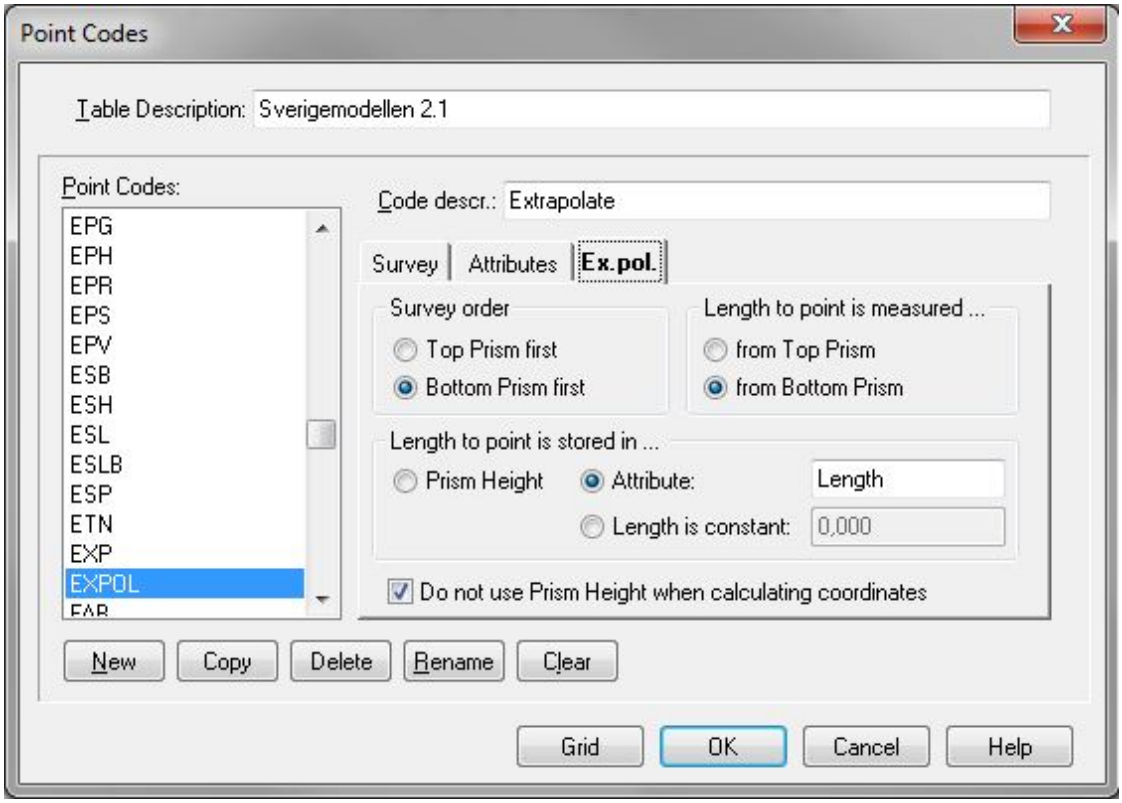


- **Arc from three points**
  Three point reading creating an arc through three measured points in a row.

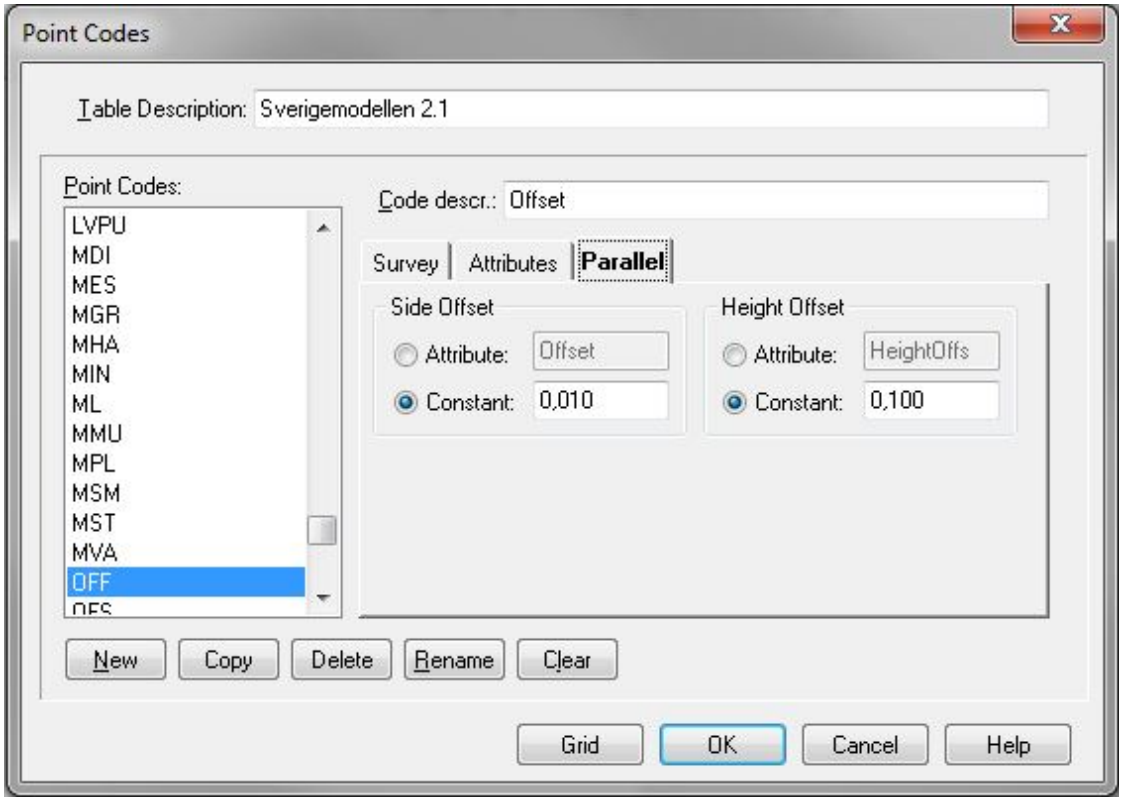


- **Extrapolation (two prisms)**
  The extrapolated point is created by surveying two prisms (or one prism thrust along a line)

and by indicating the length to the third point (as prism height or in attributes).



- **Parallel line**
  Create a parallel line that runs along the measured line. Both a fixed offset and a height addition respectively may be executed.



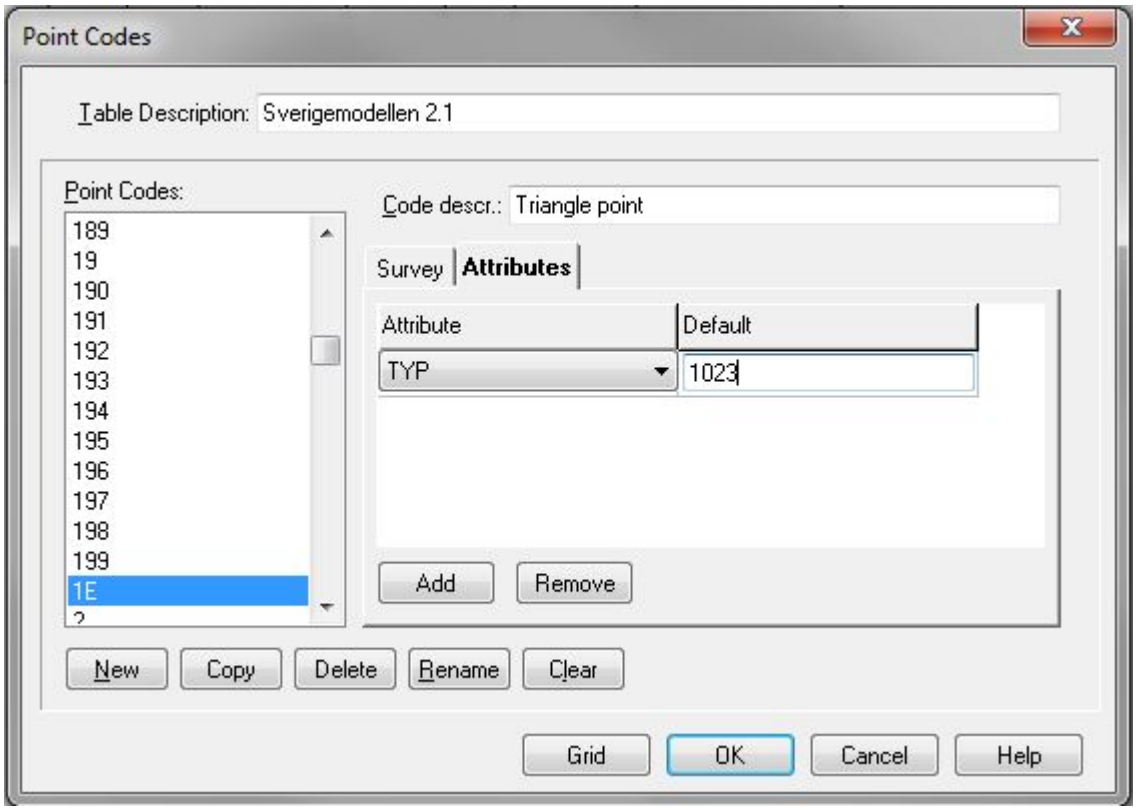
- **Rectangle from three points**
  Creates four points from three read points.

- **Rectangle from two points.**
  Creates a rectangle from two read points and indicates an offset.

Layer

Read points end up in the layer that is indicated here. Important connection to map since the name of the layer is connected to the database's table.
Please note that the name of the layer has to be exactly the same as in the database.

Attribute tab



Each point can have a number of different attributes associated with it. The attribute values can either be entered in fields, edited in survey data, or entered directly in attribute types (see Settings|Attributes), and they can have an automatic connection via the code. This connection is indicated in order to show that certain read objects will end up in a sub type of a certain layer.

Attributes

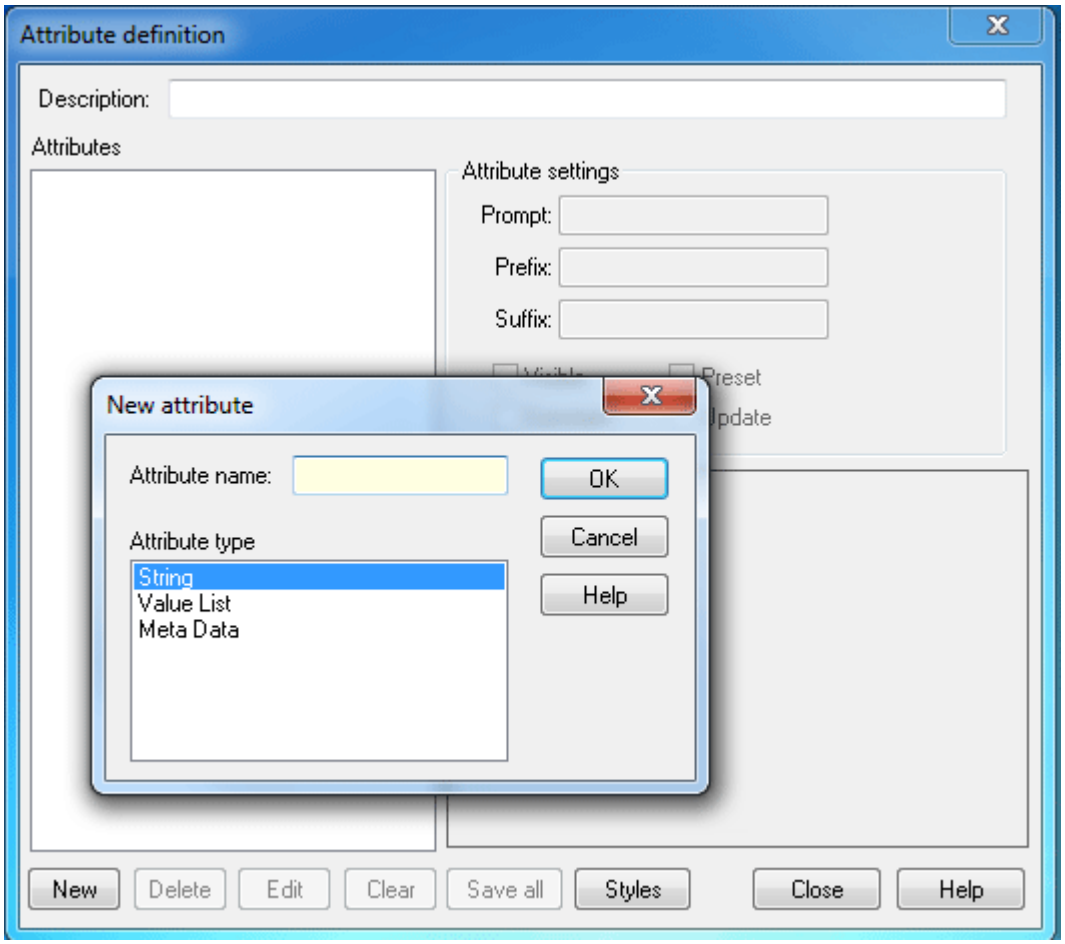
Settings|Attributes

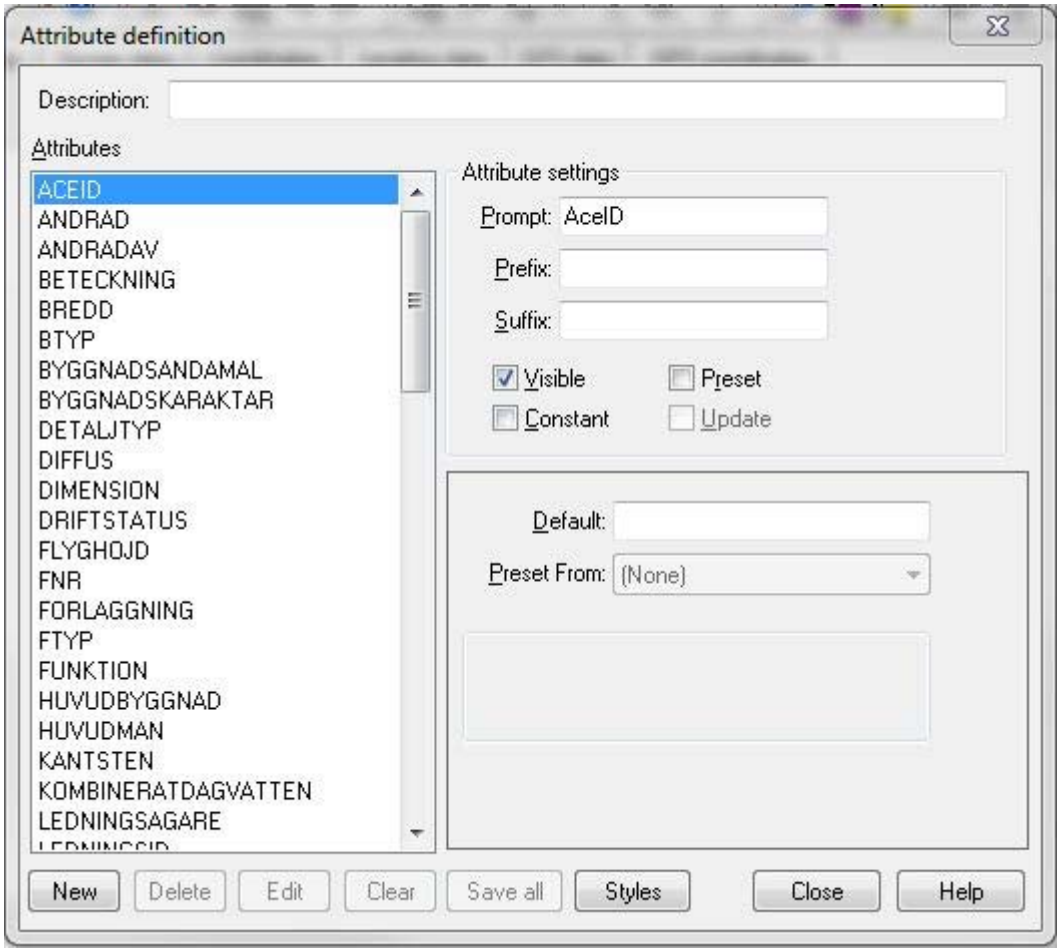
Attributes serve as added value information for points and objects. As a standard, attributes are assigned to the point during measurement and attributes are assigned to the object in the database. Objects can contain several points. For attributes to be able to be associated with object attributes, you need to associate them, which is done in System settings - Survey.

Attributes can be three different types:

- *Strict*
- *Value list*
- *Metadata*

The attributes type value list can use lists for selecting values. The attribute type metadata creates metadata files for external searches.




Attribute definition
Description:
Attributes
ACEID
ANDRAD
ANDRADAV
BETECKNING
BREDD
BTYP
BYGGNADSANDAMAL
BYGGNADSKARAKTAR
DETALJTYP
DIFFUS
DIMENSION
DRIFTSTATUS
FLYGHOJD
FNR
FORLAGGNING
FTYP
FUNKTION
HUVUDBYGGNAD
HUVUDMAN
KANTSTEN
KOMBINERATDAGVATTEN
LEDNINGSAGARE
Attribute settings
Prompt: AceID
Prefix:
Suffix:
Visible
Preset
Constant
Update
Default:
Preset From: (None)
New
Delete
Edit
Clear
Save all
Styles
Close
Help

Control codes

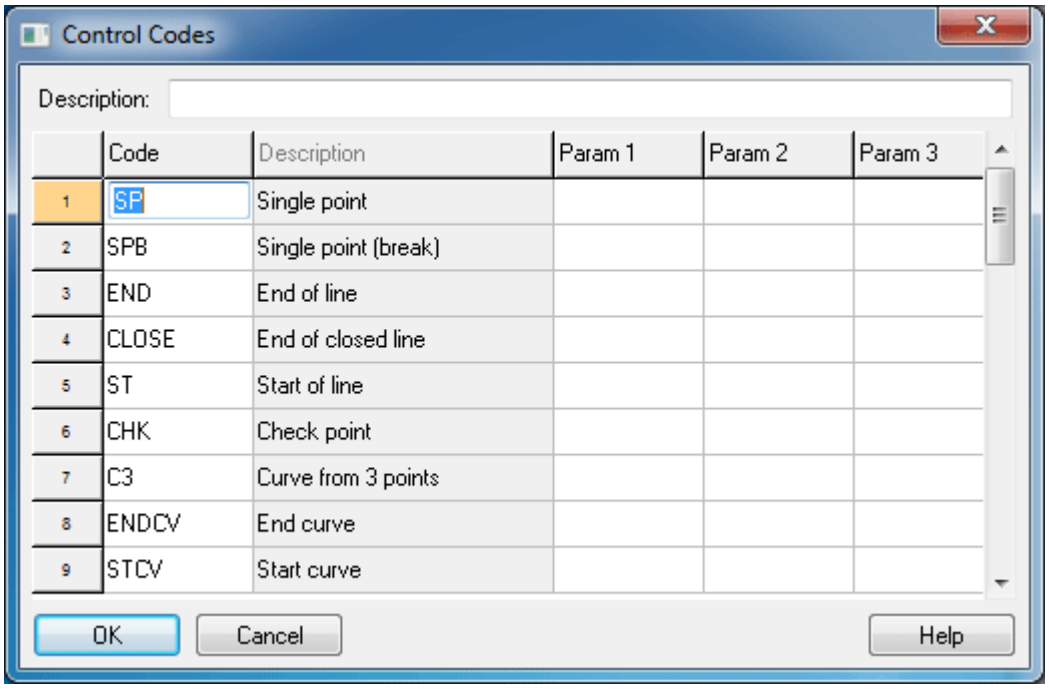
Settings*|*Control codes

Control codes are a way to read and create geometries directly in the measuring process.

There are a great many control codes, but the most important ones are:

ST Start of line
END End of line
SP Single point (the line continues)
SPB Single point break (previous line ends)
CLOSE End of closed line

To use control codes, first enter the point code and then enter the control code in the same field with a separator, usually a space.
Please note that the codes' names may change.



System settings

Settings|System settings

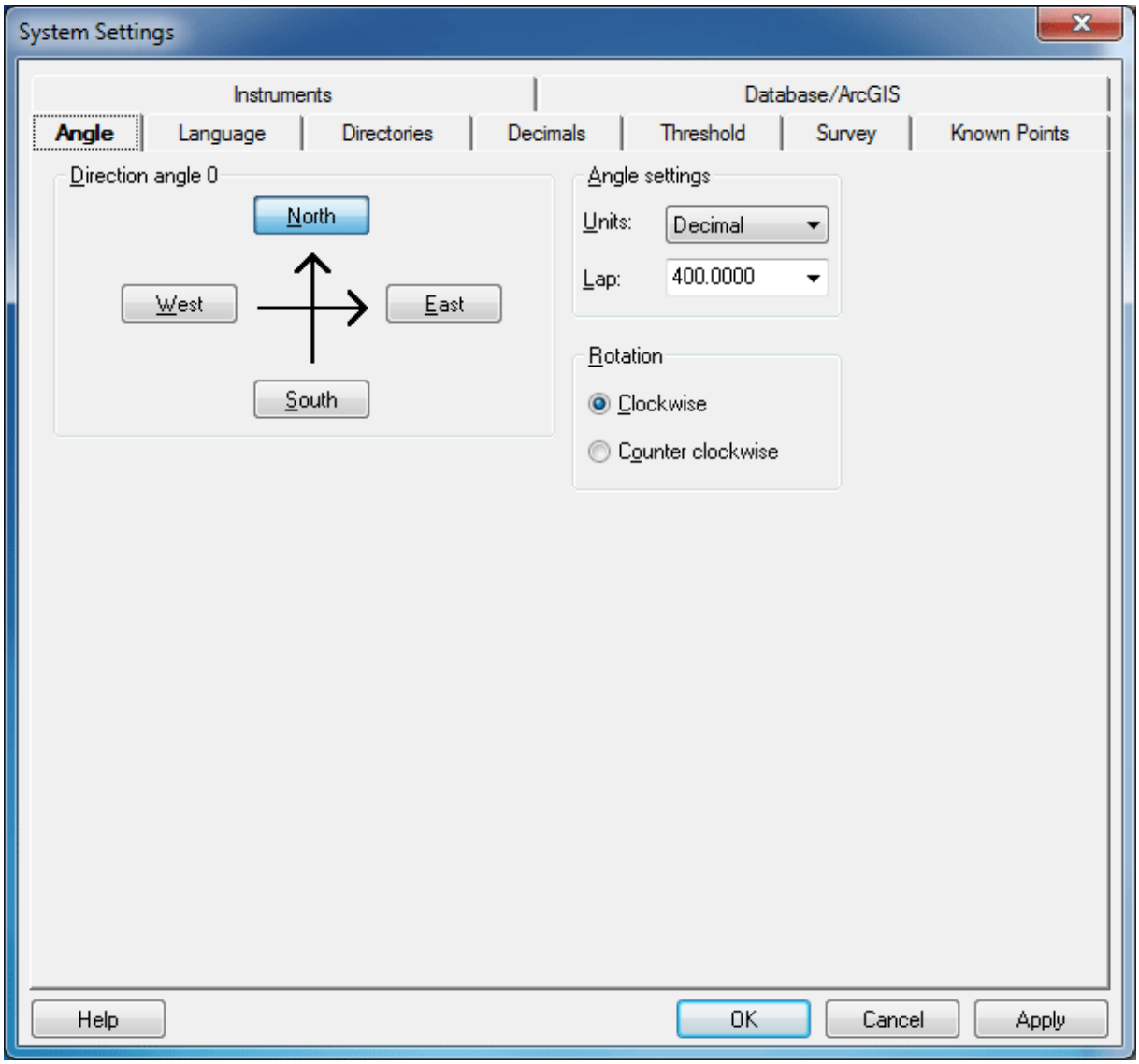
These settings are stored in the registry. If you are not able to make changes in the registry (you don't have access to it), then these are the settings that will apply when you use the app and they will not be able to be changed.

Angle
Language
Directories
Decimals
Threshold
Survey
Known points
Instruments
Database/ArcGIS

Angle

System settings|Angle

It is possible to choose which angle is 0, i.e. if 0 is facing north or east.
There are also settings for how many units are used for a turn, 400 GON, 360 degrees or radians as well as which direction the rotation goes.

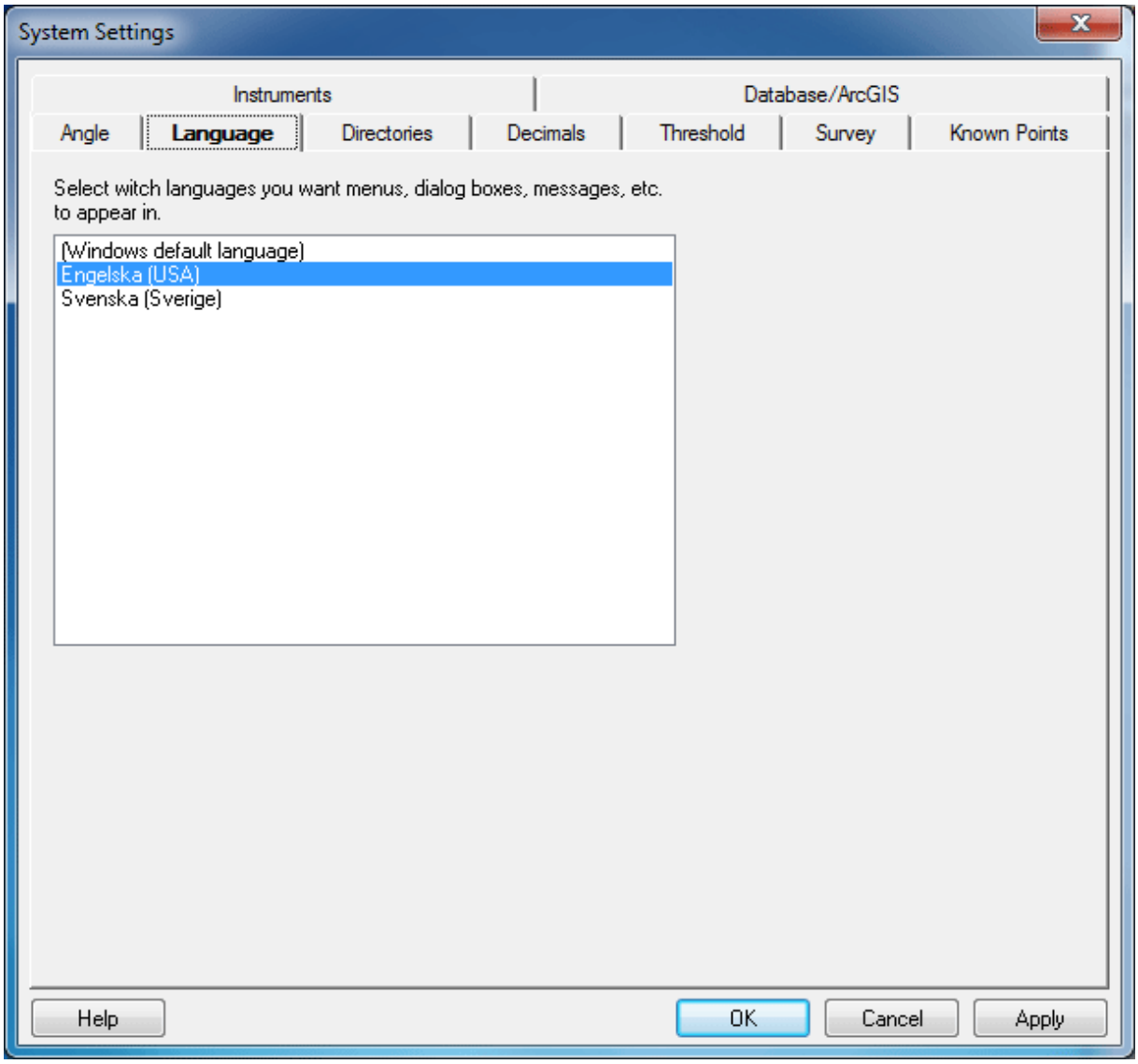


Language

Systems settings|Language

Your language is set automatically based on your settings in Windows, but it is possible to force these settings here.

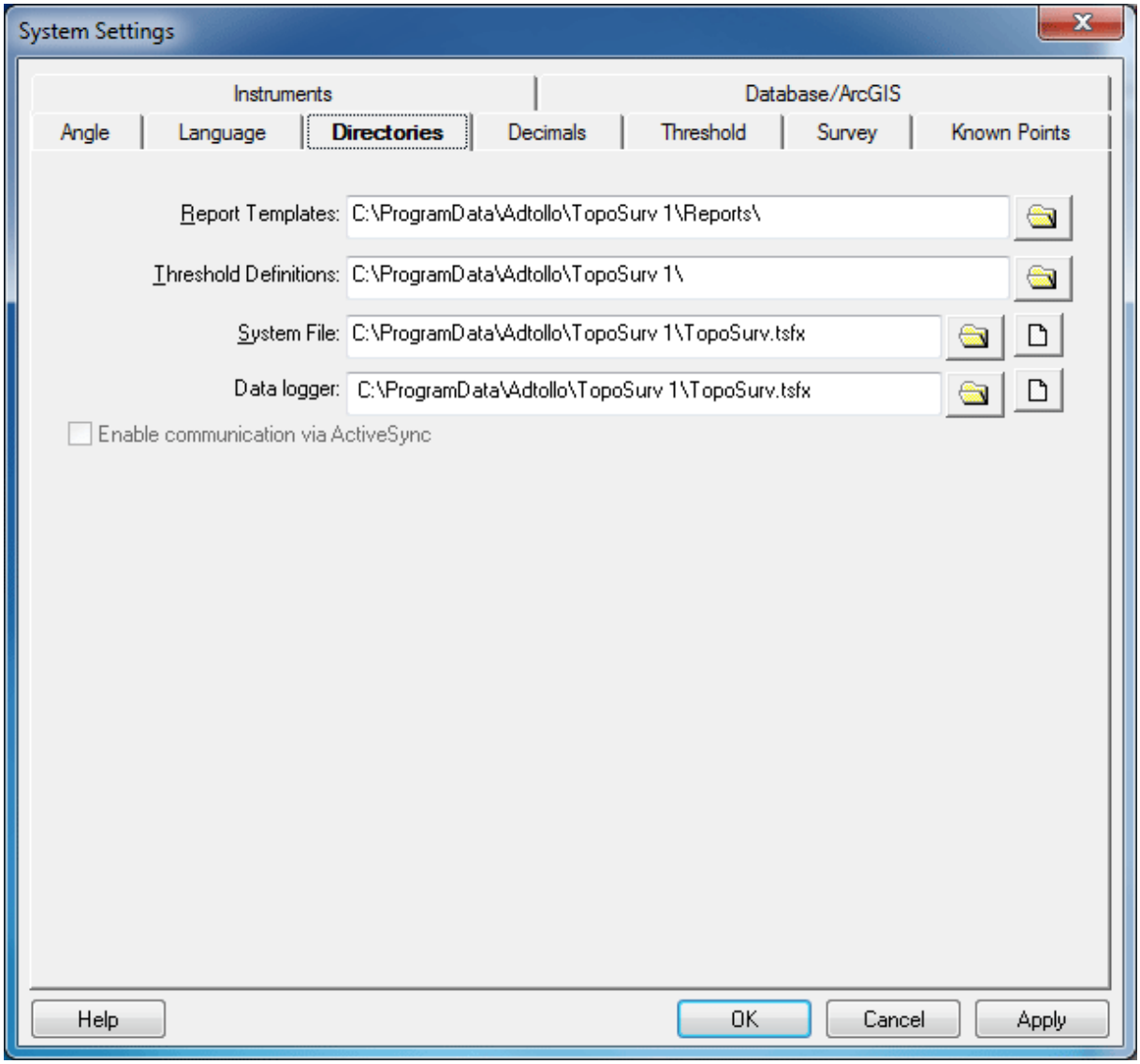
If you switch languages, you need to restart TopoSurv for the changes to take effect.



Directories

System settings|Directories

There are settings for where folders can be found, including, among reports, threshold value definitions and system files as well as a setting for whether ActiveSync will be used or not.



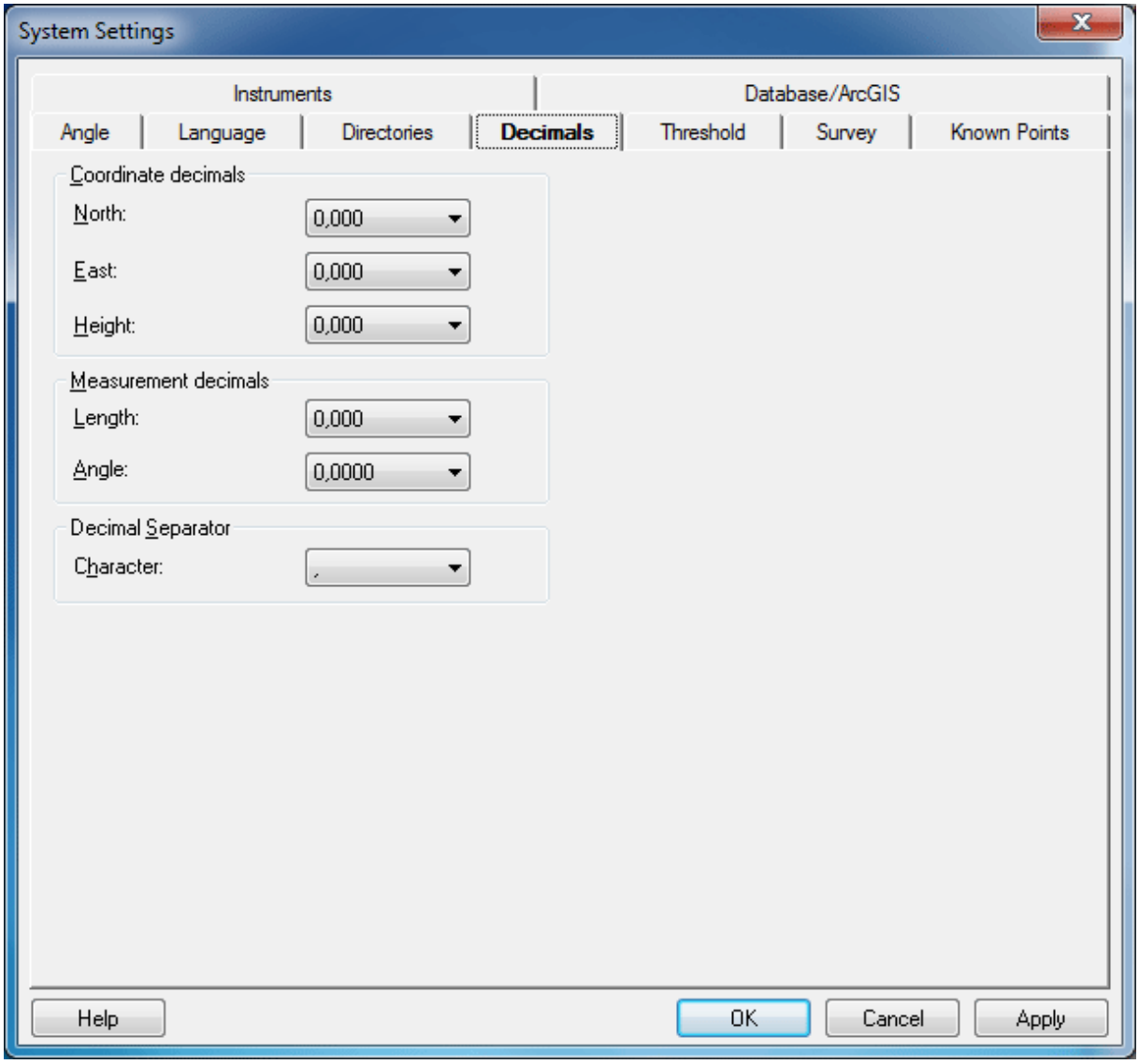
Decimals

System settings|Decimals

Standard settings for how many decimals are shown. A setting for coordinates for planes, height, lengths, angles and whether you want to use a , (comma) or a . (period) as a decimal separator.

In the places where data is shown as a grid, there are individual settings for how many decimals will be shown. This setting is applied by going to column settings by right clicking and entering decimals for the field you want to change.

Settings for periods and commas do not have any effect on how coordinate files look when imported or exported.

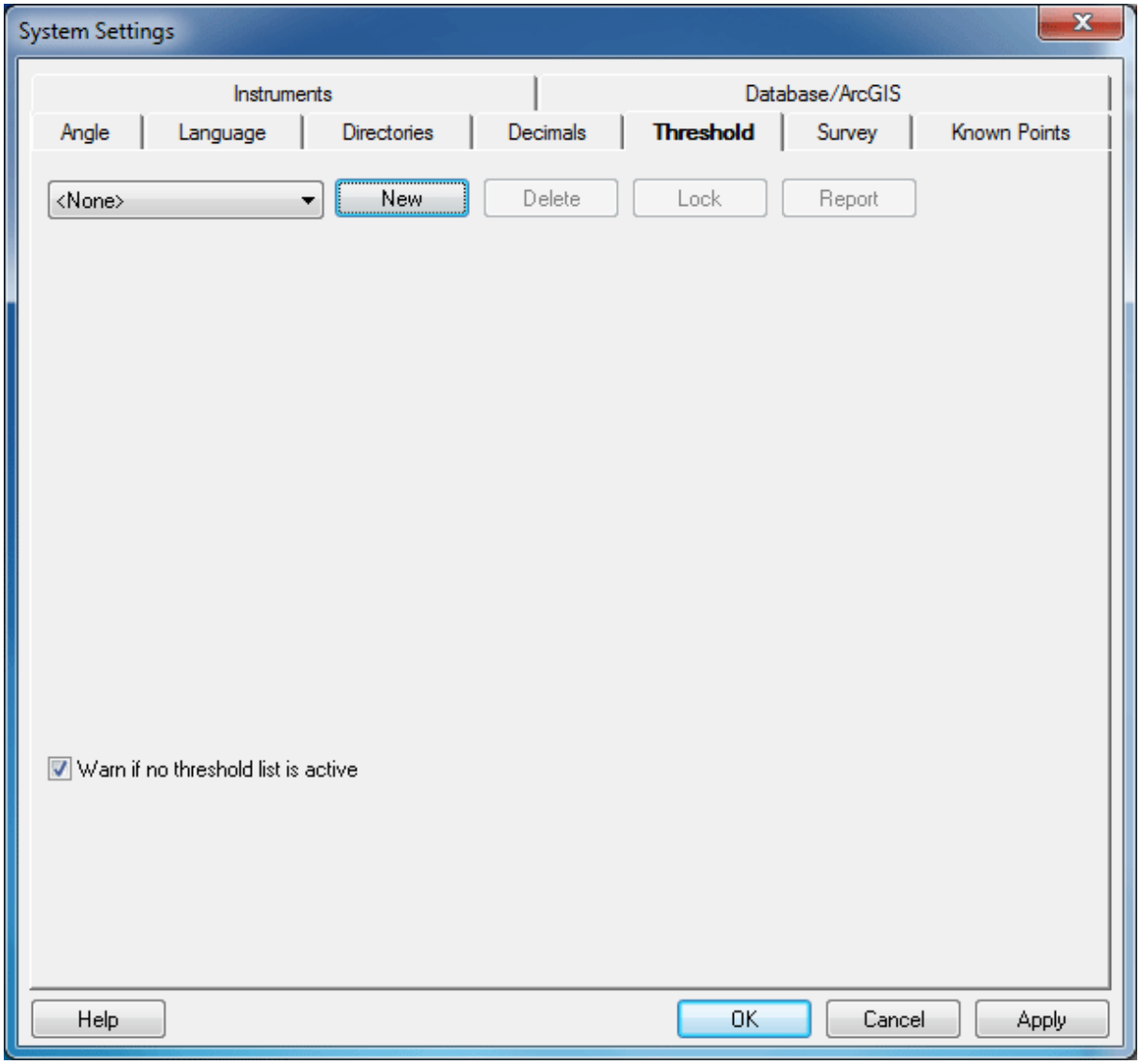


Threshold value

Determine whether a threshold value list will be used or not and which values will be used as threshold values.

There are five different things that can happen when a threshold value is passed:

- No action
- Information
- Mark, the marking is made in a report or a list.
- Warning
- Error, calculation cannot be executed.



Survey

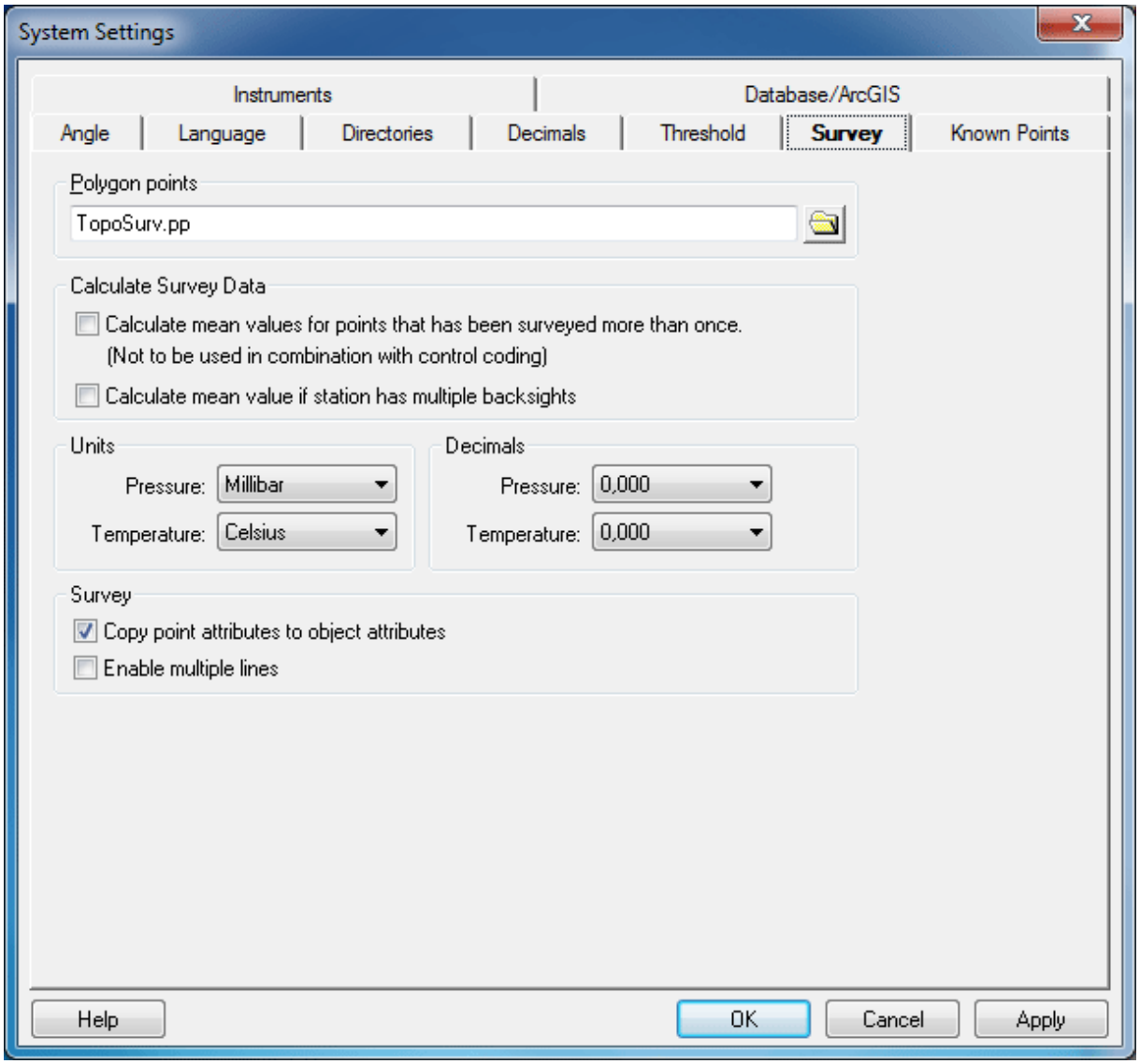
System settings|Survey

Known points can be stored in multiple different places. The PP file is one of them, and it is pointed out here.
Different settings for how mean values are used. The priority between databases and known point file is set up in tab Known points.

Units for pressure and temperature
They are shown here on most instruments and TopoSurv reads them.

Copy point attributes to object attributes
The function for copying point attributes to object attributes should be used when data is to be sent on to ArcGIS. In surveying, all objects are points. In the database, everything is an object.

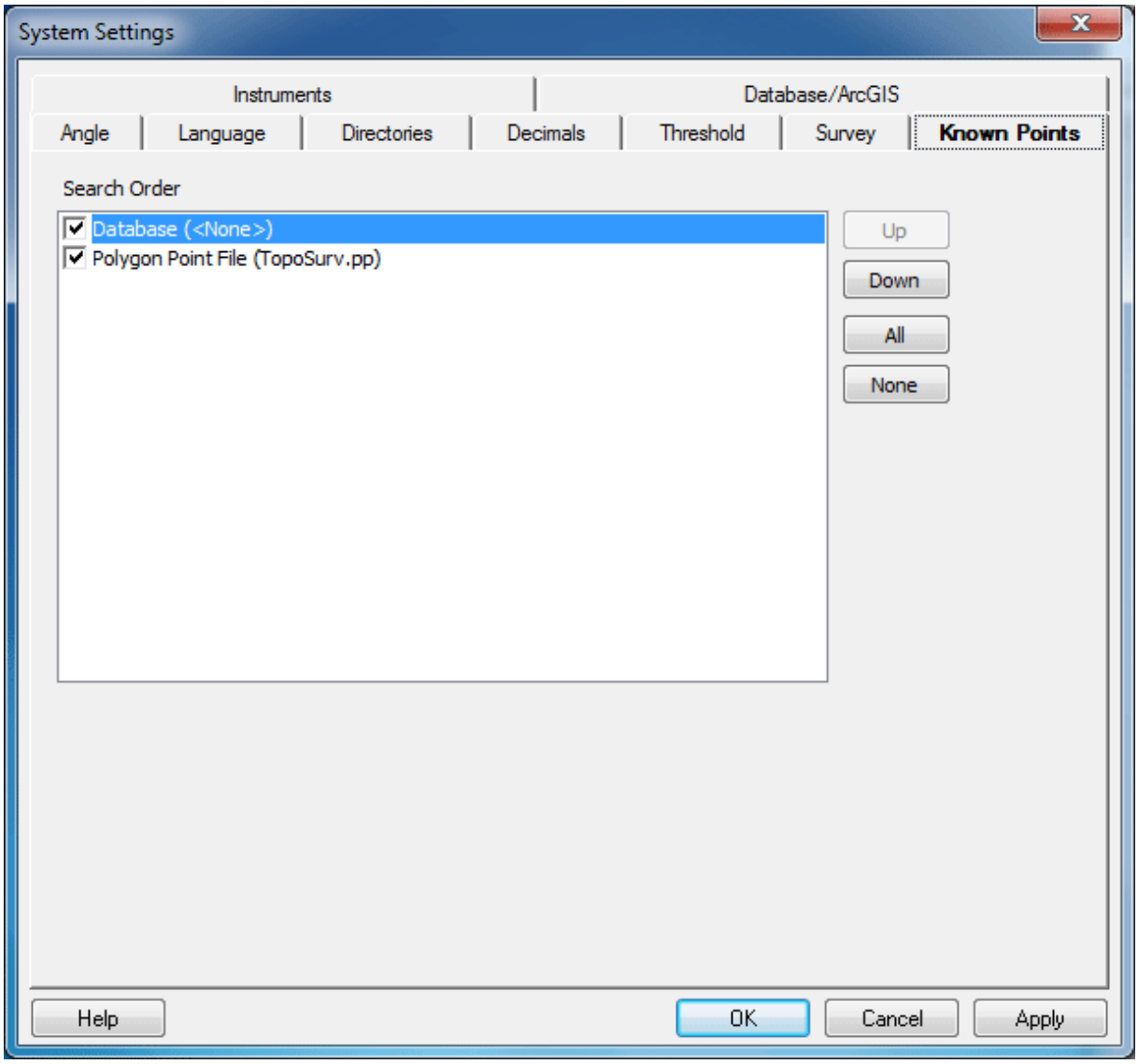
Enable multiple lines
Multiple lines may be used when you want to survey multiple lines at the same time. This is known as sectional measurement with survey sketches drawn by lines.



Known points

System settings|Known points

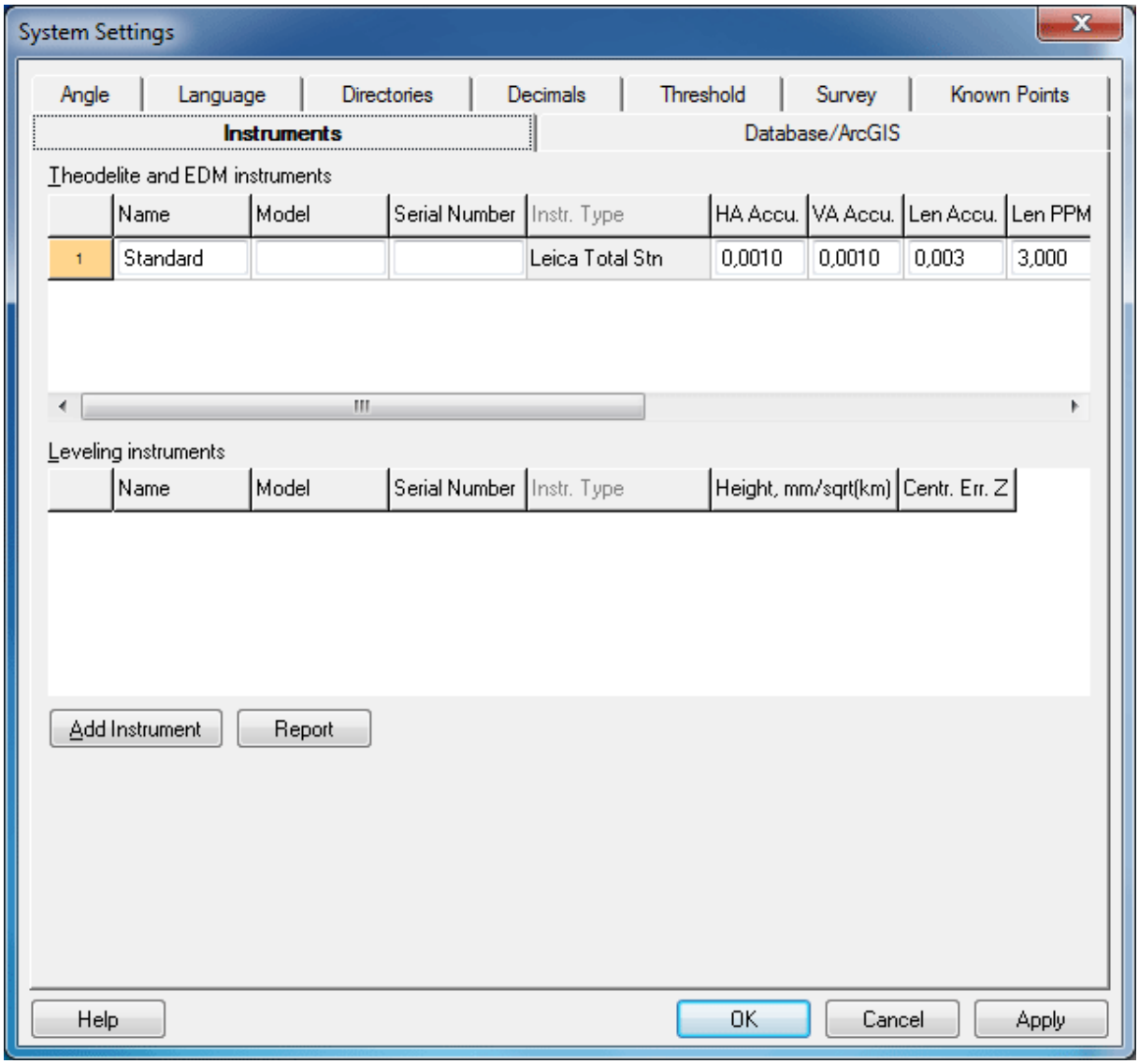
Known points can be defined from various sources, see Preparations. When you are using a Polygon point file (.pp) or a database the setup and priority between them are made here. The known point file is entered in the tab Survey.



Instruments

System settings|Instruments

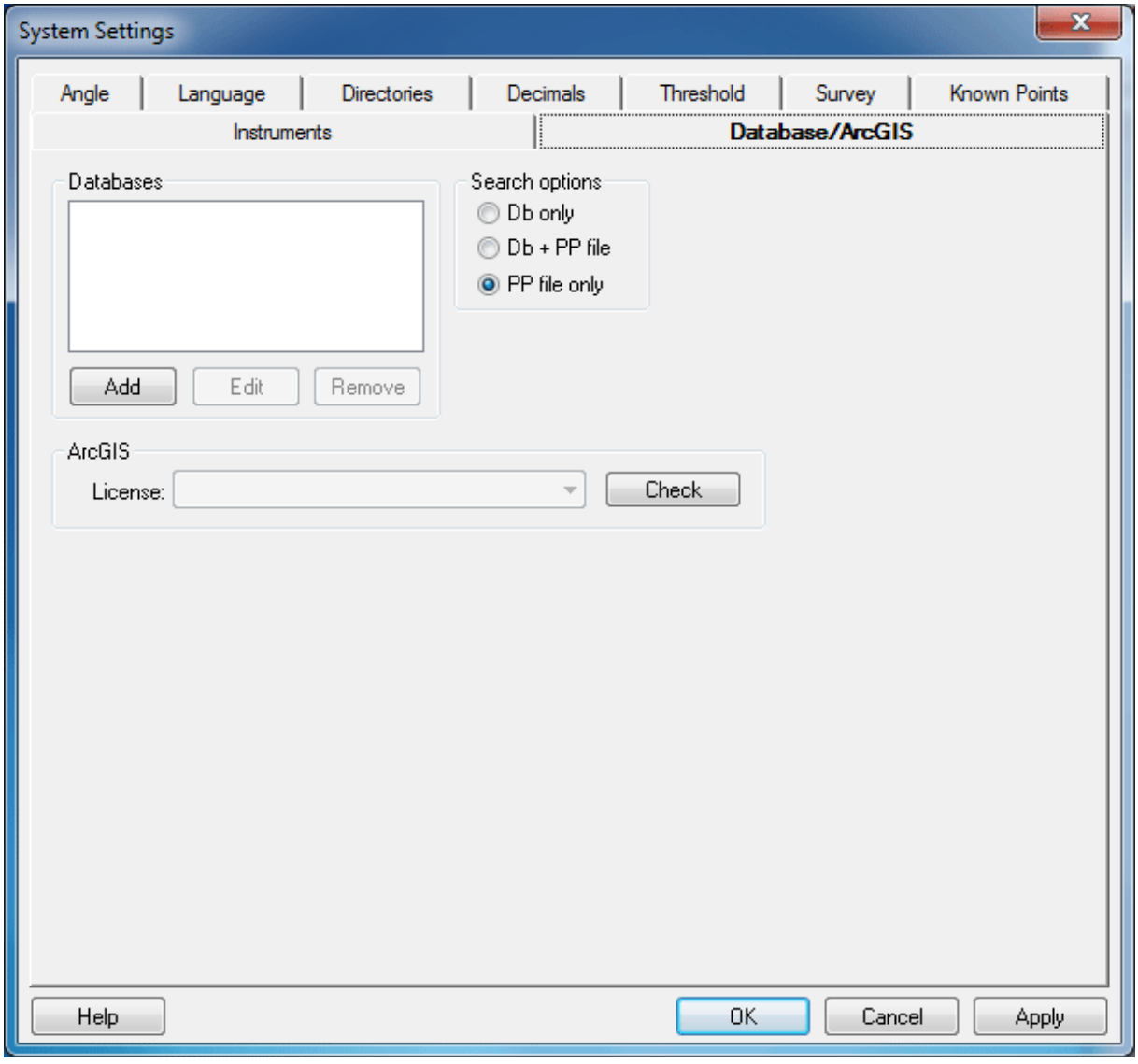
Different instruments are connected here with their precision. If TopoSurv traces the serial number when importing the survey data it will identify the instrument. Otherwise, the instrument's brand will be identified.



Database/ArcGIS

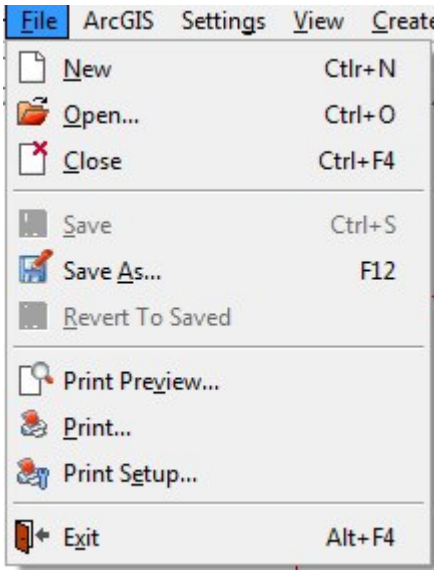
System settings|Database/ArcGIS

Here is where you choose which ArcGIS license will be used and whether you are going to use one or more point databases for access to known points.
If a point database is used, you can choose whether it will be used in combination with a coordinate file or not.
The database can be created from ArcGIS.



File menu

Commands for new document (starts new survey file) open, close, save and print.



Survey and calculation

Preparations
GPS transformations
Leveling data
Field codes
Code systems for lines and geometry
Import from Trimble instruments
Import from Leica instruments
Import from Sokkia instruments
Survey calculation
Importing coordinate files
Text editing
Commands in survey sketch

Preparations

When we are out in the field and doing surveys, we need to make certain specific adjustments for TopoSurv to be able to process the calculations in the right way.

- **For total stations** and storage of survey data, such as angles and distance, we need to define:
  - Where we find known points, base points.
  - Which points we have used as back objects.
  - If and how we have measured temporary points.

- **For certain GPS instruments** we need to know the transformation parameters from the global coordinate system (WGS84) to the local coordinate system.
- **System for field codes**. The list of codes in TopoSurv should match the field codes used out in the field.
- **Code system for lines and geometry.** Out in the field, we can use different codes for different line and point codings, but also for other geometry, such as radii, closed lines, parallel lines and others.

Preparations for total stations

If you use a total station, you can store your surveys either as survey data or as coordinates. There is space in the survey data record for survey data, coordinates, leveling, GPS vectors and GPS latitude and longitude. See the respective subchapter for information about field codes and coding for geometry.
We save information from total stations and surveys, such as distance and angles, in the survey data document. We then make calculations from this file for the survey sketch that are then saved in ArcGIS's map database. The survey data document can be saved as a file with the extension .sur which you can calculate later or send to a colleague for calculation.
We need to clarify for this which points are back objects and find the coordinates both for them and for the station.

How do we tell TopoSurv what are back objects and what are temporary points?

- For Geodimeters and older Trimble equipment, you can use *labels/tags* for these settings.
- For Leica equipment, you can use code block information.
- For all equipment, you can use the code table in TopoSurv where you indicate the point type back object on the points you want to use as back objects. You can also do manual editing in the tab *Surveying &endash; Point type*. For back object, select Point type &endash; Back object.
- For temporary points, which we are going to use as back objects or stations in the next plan, select *Pique* (only saved in memory) or *Known point* which is saved in the selected file *Polygon point* (see settings).

Here you can find station coordinates

- The station can find coordinates in the station head.
- The coordinates can also be found under the tab *Known points.*
  Points that have been used as stations and back objects, and that have been read with the same Point ID, will automatically end up under Known points when importing.
- The known points can be read with GPS to then be used from survey data calculations. In that case, choose to calculate with "Calculate GPS and survey data".

- The known points can also be saved in the file *Polygon point* which can be selected in *System settings*. The file is called Databases.
- The points can also be saved in a database. The settings for that are applied in system settings.

GPS transformations

How data is saved in GPS receivers is different depending on the manufacturer. Trimble saves data in WGS84/SWEREF99 and Leica saves data in a local coordinate system.
GPS data is saved in three different ways: as local coordinates, as latitude/longitude or as the station's latitude/longitude with its vectors.

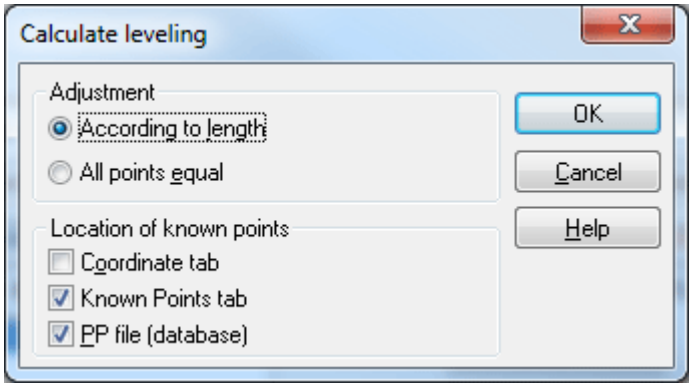
How to calculate different types of GPS data:

- *Local coordinates* &endash; process coordinates directly from your survey data document.
- *Latitude/longitude* &endash; process GPS coordinates through transformation.
- *GPS vectors* &endash; calculate GPS data through transformation. Detailed points accompany the transformation
- If you have both survey data and GPS data, you can calculate them simultaneously with the command Calculate GPS and survey data.

All calculations and transfers end up directly in the survey sketch.

Leveling data

Leveling data can be calculated and the values of heights can be saved in a coordinate file or a Polygon point file.
Adjustment of height can be calculated with *Depending on length* or *All points equally.*



Field codes

The code list is selected primarily from project settings or in other cases from system settings. If the code table is used in the project settings, it will not be able to be used in the system settings.

The codes are used to give information about what type of object is being surveyed. You can give a great deal of information for each code. This can be done in *Edit code table in Settings*:

- **Surveying**
  - Point types for back objects and temporary points are indicated here as well as settings for lines, points and design points.
  - Potential calculation functions
  - Layer for connection to the database

- **Attributes** &endash; each object/point can have attribute information. Is used for sub types among other things.

Code systems for lines and geometry

In order to be able to determine geometry out in the field, with the exception of points, you have to use some kind of system.

TopoSurv supports several different systems for surveying lines:

- Intermittent &endash; by skipping a number &endash; 1, 2, 3, blank, 5, 6, 7 &endash; there will be a new line after each skipped number.
- Line no./Point Id &endash; by using point numbers in the following way: 1.01, 1.02, 1.03, 1.04 and 2.01, 2.02, 2.03, 2.04 a new line is formed for each number. Individual points can be indicated in the following manner: 100, 101, 102 etc. The number of decimals is insignificant.
- Code group &endash; a line will be formed for as long as it is the same point code. A new code creates a new line.
- It is also possible to use labels/tags (Geodimeter) or code blocks (Leica) from different types of total stations.
- Control code &endash; the control code creates various options for surveying circular arcs, splines, parallel lines, rectangles, closed polygons etc. (see below).
- *Code table* + *control code* &endash; the code table can use the point type information Line or Point. A code that has the point type Line, will be a line. We use this in combination with the control code. In this way, it is still possible to use control codes for more advanced use of object geometry.

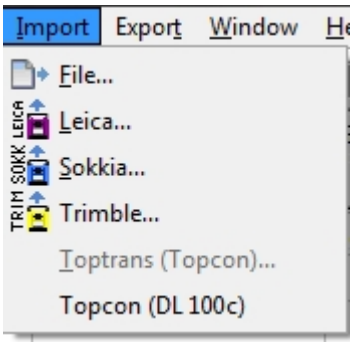
Control coding

See Control codes in Calculation functions

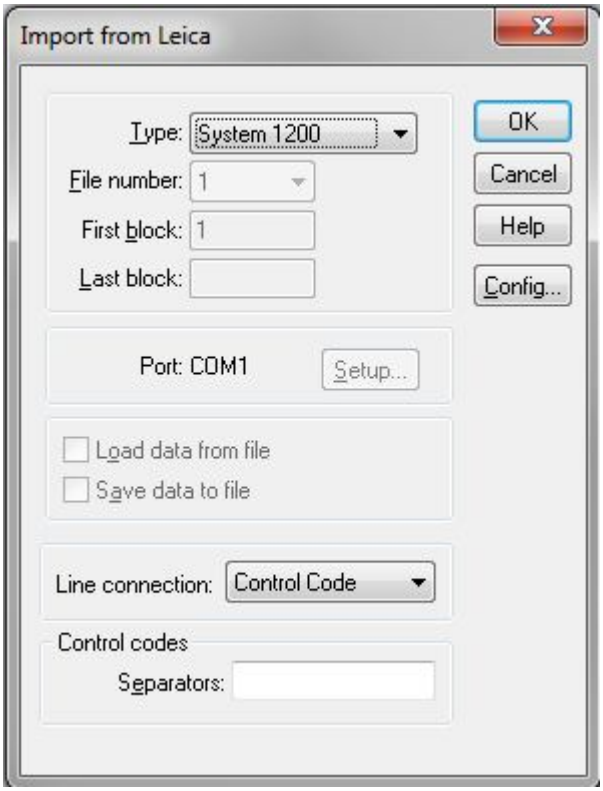
Import from Leica instruments

Import|Leica

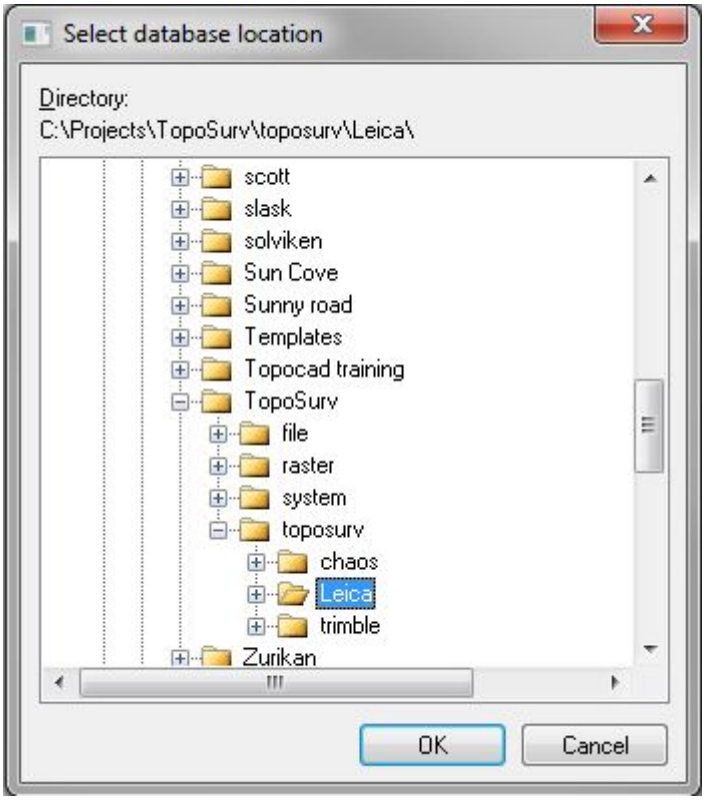
1. Start importing from Leica via the command in ArcGIS. If you are already in Toposurv, click on *Import|Leica.*



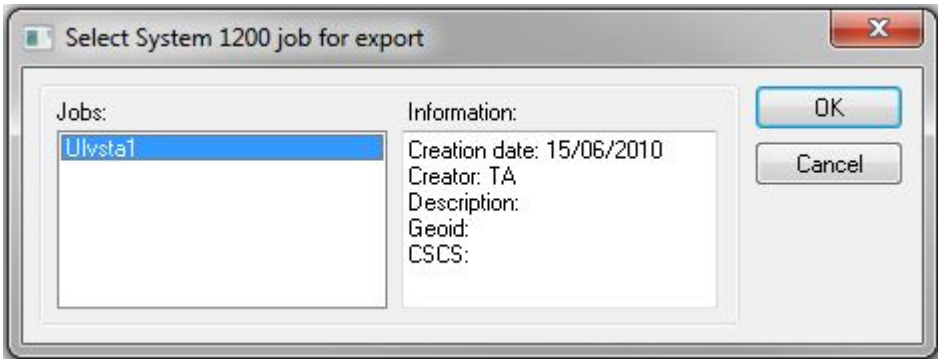
2. This dialog will come up.



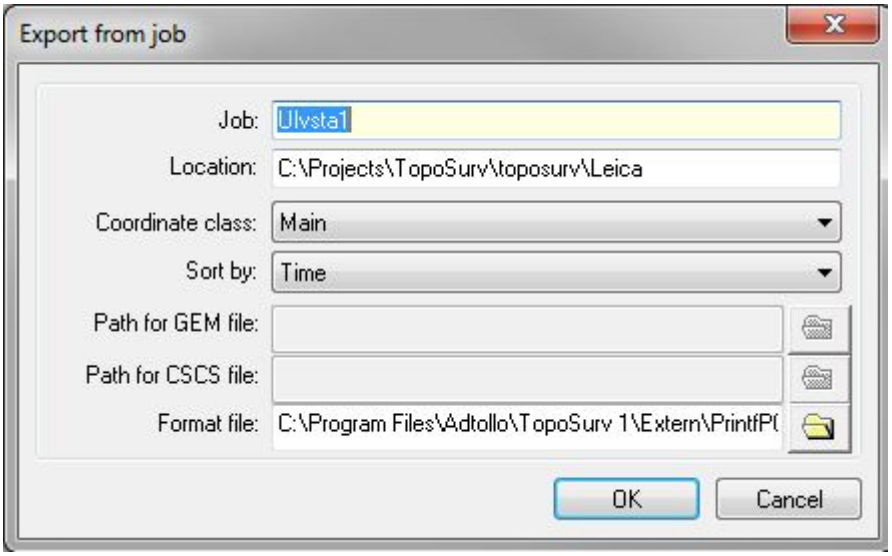
3. In this position, we will choose which Leica instrument/file format we are going to import from.
   Select line connection method.
   Indicate the separator for the control code.
4. Click OK.
5. You will now enter the Roadrunner application from Leica.
   Select the folder for where your data is.



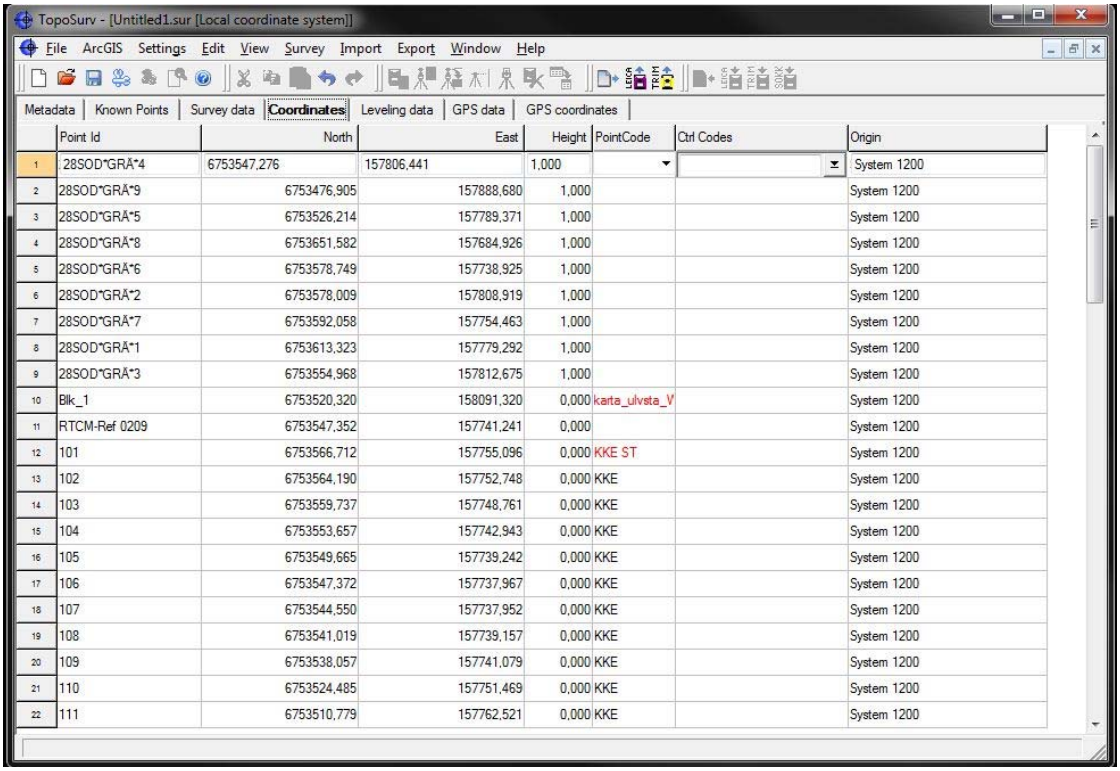
6. In the next dialog, you select which job you are going to import.



7. In the next dialog, there is information about the job. Click OK.



8. Now your screen will look like this:



	Point Id	North	East	Height	PointCode	Ctrl Codes	Origin
1	.28SOD"GRÄ"4	6753547,276	157806,441	1,000			System 1200
2	28SOD"GRÄ"9	6753476,905	157888,680	1,000			System 1200
3	28SOD"GRÄ"5	6753526,214	157789,371	1,000			System 1200
4	28SOD"GRÄ"8	6753651,582	157684,926	1,000			System 1200
5	28SOD"GRÄ"6	6753578,749	157738,925	1,000			System 1200
6	28SOD"GRÄ"2	6753578,009	157808,919	1,000			System 1200
7	28SOD"GRÄ"7	6753592,058	157754,463	1,000			System 1200
8	28SOD"GRÄ"1	6753613,323	157779,292	1,000			System 1200
9	28SOD"GRÄ"3	6753554,968	157812,675	1,000			System 1200
10	Blk_1	6753520,320	158091,320	0,000	karta_ulvsta_V		System 1200
11	RTCM-Ref 0209	6753547,352	157741,241	0,000			System 1200
12	101	6753566,712	157755,096	0,000	KKE ST		System 1200
13	102	6753564,190	157752,748	0,000	KKE		System 1200
14	103	6753559,737	157748,761	0,000	KKE		System 1200
15	104	6753553,657	157742,943	0,000	KKE		System 1200
16	105	6753549,665	157739,242	0,000	KKE		System 1200
17	106	6753547,372	157737,967	0,000	KKE		System 1200
18	107	6753544,550	157737,952	0,000	KKE		System 1200
19	108	6753541,019	157739,157	0,000	KKE		System 1200
20	109	6753538,057	157741,079	0,000	KKE		System 1200
21	110	6753524,485	157751,469	0,000	KKE		System 1200
22	111	6753510,779	157762,521	0,000	KKE		System 1200

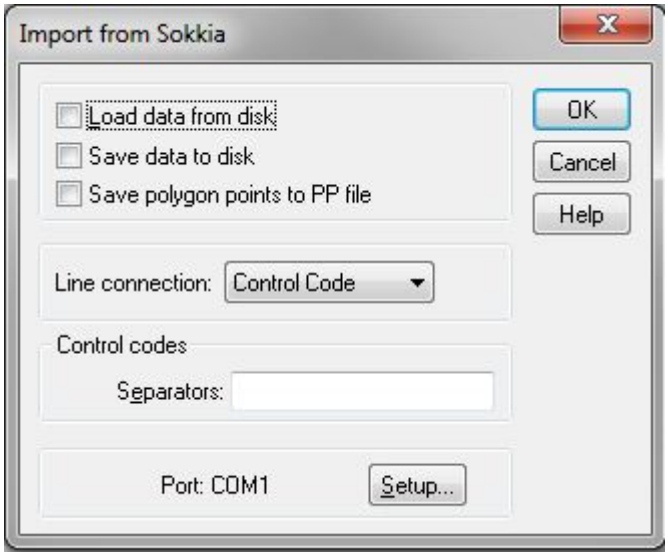
Data from Leica comes in as local coordinates or survey data. In this case, only as local coordinates.

For coordinate process, see Survey calculation.

Import from Sokkia instruments

Import|Sokkia

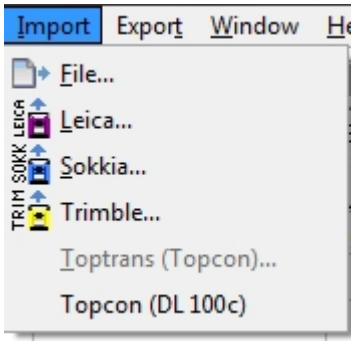
To import data from Sokkia, use the button or select *Import*|*Sokkia* from the menu.



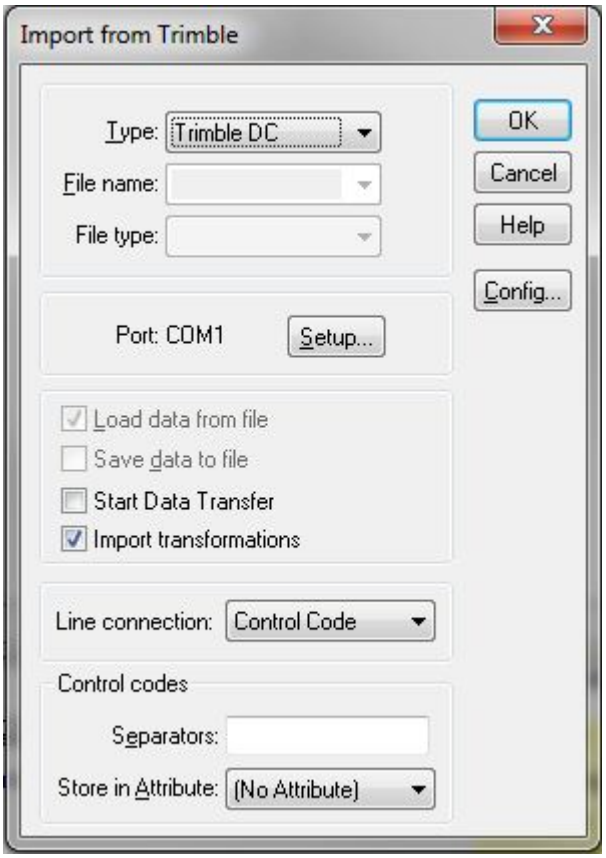
Import from Trimble instruments

Import|Trimble

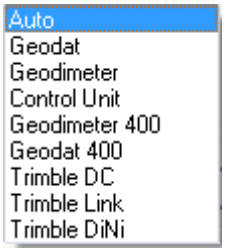
Start importing from Trimble via the command in ArcGIS. If you are already in Toposurv, click *Import*|*Trimble.*



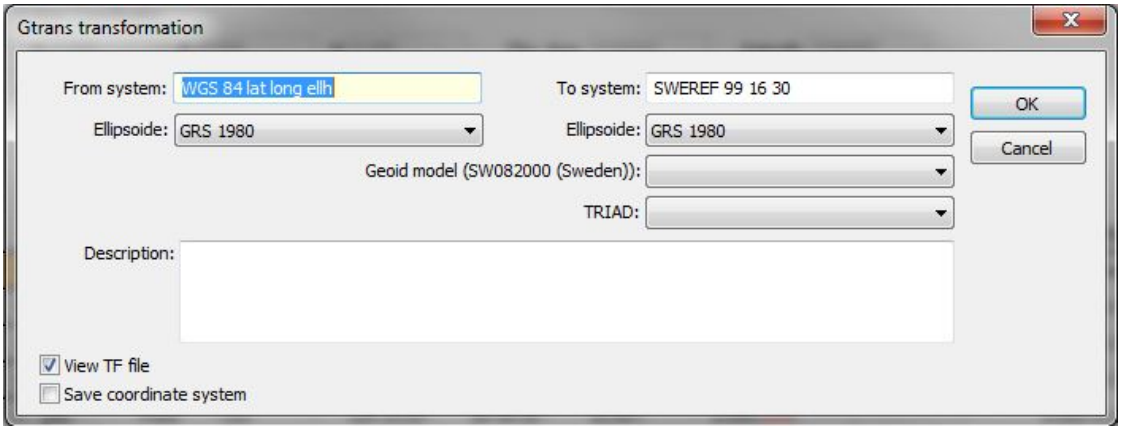
1. This dialog will come up.



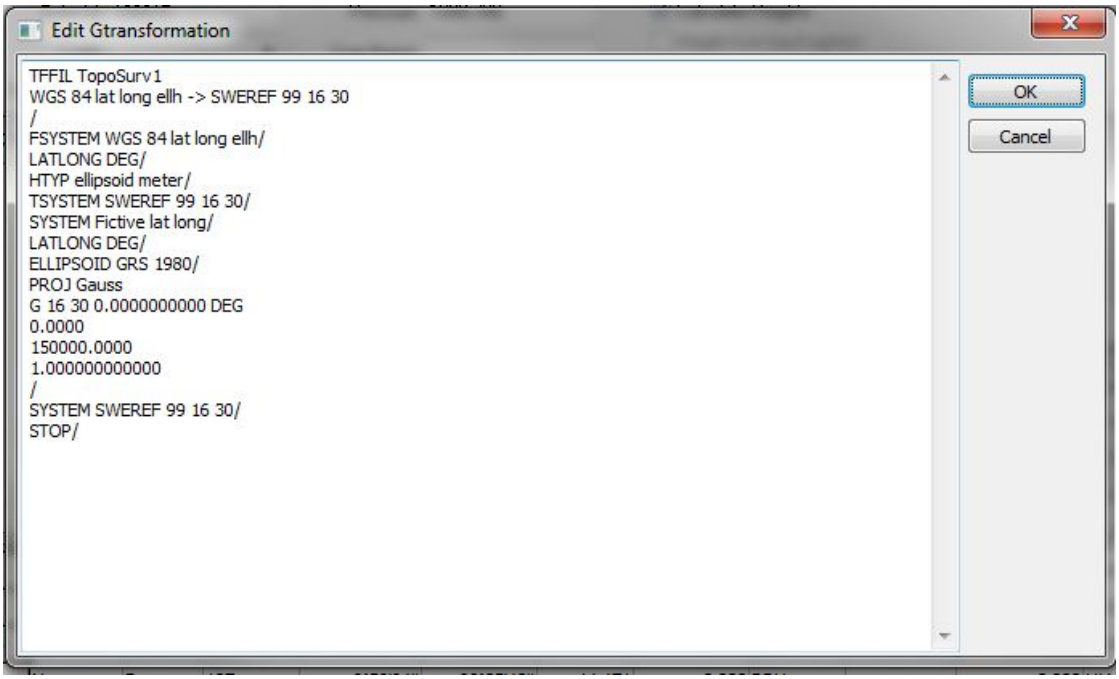
2. In this position, we will choose which Trimble instrument/file format we are going to import from. It is possible to select a great many different Trimble instruments.



3. Select the type of instrument, or Auto. Please note that certain data is retrieved directly from the instrument and certain data is retrieved from files. In that case, we select Auto and mark from file or we select Trimble DC (from file is preselected).
   Select line connection method.
   Indicate the separator for the control code (space in this case.)
4. Click OK.
5. If you have GPS data in this survey, you now have the opportunity to trace the correlation that you used out in the field. You can also use the correlations that you made previously or that accompany Gtrans.



A description is possible. Press OK if you want to save the correlation.



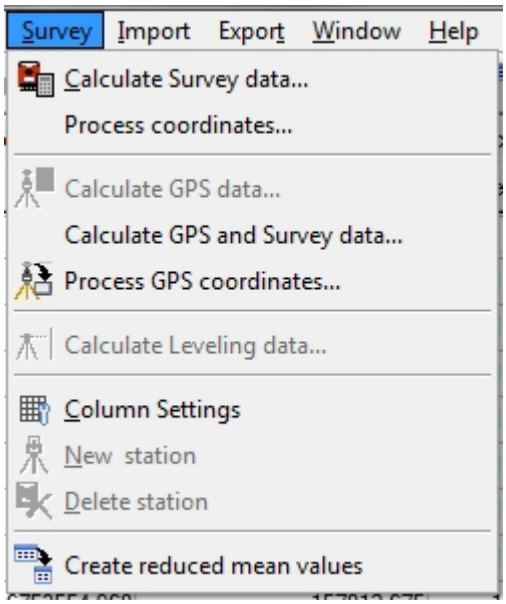
Preview/editing of the correlation. Press OK to save.

Save the file. Please note that you will not see the file's name during calculation. Instead you will see the From systems and To systems that are defined in the TF file. Put the file in a specific folder, but not the folder that is used internally by Gtrans (SYS).

Process with calculation see Survey calculation

Survey calculation

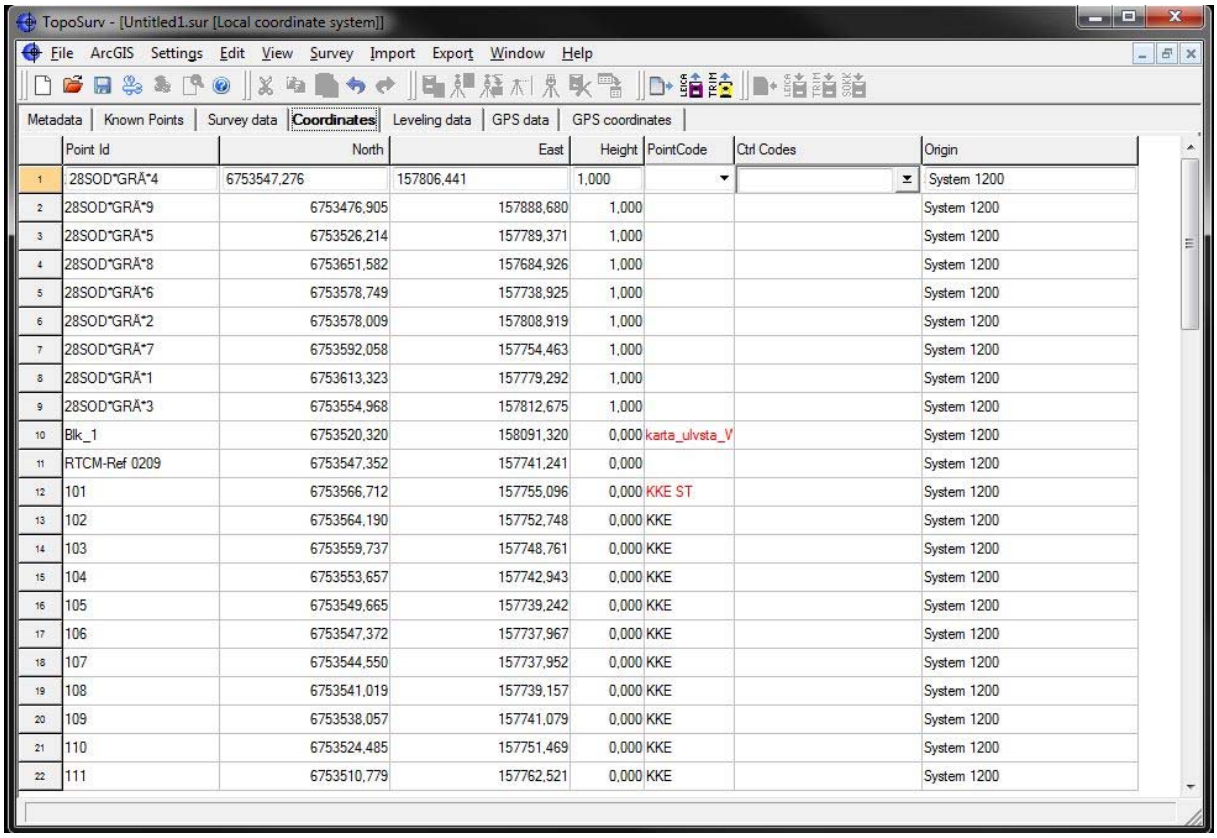
Survey



Different methods to calculate and process observation data. Depending on the type of data you have you need to make different types of calculations.

Process coordinates

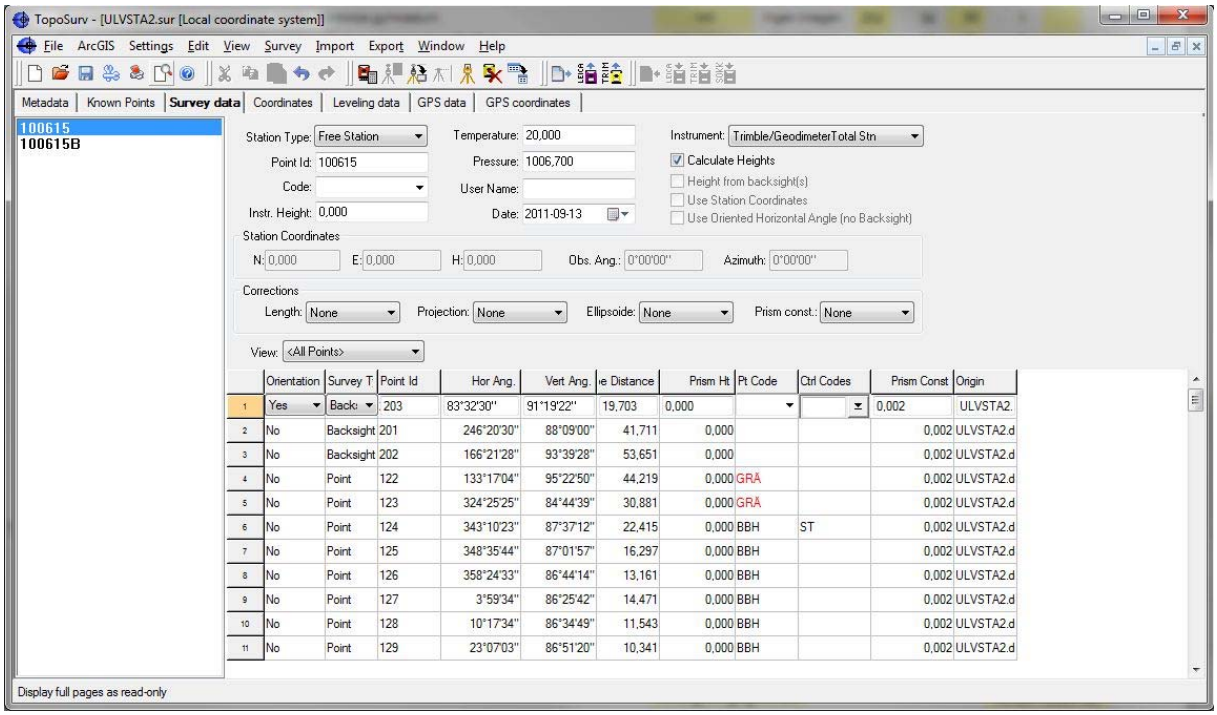
Calculating the coordinates is done via the command *Survey data - Process coordinates.* The result ends up directly in the survey sketch.
This drawing can be saved as a .top file.
The reason that objects are shown with different colors is partly because each code ends up in a layer, put up in the code table, and that there is a built-in (designated) standard drawing with layers and their colors.



	Point Id	North	East	Height	PointCode	Ctrl Codes	Origin
1	28SOD"GRÄ"4	6753547,276	157806,441	1,000			System 1200
2	28SOD"GRÄ"9	6753476,905	157888,680	1,000			System 1200
3	28SOD"GRÄ"5	6753526,214	157789,371	1,000			System 1200
4	28SOD"GRÄ"8	6753651,582	157684,926	1,000			System 1200
5	28SOD"GRÄ"6	6753578,749	157738,925	1,000			System 1200
6	28SOD"GRÄ"2	6753578,009	157808,919	1,000			System 1200
7	28SOD"GRÄ"7	6753592,058	157754,463	1,000			System 1200
8	28SOD"GRÄ"1	6753613,323	157779,292	1,000			System 1200
9	28SOD"GRÄ"3	6753554,968	157812,675	1,000			System 1200
10	Blk_1	6753520,320	158091,320	0,000	karta_ulvsta_V		System 1200
11	RTCM-Ref 0209	6753547,352	157741,241	0,000			System 1200
12	101	6753566,712	157755,096	0,000	KKE ST		System 1200
13	102	6753564,190	157752,748	0,000	KKE		System 1200
14	103	6753559,737	157748,761	0,000	KKE		System 1200
15	104	6753553,657	157742,943	0,000	KKE		System 1200
16	105	6753549,665	157739,242	0,000	KKE		System 1200
17	106	6753547,372	157737,967	0,000	KKE		System 1200
18	107	6753544,550	157737,952	0,000	KKE		System 1200
19	108	6753541,019	157739,157	0,000	KKE		System 1200
20	109	6753538,057	157741,079	0,000	KKE		System 1200
21	110	6753524,485	157751,469	0,000	KKE		System 1200
22	111	6753510,779	157762,521	0,000	KKE		System 1200

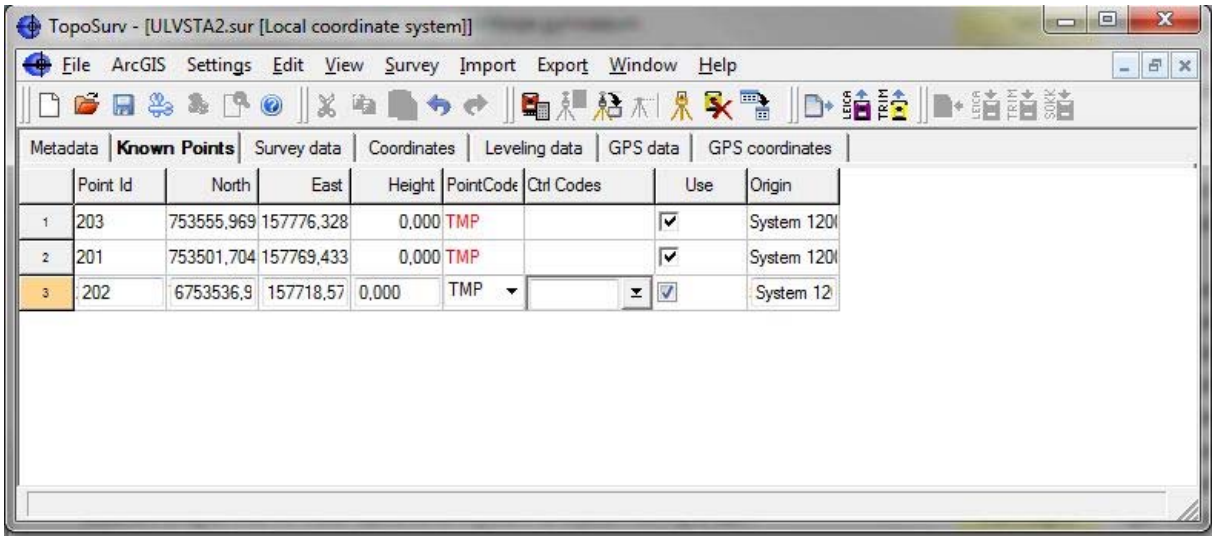
Survey data calculation and GPS processing

Two station names are seen to the left. The station type is selected as free station contingent upon Toposurv having found more than one back object. See the column Survey type. The station coordinates are under the tab "Coordinates", whereas the back object has been read with the help of GPS and is found under the tab GPS coordinates as latitude and longitude.



	Orientation	Survey T	Point Id	Hor Ang.	Vert Ang.	e Distance	Prism Ht	Pt Code	Ctrl Codes	Prism Const	Origin
1	Yes	Back	203	83°32'30"	91°19'22"	19,703	0,000			0,002	ULVSTA2.
2	No	Backsight	201	246°20'30"	88°09'00"	41,711	0,000			0,002	ULVSTA2.d
3	No	Backsight	202	166°21'28"	93°39'28"	53,651	0,000			0,002	ULVSTA2.d
4	No	Point	122	133°17'04"	95°22'50"	44,219	0,000	GRÄ		0,002	ULVSTA2.d
5	No	Point	123	324°25'25"	84°44'39"	30,881	0,000	GRÄ		0,002	ULVSTA2.d
6	No	Point	124	343°10'23"	87°37'12"	22,415	0,000	BBH	ST	0,002	ULVSTA2.d
7	No	Point	125	348°35'44"	87°01'57"	16,297	0,000	BBH		0,002	ULVSTA2.d
8	No	Point	126	358°24'33"	86°44'14"	13,161	0,000	BBH		0,002	ULVSTA2.d
9	No	Point	127	3°59'34"	86°25'42"	14,471	0,000	BBH		0,002	ULVSTA2.d
10	No	Point	128	10°17'34"	86°34'49"	11,543	0,000	BBH		0,002	ULVSTA2.d
11	No	Point	129	23°07'03"	86°51'20"	10,341	0,000	BBH		0,002	ULVSTA2.d

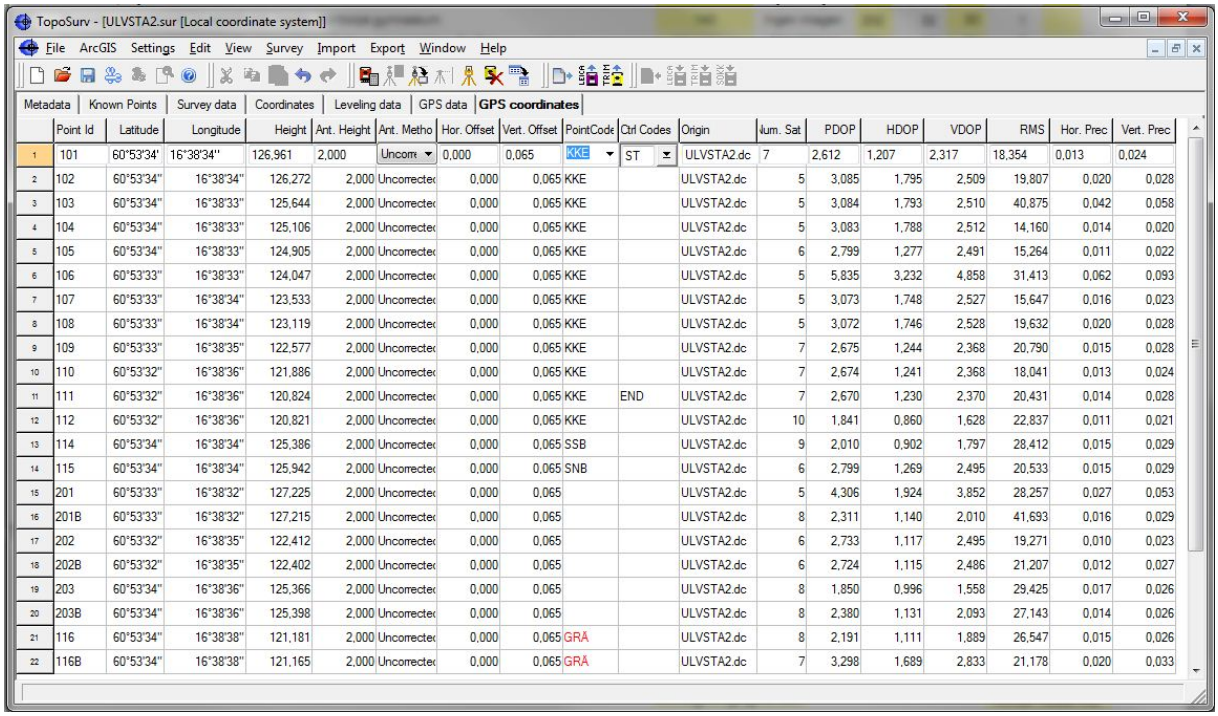
Known points have their station coordinates:



	Point Id	North	East	Height	PointCode	Ctrl Codes	Use	Origin
1	203	753555,969	157776,328	0,000	TMP		☑	System 120
2	201	753501,704	157769,433	0,000	TMP		☑	System 120
3	202	6753536,9	157718,57	0,000	TMP		☑	System 12

If we want to use them as points of origin, we will mark them under the column "Use"

This is what GPS readings look like:

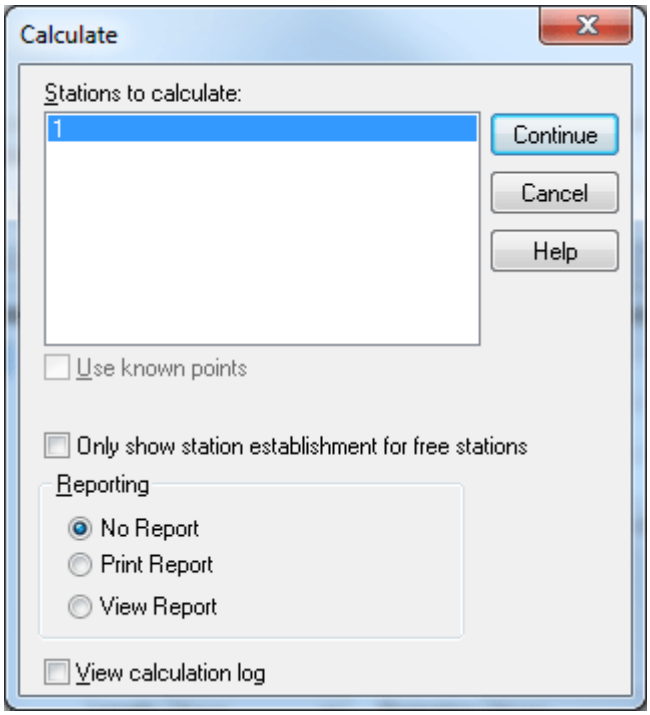


	Point Id	Latitude	Longitude	Height	Ant. Height	Ant. Metho	Hor. Offset	Vert. Offset	PointCode	Ctrl Codes	Origin	Num. Sat	PDOP	HDOP	VDOP	RMS	Hor. Prec	Vert. Prec
1	101	60°53'34'	16°38'34"	126,961	2,000	Uncorr	0,000	0,065	KKE	ST	ULVSTA2.dc	7	2,612	1,207	2,317	18,354	0,013	0,024
2	102	60°53'34"	16°38'34"	126,272	2,000	Uncorrecte	0,000	0,065	KKE		ULVSTA2.dc	5	3,085	1,795	2,509	19,807	0,020	0,028
3	103	60°53'34"	16°38'33"	125,644	2,000	Uncorrecte	0,000	0,065	KKE		ULVSTA2.dc	5	3,084	1,793	2,510	40,875	0,042	0,058
4	104	60°53'34"	16°38'33"	125,106	2,000	Uncorrecte	0,000	0,065	KKE		ULVSTA2.dc	5	3,083	1,788	2,512	14,160	0,014	0,020
5	105	60°53'34"	16°38'33"	124,905	2,000	Uncorrecte	0,000	0,065	KKE		ULVSTA2.dc	6	2,799	1,277	2,491	15,264	0,011	0,022
6	106	60°53'33"	16°38'33"	124,047	2,000	Uncorrecte	0,000	0,065	KKE		ULVSTA2.dc	5	5,835	3,232	4,858	31,413	0,062	0,093
7	107	60°53'33"	16°38'34"	123,533	2,000	Uncorrecte	0,000	0,065	KKE		ULVSTA2.dc	5	3,073	1,748	2,527	15,647	0,016	0,023
8	108	60°53'33"	16°38'34"	123,119	2,000	Uncorrecte	0,000	0,065	KKE		ULVSTA2.dc	5	3,072	1,746	2,528	19,632	0,020	0,028
9	109	60°53'33"	16°38'35"	122,577	2,000	Uncorrecte	0,000	0,065	KKE		ULVSTA2.dc	7	2,675	1,244	2,368	20,790	0,015	0,028
10	110	60°53'32"	16°38'36"	121,886	2,000	Uncorrecte	0,000	0,065	KKE		ULVSTA2.dc	7	2,674	1,241	2,368	18,041	0,013	0,024
11	111	60°53'32"	16°38'36"	120,824	2,000	Uncorrecte	0,000	0,065	KKE	END	ULVSTA2.dc	7	2,670	1,230	2,370	20,431	0,014	0,028
12	112	60°53'32"	16°38'36"	120,821	2,000	Uncorrecte	0,000	0,065	KKE		ULVSTA2.dc	10	1,841	0,860	1,628	22,837	0,011	0,021
13	114	60°53'34"	16°38'34"	125,386	2,000	Uncorrecte	0,000	0,065	SSB		ULVSTA2.dc	9	2,010	0,902	1,797	28,412	0,015	0,029
14	115	60°53'34"	16°38'34"	125,942	2,000	Uncorrecte	0,000	0,065	SNB		ULVSTA2.dc	6	2,799	1,269	2,495	20,533	0,015	0,029
15	201	60°53'33"	16°38'32"	127,225	2,000	Uncorrecte	0,000	0,065			ULVSTA2.dc	5	4,306	1,924	3,852	28,257	0,027	0,053
16	201B	60°53'33"	16°38'32"	127,215	2,000	Uncorrecte	0,000	0,065			ULVSTA2.dc	8	2,311	1,140	2,010	41,693	0,016	0,029
17	202	60°53'32"	16°38'35"	122,412	2,000	Uncorrecte	0,000	0,065			ULVSTA2.dc	6	2,733	1,117	2,495	19,271	0,010	0,023
18	202B	60°53'32"	16°38'35"	122,402	2,000	Uncorrecte	0,000	0,065			ULVSTA2.dc	6	2,724	1,115	2,486	21,207	0,012	0,027
19	203	60°53'34"	16°38'36"	125,366	2,000	Uncorrecte	0,000	0,065			ULVSTA2.dc	8	1,850	0,996	1,558	29,425	0,017	0,026
20	203B	60°53'34"	16°38'36"	125,398	2,000	Uncorrecte	0,000	0,065			ULVSTA2.dc	8	2,380	1,131	2,093	27,143	0,014	0,026
21	116	60°53'34"	16°38'38"	121,181	2,000	Uncorrecte	0,000	0,065	GRÅ		ULVSTA2.dc	8	2,191	1,111	1,889	26,547	0,015	0,026
22	116B	60°53'34"	16°38'38"	121,165	2,000	Uncorrecte	0,000	0,065	GRÅ		ULVSTA2.dc	7	3,298	1,689	2,833	21,178	0,020	0,033

Data in latitude and longitude according to WGS84.
Please note that control codes indicate whether it is a line, the end of a line or a point.

To calculate that, since we use points in GPS data as points of origin, and back objects, we need to calculate everything simultaneously in the survey data calculation. Go to the command *Calculate GPS data and survey data*.

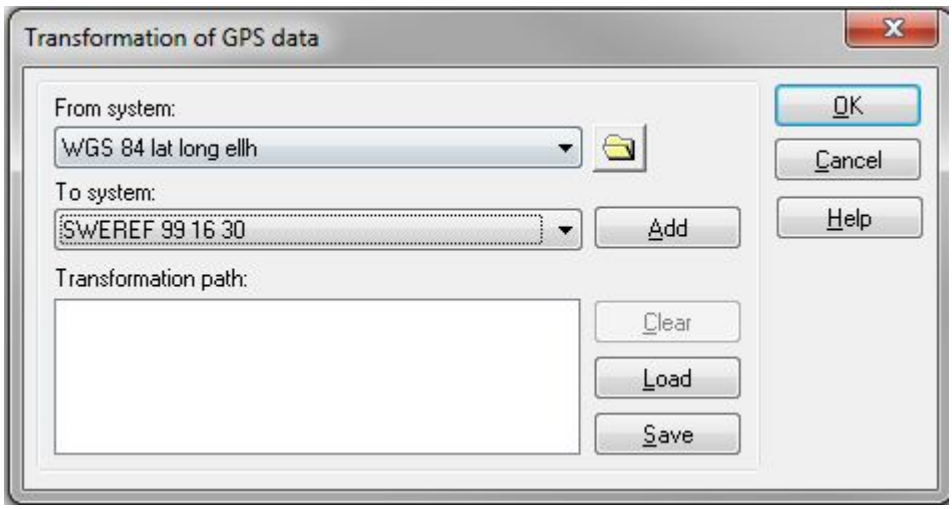
(If we only have Survey data or GPS data you can always select the specific command for this. The calculation routine will be the same as a combination of the two.)



In the command for calculating, we indicate which stations will be calculated. There are options for:

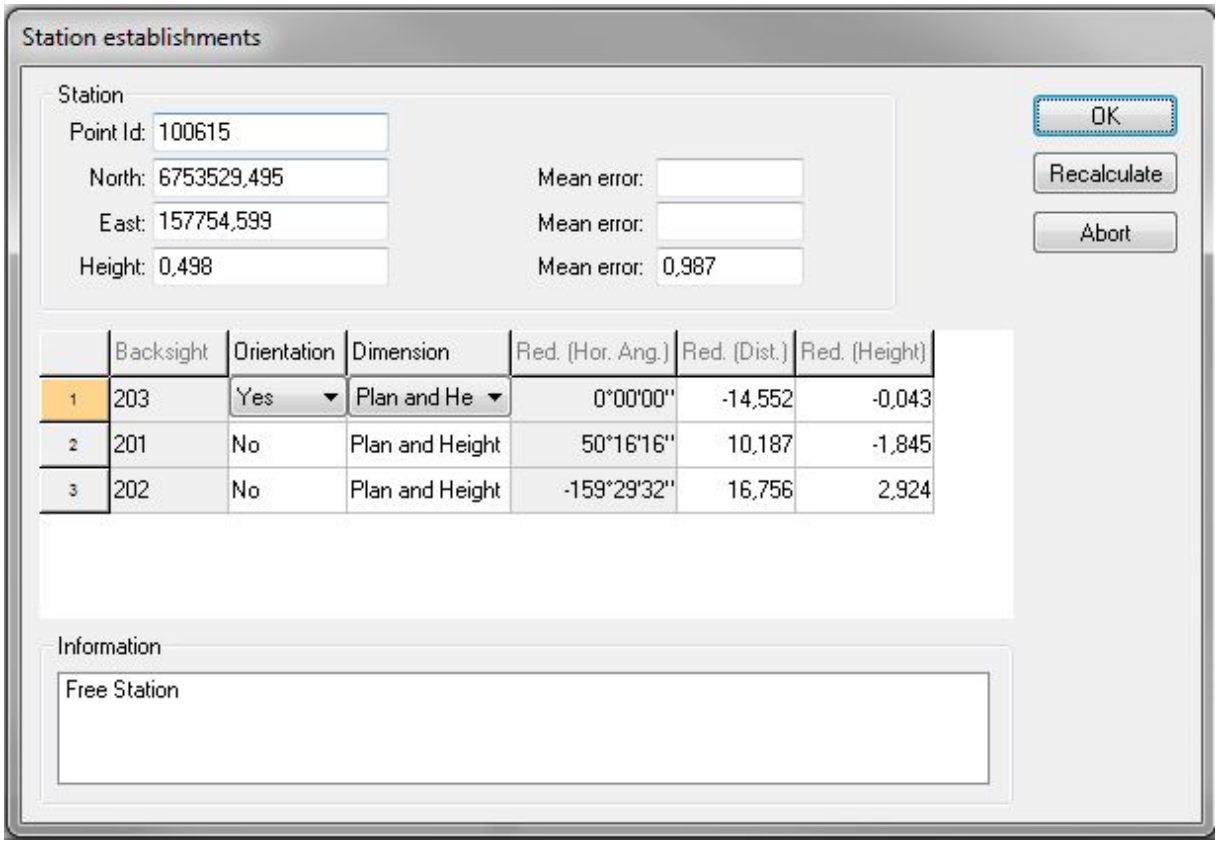
a. Use known points
b. Show only station set up for free station
c. Select whether report will be used
d. Show the calculation (free stations always shown)

First, we need to transform GPS data and bring up a dialog where we will determine the correlation.



Select the folder where your correlations are. if you want to use your predefined Gtrans correlations, they are available as standard folders.
If you want to use the correlation that you previously saved (which we are using for the course), select the folder where you saved the .tf file.
Then select *To system.*

The calculations for the two free stations comes up one after the other.



Here you can select different orientations and deselect back objects. If changes are made, you need to press "*Recalculate*" to get an updated image of the set up.

This process is repeated for each station.
When the calculation is done, the graphic is shown in a survey sketch, a .top file.
This drawing can be saved as a .top.

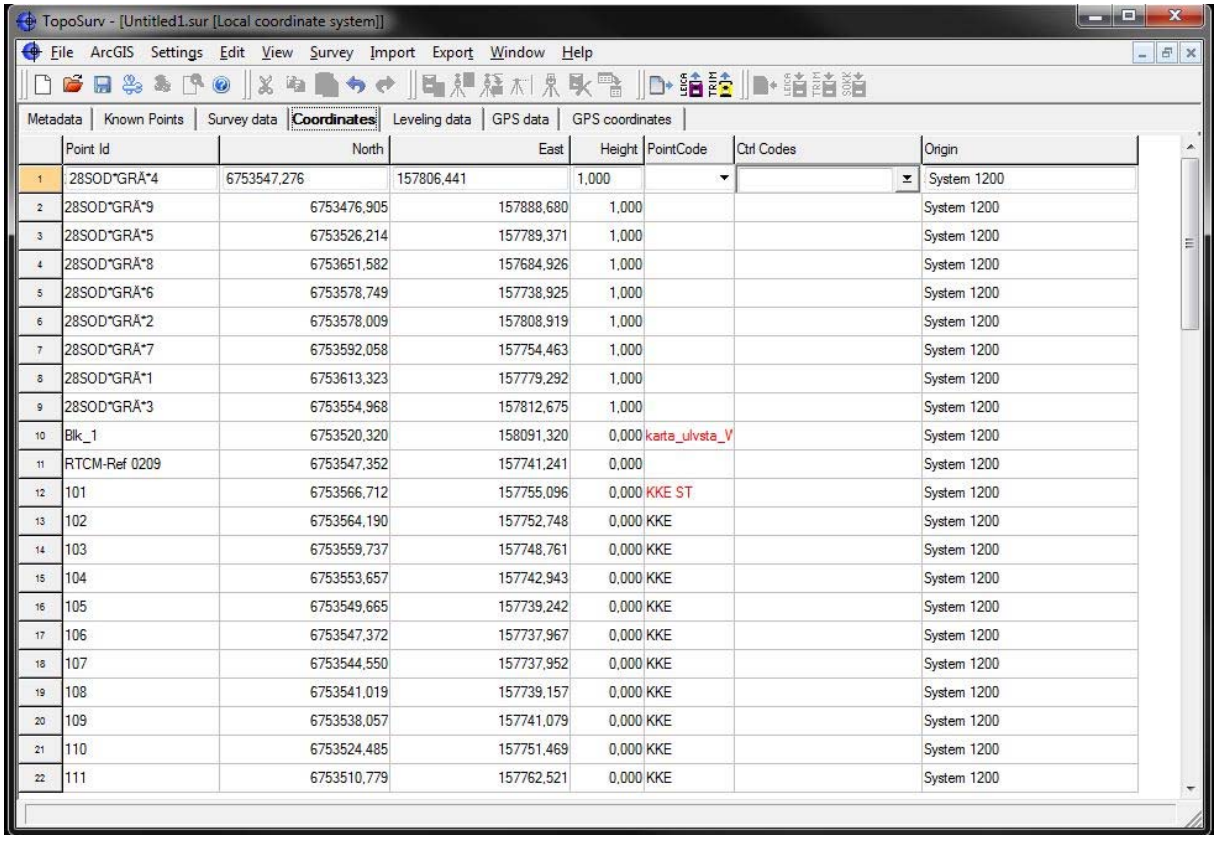
Common sources of error in conjunction with calculating survey data

Error message that the station coordinates cannot be found:
i. Where are the coordinates? If they are in the coordinates tab, you need to indicate that by checking the box in "Search in the coordinate list for known points"
ii. Are they in the form of GPS data? Check that you are doing the right calculation &endash; Calculate GPS data and Survey data.
iii. Are you searching in a database? Check that the point exists in the database with the exact right Id.
iv. Is the point in a polygon point file, pp file? Check that the point exists in the file with the exact right Id. Check that the right search path is being used for the polygon point file.

Import coordinate files

K files, PXY files, LandXML and general ASCII files are imported via Toposurv starting with the button in ArcGIS:

The open dialog is shown and there you can select the file format and file.
After importing, the result ends up under the tab Coordinates as shown below:



	Point Id	North	East	Height	PointCode	Ctrl Codes	Origin
1	28SOD"GRÄ"4	6753547,276	157806,441	1,000			System 1200
2	28SOD"GRÄ"9	6753476,905	157888,680	1,000			System 1200
3	28SOD"GRÄ"5	6753526,214	157789,371	1,000			System 1200
4	28SOD"GRÄ"8	6753651,582	157684,926	1,000			System 1200
5	28SOD"GRÄ"6	6753578,749	157738,925	1,000			System 1200
6	28SOD"GRÄ"2	6753578,009	157808,919	1,000			System 1200
7	28SOD"GRÄ"7	6753592,058	157754,463	1,000			System 1200
8	28SOD"GRÄ"1	6753613,323	157779,292	1,000			System 1200
9	28SOD"GRÄ"3	6753554,968	157812,675	1,000			System 1200
10	Blk_1	6753520,320	158091,320	0,000	karta_ulvsta_V		System 1200
11	RTCM-Ref 0209	6753547,352	157741,241	0,000			System 1200
12	101	6753566,712	157755,096	0,000	KKE ST		System 1200
13	102	6753564,190	157752,748	0,000	KKE		System 1200
14	103	6753559,737	157748,761	0,000	KKE		System 1200
15	104	6753553,657	157742,943	0,000	KKE		System 1200
16	105	6753549,665	157739,242	0,000	KKE		System 1200
17	106	6753547,372	157737,967	0,000	KKE		System 1200
18	107	6753544,550	157737,952	0,000	KKE		System 1200
19	108	6753541,019	157739,157	0,000	KKE		System 1200
20	109	6753538,057	157741,079	0,000	KKE		System 1200
21	110	6753524,485	157751,469	0,000	KKE		System 1200
22	111	6753510,779	157762,521	0,000	KKE		System 1200

Calculating

1. Calculating the coordinates is done via the command *Survey data - Process coordinates.* The result ends up directly in the survey sketch.
2. This drawing can be saved as a .top file.
3. The reason that objects are shown with different colors is partly because each code ends up in a layer, put up in the code table, and that there is a built-in (designated) standard drawing with layers and their colors.

Text editing

Right click

There are some good functions for editing survey data or coordinates which you can access by right clicking.
There are functions both for deleting and adding rows.

Under *Column settings* you have the option to select and deselect different fields as well as to change the order of the various fields/columns.

Under *Search & Modify* you have a function for deselecting different types of fields, or using marking in the grid, and then making changes by replacing, exchanging, adding or multiplying with multiple commands for different types of data.

TopoSurv in ArcGIS

The most commands are reached directly from ArcGIS via the TopoSurv buttons.

The button commands are

TopoSurv, starts TopoSurv in blanc mode
Copy objects to TopoSurv
Export DXF file as background picture to instruments
Create database for known points.
Import coordinate file
Import from Leica
Import from Trimble
Import from Sokkia
Export file for stake out
Export data to Leica
Export data to Trimble
Export data to Sokkia
ArcGIS settings for TopoSurv
Refresh

Commands from ArcGIS

Copy objects to TopoSurv

Copies selected objects to clip board for insertion into TopoSurv. Possible to either export objects to instruments or to re-process points.

Export DXF file as background picture to instruments

Select a DXF file that you want to send to instruments as background map. TopoSurv will export the file.

Create database for known points

Select points in the map you want to use as known points for the survey. The points will be set up as a small database for access in TopoSurv calculation. See also Known points settings and Preparations

ArcGIS settings for TopoSurv

Select a folder to be used as project directory in TopoSurv. The folder will be used as default location for saved files and default folder when you want to import or open files.

Export to instruments

Exporting data for staking is done via a button in ArcGIS.

Select the object(s) you want to stake out and then click on the instrument type you want to export field data to.

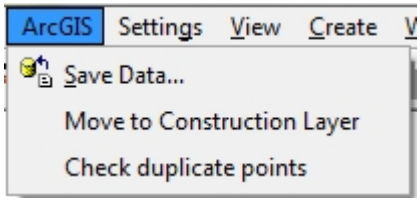
Dialog for Trimble
There is a setting that is applied for which instrument you want to send to.

Dialog for Leica
There is a setting that is applied for which instrument you want to send to.

Dialog for Sokkia
There is a setting that is applied for which instrument you want to send to.

Sketch/ArcGIS menu

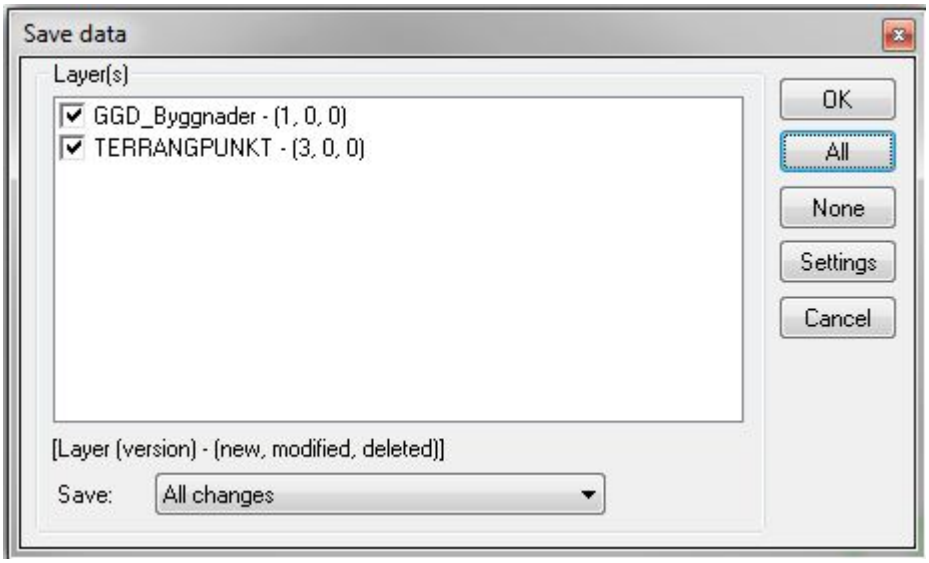
Save Data
Move to Construction layer
Check duplicate points



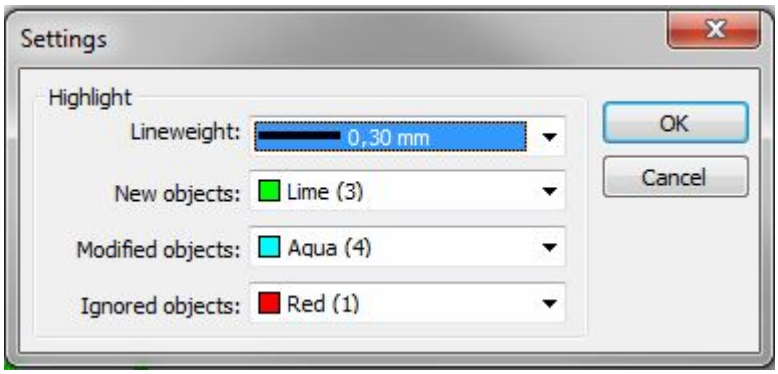
Save data

ArcGIS|Save data

In the dialog, you select which layer's points you are going to save in the database.

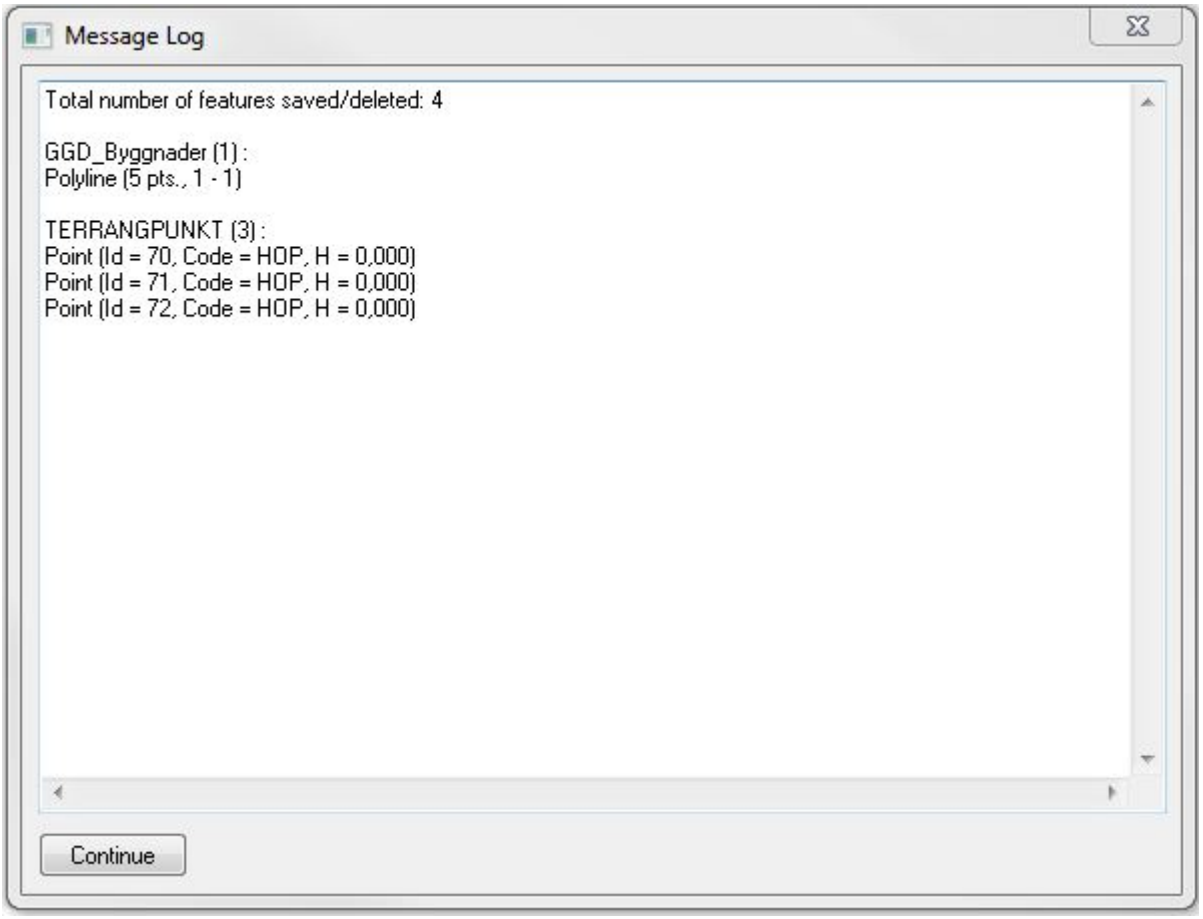


Settings indicate which colors new objects that are going to be saved in the drawing are displayed in.



In TopoSurv, there is no option to remove points or another way to edit points in the database. These settings are intended for Topocad.

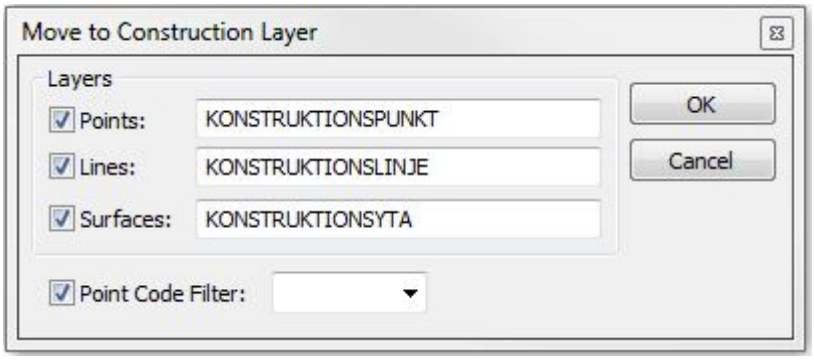
Message log shows saved data.


Message Log
Total number of features saved/deleted: 4
GGD_Byggnader (1) :
Polyline (5 pts., 1 - 1)
TERRANGPUNKT (3) :
Point (Id = 70, Code = HOP, H = 0,000)
Point (Id = 71, Code = HOP, H = 0,000)
Point (Id = 72, Code = HOP, H = 0,000)
Continue

Move to Construction layer

ArcGIS|Move to construction layer

This command moves objects from the layers they are on now to other layer names which can be used to edit data in ArcGIS.
The command can be found under ArcGIS &endash; Move to design layer.



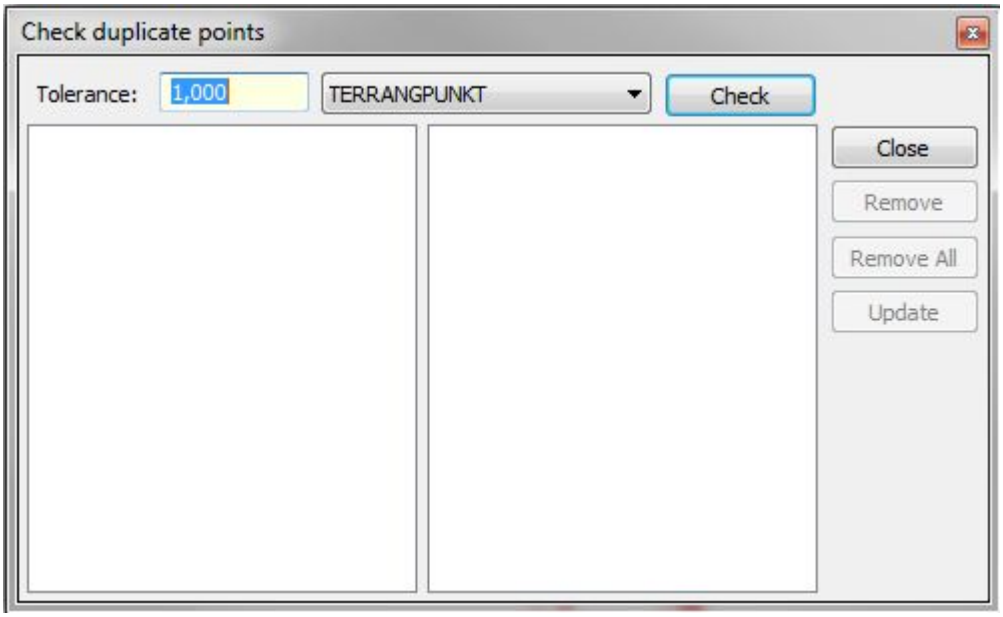
Check duplicate points

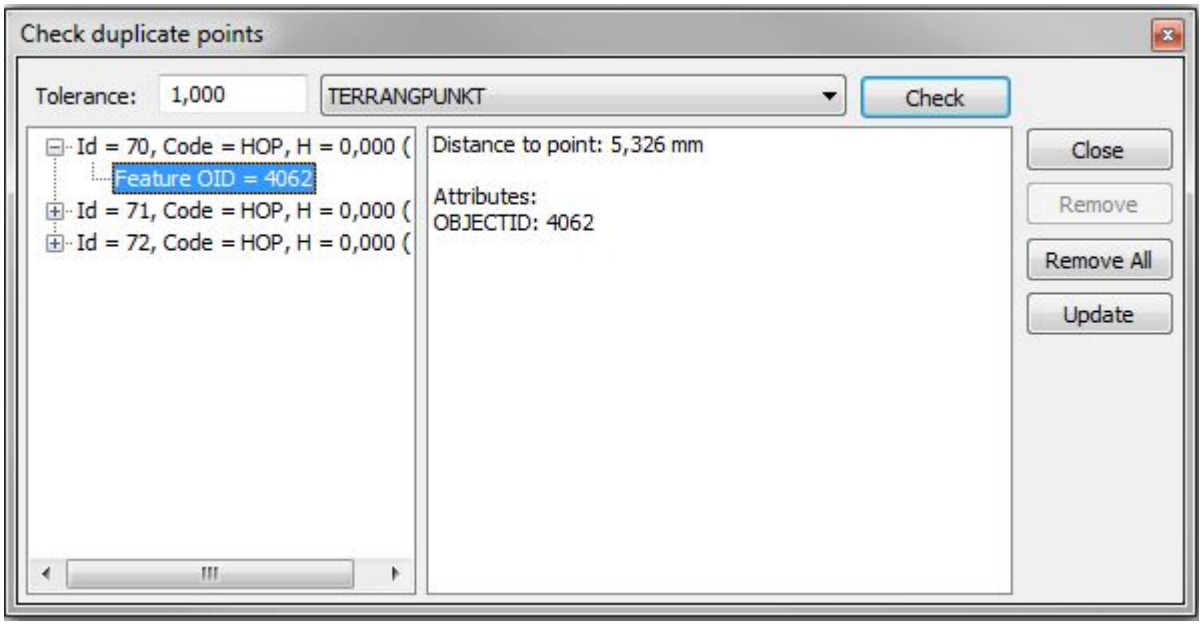
ArcGIS|Check duplicate points

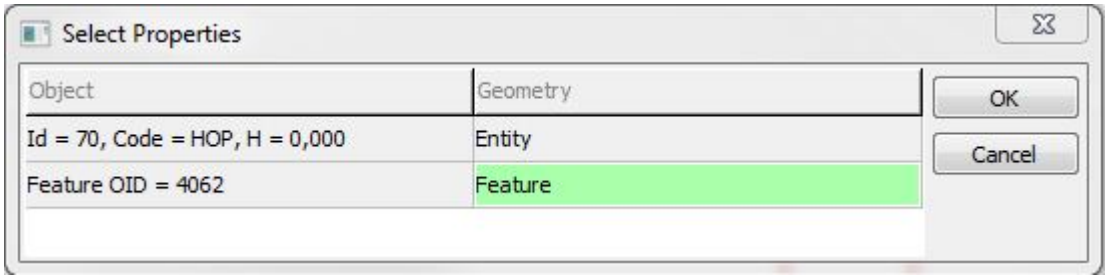
The command *Check duplicate points* checks points in survey sketches against points in the database.
You indicate a tolerance for a geographic area and after that a check of the points in the sketch and the database is run.
Duplicates (or multiple duplicates) come up in a list. You can control how much the difference is.

Remove/update
You can choose to remove duplicates or update them.

Select which point you are going to use the geometry from. Choose between points in the survey sketch or a point in the database (feature).
After making that choice, you can choose whether you want to remove duplicate points from the survey sketch.

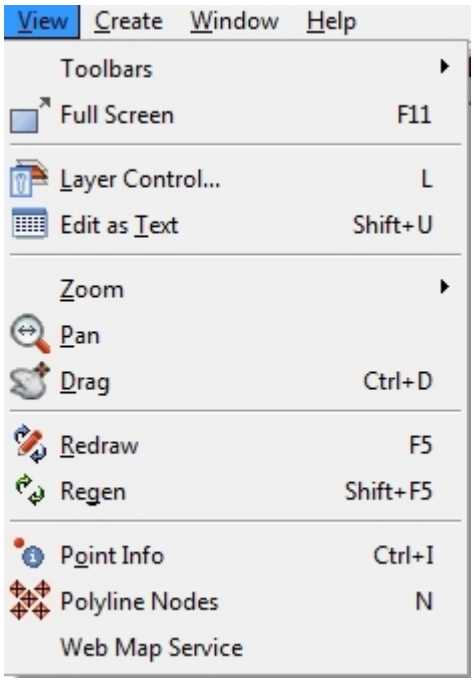



Check duplicate points
Tolerance:
1,000
TERRANGPUNKT
Check
Id = 70, Code = HOP, H = 0,000 (
Feature OID = 4062
Id = 71, Code = HOP, H = 0,000 (
Id = 72, Code = HOP, H = 0,000 (
Distance to point: 5,326 mm
Attributes:
OBJECTID: 4062
Close
Remove
Remove All
Update


Select Properties
Object
Geometry
Id = 70, Code = HOP, H = 0,000
Entity
Feature OID = 4062
Feature
OK
Cancel

View

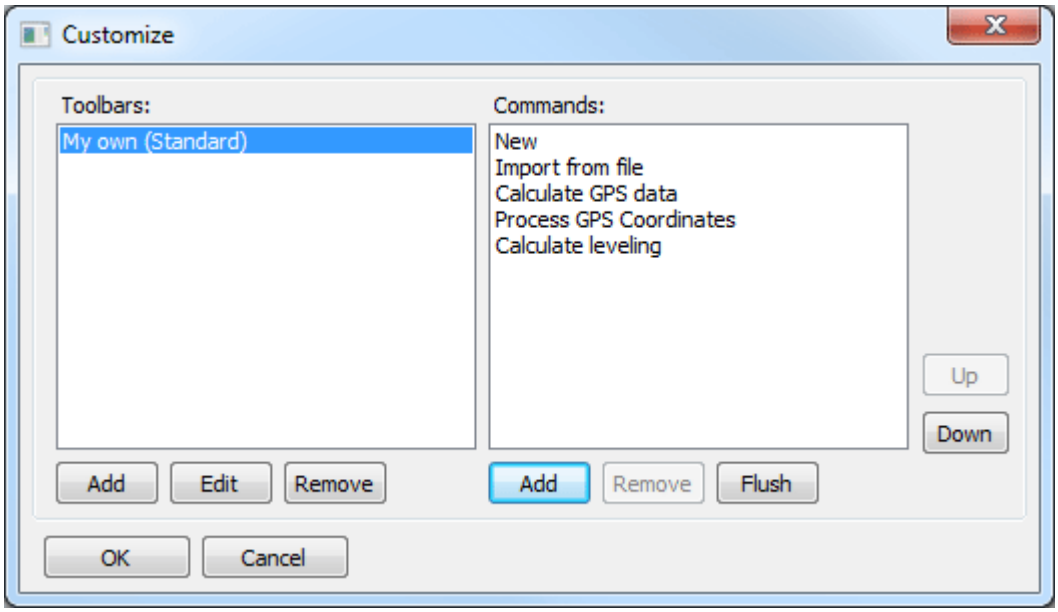
Toolbars
Fullscreen
Layer Control
Edit as text
Zoom
Pan
Drag
Redraw
Regen
Point info
Polyline Nodes
Web Map Service



Toolbars

View|Toolbars

Toolbars &endash; turn on and turn off the different toolbars that are available. Under Customize... there is the option to create your own toolbars with the buttons you want to use.



Fullscreen

View|Fullscreen

Fullscreen that you reach by pressing the hotkey F11 removes menu rows and buttons and gives you as large a graphic workspace as possible.

Layer Control

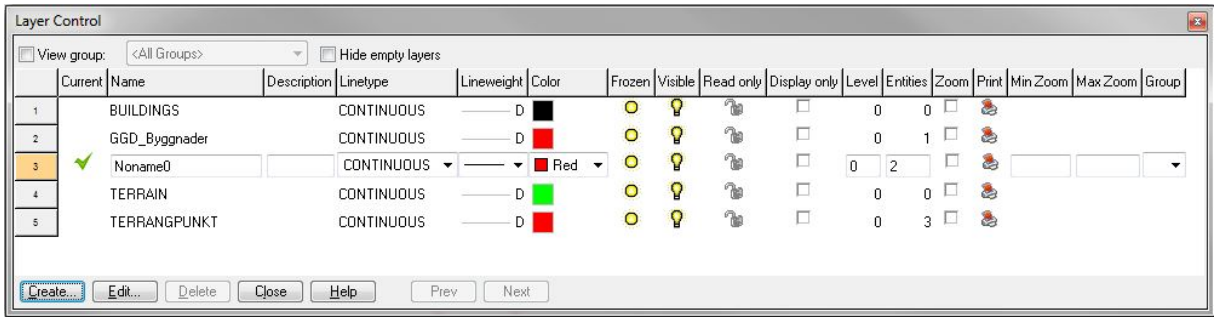
View|Layer Control

The survey sketch is built up with layers.

Layers can have a description, a line type, a line width and a color. Please note that objects can have these settings per code, or per object, and that has a higher priority than the settings made in the layer manager.

Layers can be frozen, displayed and locked. The level can be indicated on layers, which, among other things, is used for objects with surfaces that are placed under other objects, such as, for example, raster graphic images.

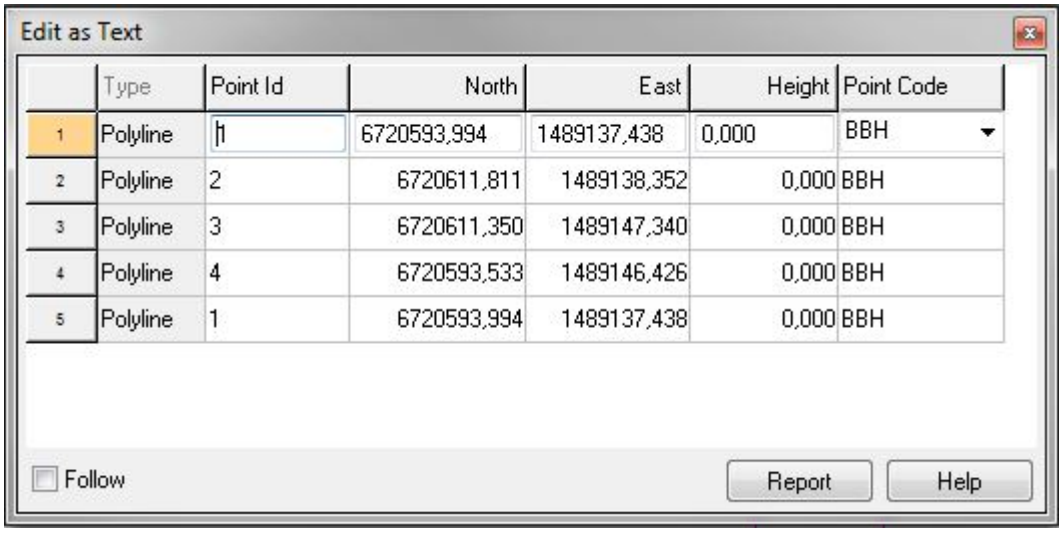
Layers can be divided into groups for simpler managing and sorting.



Edit as text

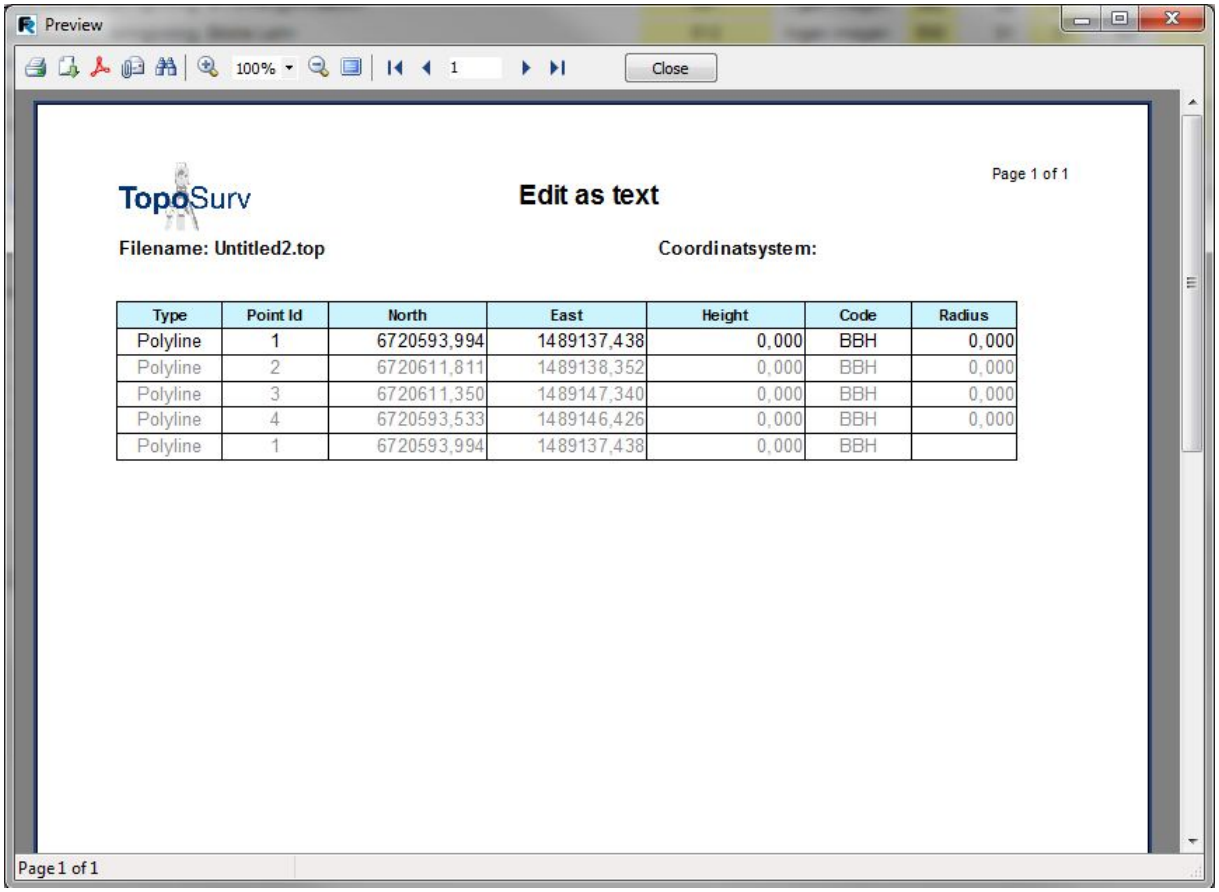
View|Edit as text

A powerful command that shows the object's coordinates, type, point number and even attributes. By right clicking, you can select a command for selecting column headings and the find and replace (modify) function respectively.



	Type	Point Id	North	East	Height	Point Code
1	Polyline	1	6720593,994	1489137,438	0,000	BBH
2	Polyline	2	6720611,811	1489138,352	0,000	BBH
3	Polyline	3	6720611,350	1489147,340	0,000	BBH
4	Polyline	4	6720593,533	1489146,426	0,000	BBH
5	Polyline	1	6720593,994	1489137,438	0,000	BBH

Report



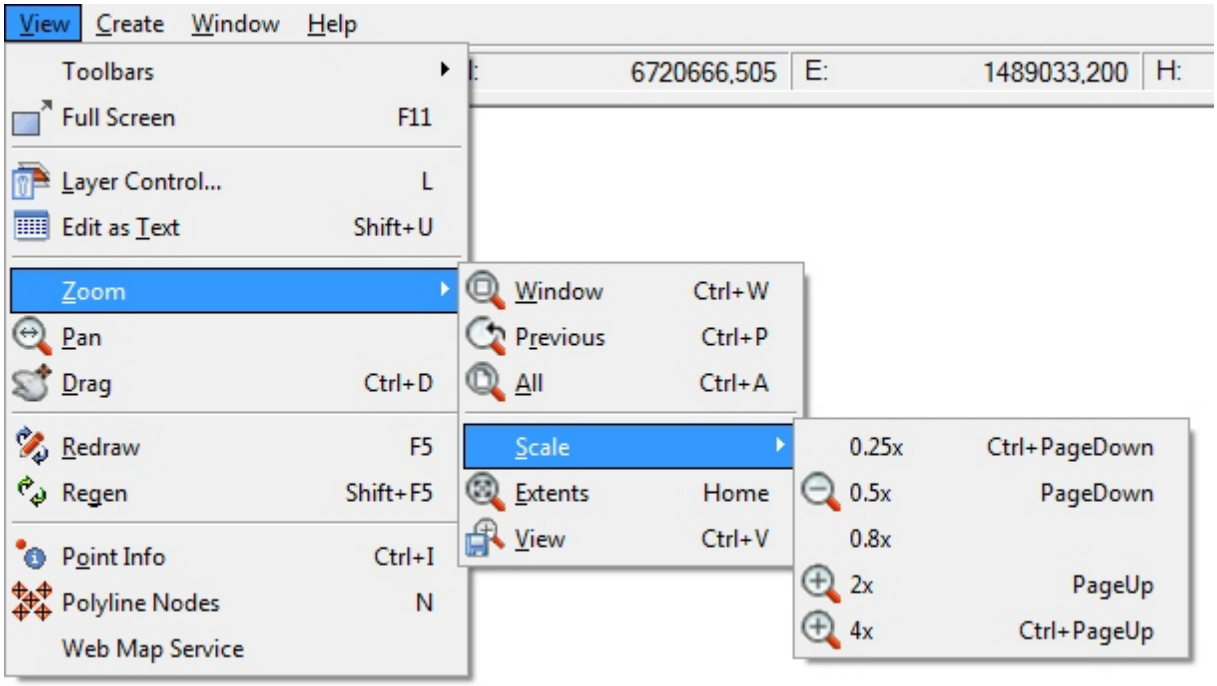
Type	Point Id	North	East	Height	Code	Radius
Polyline	1	6720593,994	1489137,438	0,000	BBH	0,000
Polyline	2	6720611,811	1489138,352	0,000	BBH	0,000
Polyline	3	6720611,350	1489147,340	0,000	BBH	0,000
Polyline	4	6720593,533	1489146,426	0,000	BBH	0,000
Polyline	1	6720593,994	1489137,438	0,000	BBH	

Zoom, Pan, Drag

View|Zoom/Pan/Drag/Redraw/Regen

Zoom
There are number of different zoom commands.

Zoom commands are reached both via the menu and also by right clicking.
The favorites are zooming extents (everything) by pressing the Home key, dragging the screen by holding down the wheel of the mouse and rolling the mouse's wheel to zoom in and out.



Pan
Pans a drawing from point to point

Drag
Pans a drawing by dragging it.

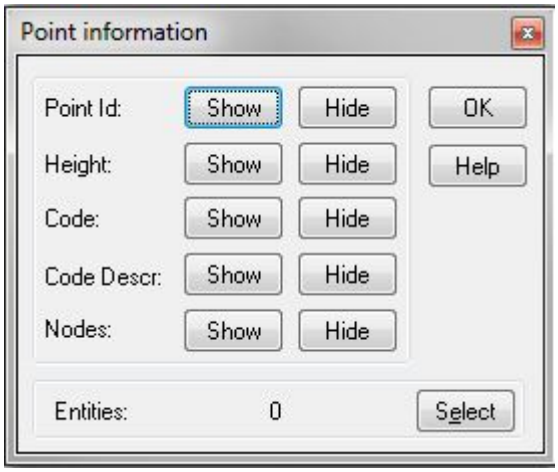
Redraw
Clears the drawing.

Regen
Regenerate a drawing.

Point info

View|Point info

Shows selected information as Point Id, Code, Height and the point code's description beside the selected object.



Polyline nodes

View|Polyline Nodes

To more easily see where the nodes and points are in lines, you can display them via *View|Polyline nodes.*

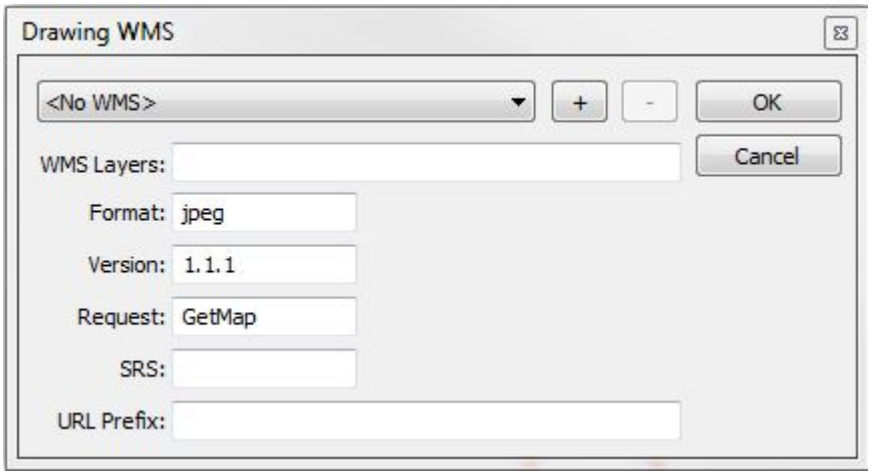
The hotkey for this is N.

WMS

View|Web Map Services

TopoSurv can use a WMS as background. Information about map source is entered and selected in this command.

Different WMS services can be used and will be stored in a text file.

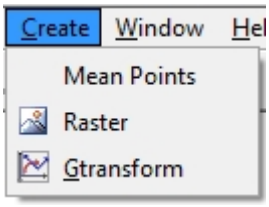


Create

Create

There are three commands in the survey sketch for processing data.

Mean Points
Raster
Gtransform

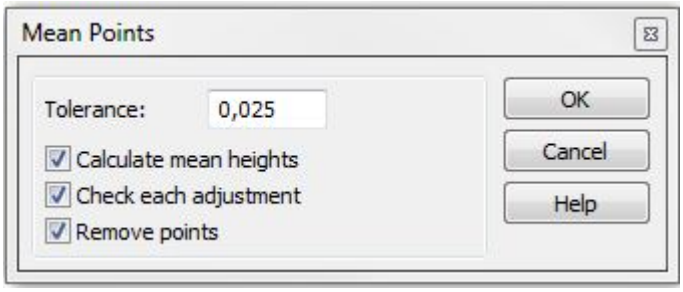


Mean point calculation

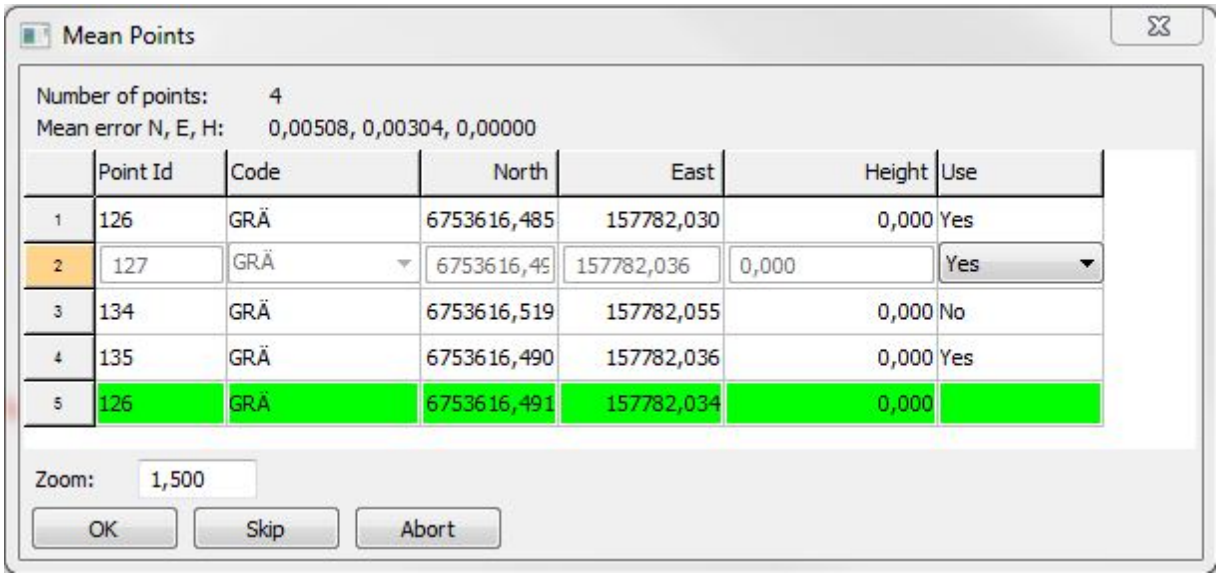
Create|Mean points

The command creates a mean point from points within a given tolerance.

In this case, you search for all of the points that are 25 mm apart and you indicate that the points are removed and a mean points formed.



A list of the points included is shown. You get a choice to perform the operation, i.e. form mean points, skip it or abort the command.



Create rasters as a background image

View|Layer manager

Raster graphic images can be inserted as background images.

Before the raster graphic image is inserted, you should select the current layer as *Raster* or create the layer and then insert the raster graphic image. The layer shall have a level that is below the other objects.

The layer manager can be found under *View|Layer manager.* The hotkey for this is L.

The command for inserting raster graphics images is under the *Create menu*. Geo-referenced raster graphic images are used for direct insertion into the survey sketch.

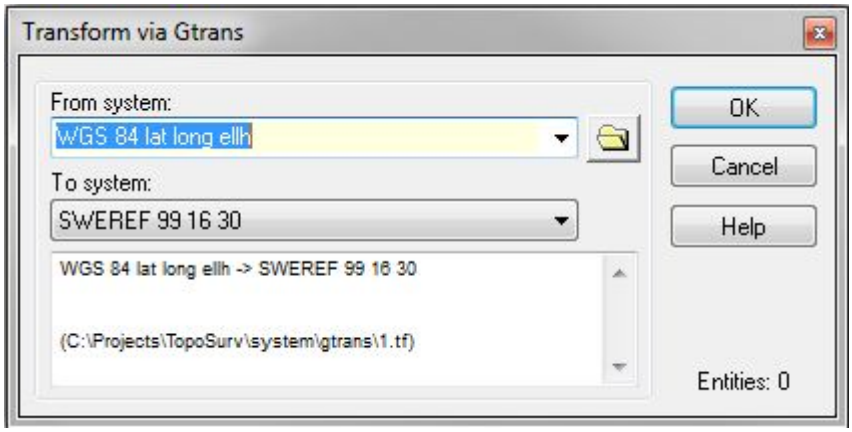
Gtrans

Gtrans works with transformation calculations from Lantmäteriet's Gtrans. The program uses TF and TFI files with correlations between different coordinate systems.

A great many correlations are included with TopoSurv, but you can also make your own correlations by:

- Entering them manually in a text file.
- Using Gtrans from Lantmäteriet.
- Many different correlations are posted on www.lantmateriet.se/rix95
- When importing data from Trimble, the correlation can be created directly in TopoSurv.
- When using Topocad, you can create correlations from Helmerth's and Affin's transformation calculations.

Mark the object that is to be transformed. Go to the command. Indicate which From system and which To system you have. It is possible to go through multiple different correlations.

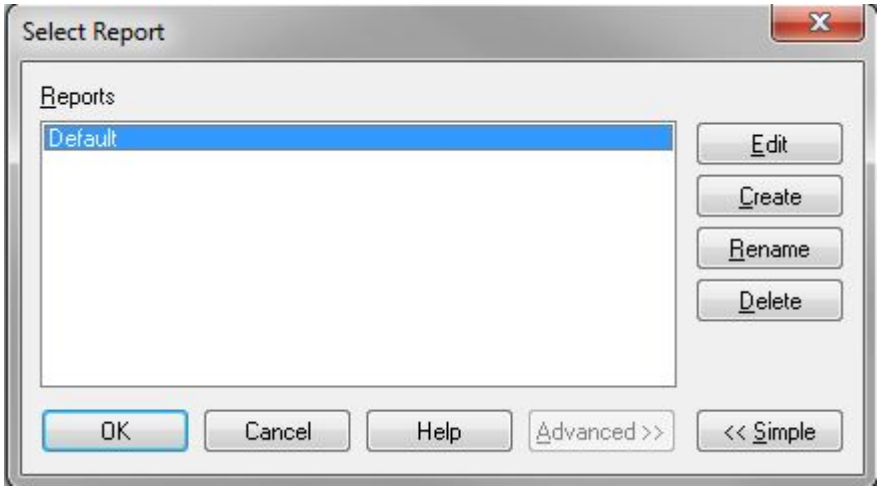


General commands

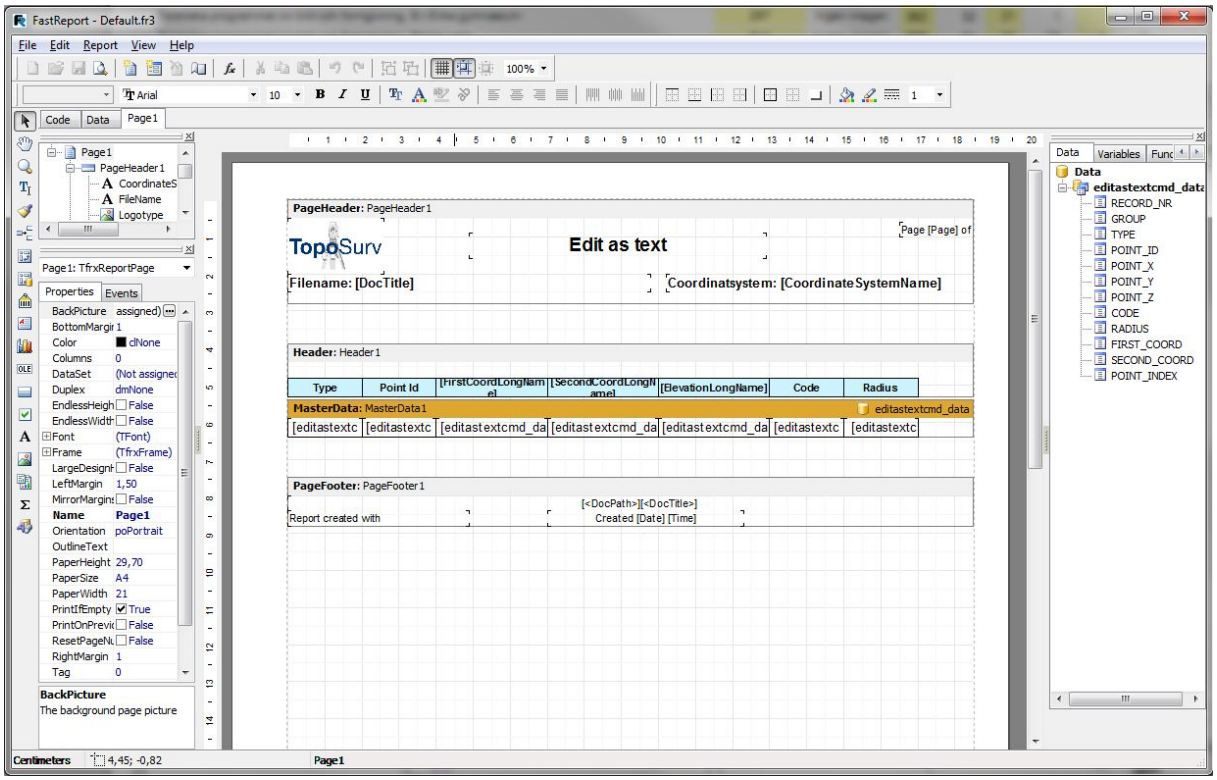
Reports

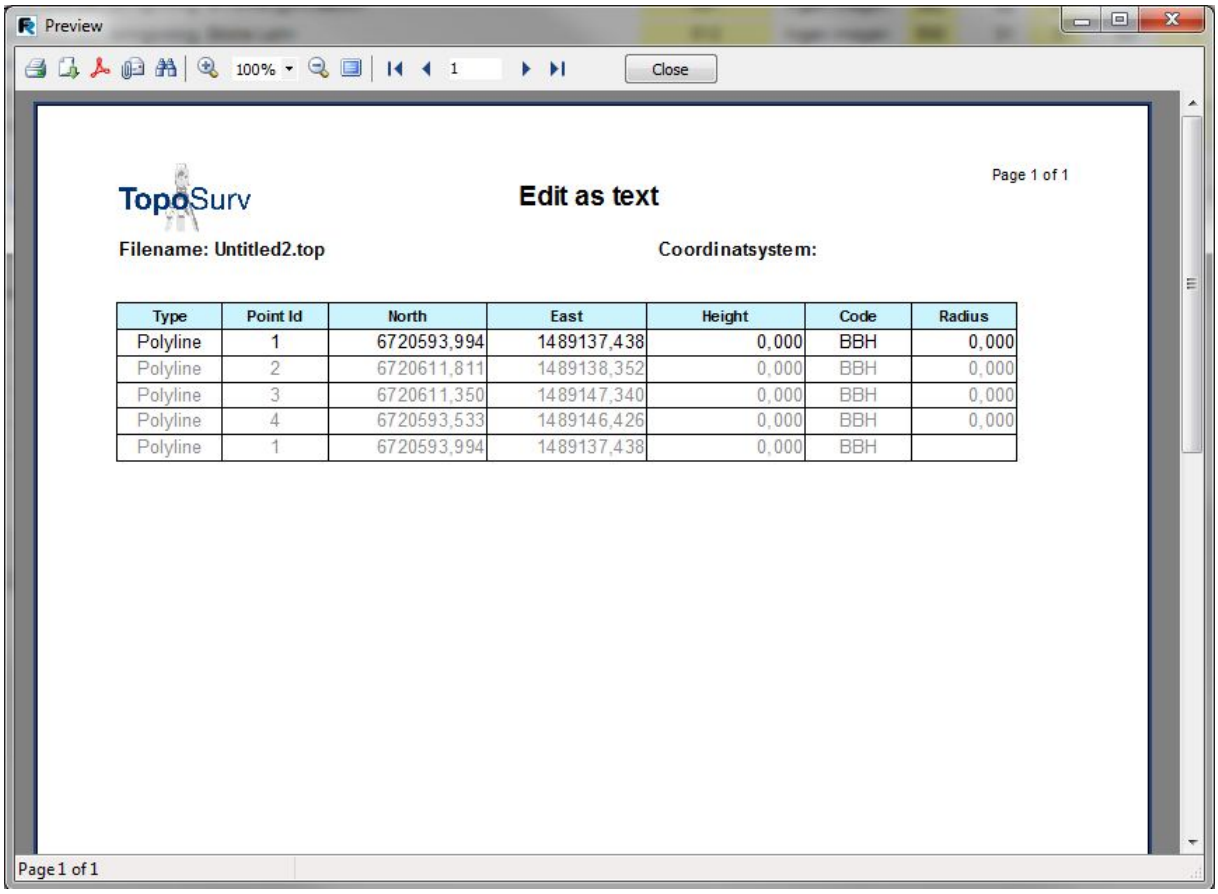
In TopoSurv there are different report for various tasks. Reports can be modified with a fast report build-in.

Whenever you have a report to make (as in Edit as text, Print command from survey, Survey calculation) you will end up in the following dialog:



If you want to modify a report or create your own one, click the *Advanced* button and select *Edit* or *Create*.
The Edit command gives you the fast report editor as below.



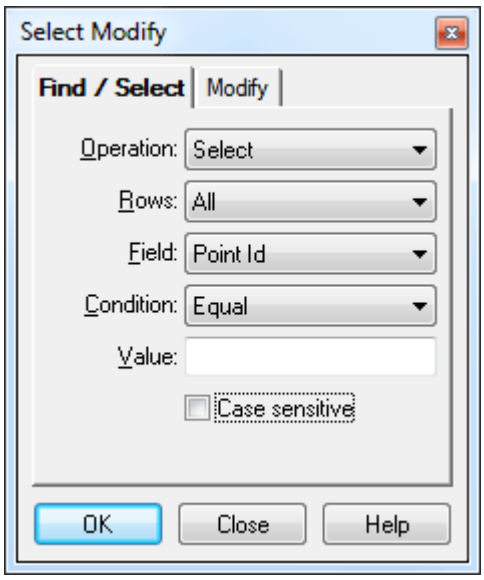


Type	Point Id	North	East	Height	Code	Radius
Polyline	1	6720593,994	1489137,438	0,000	BBH	0,000
Polyline	2	6720611,811	1489138,352	0,000	BBH	0,000
Polyline	3	6720611,350	1489147,340	0,000	BBH	0,000
Polyline	4	6720593,533	1489146,426	0,000	BBH	0,000
Polyline	1	6720593,994	1489137,438	0,000	BBH	

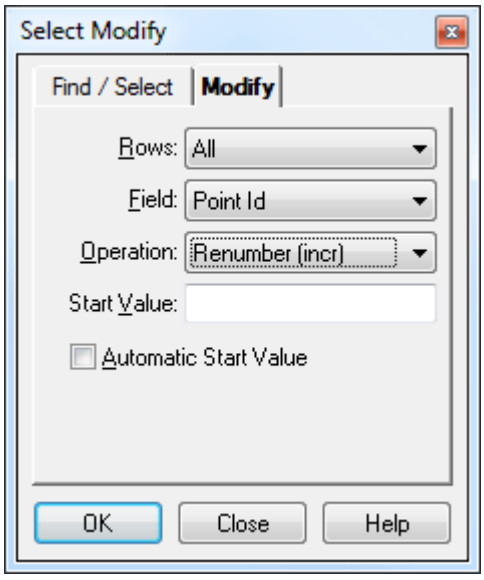
Search and modify

From right click in the grid there are options to select and modify available data.

For different grids there are different types of operations.



Note! When you have made a selection and want to edit the selected fields - check that you have selected the option *Selected* under *Rows*.



Most recent command

The most recent command can be repeated by clicking on the Enter key or the space bar and it is also found at the top of the menu that is reached by right clicking the mouse.

Select

For certain commands, it is good to be able to select the object.

A select command can be found by *right clicking*, and the above sub-menu is found there with it.
There is also an automatic select command where you can select objects by clicking directly on them with the mouse or where you select many objects by clicking on an empty location in the survey sketch and then moving the mouse to the right or the left.

By dragging the mouse from the left to the right, all objects that are fully inside the black rectangle that is formed are selected. By dragging the mouse from the right to the left, all objects that are inside but also touch the dashed line are marked.

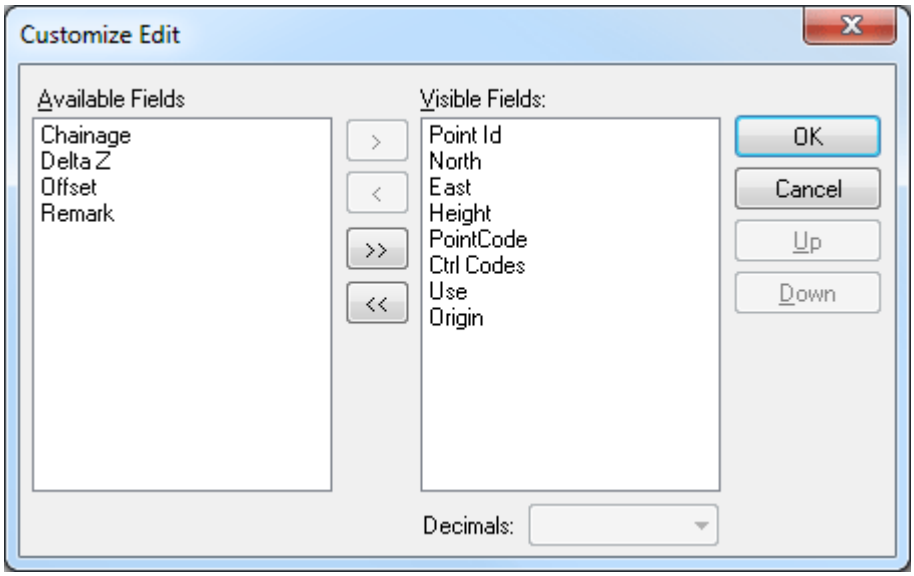
Unmarking can be done by holding down the Ctrl key and simultaneously making a selection as above.
Unmarking all selected objects is done with the Escape key.

Grid column settings

When in a grid you can use right click to adjust column settings.

For different grids there are different fields to select if they should be active or not.

Decimals
For fields with digits as coordinates etc. you can define the number of decimals displayed. These settings has higher priority than the system settings decimals.



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