# MAGNET™

# MAGNET Tools Help

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Revision E

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# Introduction

MAGNET Tools provides a full-featured environment for the calculation and adjustment of coordinates based on observations created with the family of Topcon and Sokkia instruments.

All experience levels of surveyors/geodesists can use MAGNET Tools for:

- Processing TS, DL and/or RTK and GPS observations,
- Least Squares Network adjustment,
- Instant reporting of unadjusted traverse closures,
- Compass rule, including angle balance, adjustments,
- Performing Localization using any defined projection,
- Uploading and downloading data to a project on the MAGNET Enterprise service,
- Receiving “Real-Time” data from MAGNET Field products,
- Importing files on a computer or from a device,
- Exporting data to files on a computer or to a device,
- Direct export of data to Civil 3D drawing,
- Direct export of data to MAGNET Office
- Creating, viewing and editing a digital terrain model (“surface”),
- Creating, viewing and editing road and X-section templates.
- Creating, viewing and editing of horizontal and vertical alignment data.
- Viewing and edition of MAGNET Field Road String Sets

MAGNET Tools has tabular and graphical representations of data:

- Use the Tabular view for viewing points information, viewing vector or occupation information, viewing data with the same names, and sorting lines in alphabetical order by time or by increasing or decreasing values.
- Use the Observation view for displaying a common network configuration, multiple background images, estimating the mutual position of points and vectors, and finding the necessary vector or point.
- Use the Map view for displaying view of lines, surfaces and roads.
- Use MAGNET Enterprise service to get the possibility to communicate with the company members in the using the chat function
- Use MAGNET Enterprise to transfer data between the field and office.
- Use MAGNET Enterprise to locate and monitor company assets while in use.

Changes made in either the Observation, Map or Tabular view are applied and reflected to the other views, providing faster, more convenient, and more effective viewing and editing of data.

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# MAGNET Tools Activation

To use full functionality of the application you have to activate it. Online activation of the application requires an Internet connection of the computer where the application was installed.

When you first start the application, the ***Product Activation*** dialog prompts you to select the activation method. Select one of the following radiobuttons:

- *Online* — to perform the online activation. See "Online activation" section below for details.
- *Network* — to perform the network activation. See "Network activation" section on page 23 for details.
- *Offline* — to perform the offline activation. See "Offline activation" section on page 24 for details.

Also you may close the dialog to postpone activation and use the application in demo mode. In this mode, the Post Processing module is omitted and the import and processing of GPS raw data are disabled. You can view, edit, calculate/recalculate and adjust no more than five points (RTK, TS and DL) in a job. If the imported file contains more than 5 points, the application will import only first five points.

## Online activation

At the ***Online activation*** page you may activate the MAGNET Tools by using your Enterprise account; also you may change or reset your enterprise password.

To perform an online activation:

1. At the ***Activation type*** page, select the *Online* radiobutton and click **Next**.

   The ***Mange account*** page is displayed.
2. Select the *Logon with MAGNET Enterprise account* radiobutton and click **Next**.

   The ***Enterprise logon*** page is displayed.

   > *NOTE*
   > *An e-mail which you have received from Topcon, when your company's account administrator adds you into the user list, contains only a temporary password. The temporary password does not allow you to establish the connection with MAGNET Enterprise. Please follow the recommendation from the e-mail to update your password.*
3. Specify you login (e-mail) and password in the respective fields.
4. Click **Next**.

   The ***Online activation*** page is displayed.
5. In the *Serial number* field, specify your serial number.
6. From the *Device-id* drop-down list, select the device to which your serial number will be assigned. You may select one of the following:
   - An identification number of the computer. In this case, the serial number ties to the computer and operation system (OS) of this computer. If the OS is reinstalled, the system identical number changes and activation is disabled.
   - An identification number of the computer's network card. In this case, the serial number ties to the network adapter. A reinstallation of the OS does not affect the application activation.
   - An identification number of the external USB flash drive. The type of the given driver must be approved by Topcon company to use in MAGNET activation procedure. In this case, the serial number ties to the external USB flash drive. You can use the given serial number and the given USB flash drive for activation of the application on any computer.

> *NOTE*
> *The application is activated only if the USB flash drive is plugged to the USB port. Removing of the USB flash drive will disable the ativation. You may re-plug the USB flash drive and any time – the activation will be restored after the next launch.*

7. Click **Next**.

   The ***License agreement*** page is displayed.
8. Carefully read the End User License Agreement.
9. Tick the *I have read, understand and agree with license* checkbox.
10. Click **Next**.

    The application checks the entered serial number. If the number is correct, the MAGNET Tools is activated and the table, listing available modules is displayed.

If you do not have an Enterprise account, contact your Administrator to obtain it. Only Administrators may create accounts. If you are going to work in a team of the Company, you should not create an account yourself — the Administrators are unable to add account, created by user to the Company account.

## Changing password

To change a password:

1. At the ***Activation type*** page, select the *Change password* radiobutton.
2. Click **Next**.

   The ***Change Password*** page is displayed.
3. In the *Login (email)* editbox, type your Enterprise login.
4. In the *Old password* editbox, type your current password.
5. In the *New password* editbox, type your new password.
6. In the *Confirm New* editbox, re-type your new password.
7. Click **Next**.

## Reseting password

To reset a password:

1. At the ***Activation type*** page, select the *Forgot password* radiobutton.
2. Click **Next**.

   The ***Reset password*** page is displayed.
3. In the *Login (email)* editbox, type your Enterprise login.
4. Click **Next**.

   Topcon will send you a temporary password to your e-mail address.

   The confirmation message is displayed.
5. Click **OK**.

   The ***Change Password*** page is displayed.
6. In the *Login (email)* editbox, type your Enterprise login.
7. In the *Old password* editbox, type temporary password from the e-mail.
8. In the *New password* editbox, type your new password.
9. In the *Confirm New* editbox, re-type your new password.
10. Click **Next**.

## Creating account

To create a company account:

1. At the ***Activation type*** page, select the *Create account* radiobutton.
2. Click **Next**.

   The warning page is displayed.
3. Carefully read the information.
4. Click **Next**.

   The ***Create company account - contact information*** page is displayed.
5. Fill in all fields and click **Next**.

   The ***Create company account - billing address*** page is displayed.
6. Specify your billing address and click **Next**.

   The ***Create company account - shipping address*** page is displayed.
7. Do one of the following:
   - Tick *Same as billing address* checkbox to use your billing address as the shipping one.
   - Specify your shipping address.
8. Click **Next**.

   The ***Create company account - review information*** page is displayed.
9. Carefully review information, which you have specified. If needed, click **Back** to change it.
10. Click **Next**.

    The ***Master Subscription Agreement*** page is displayed.
11. Carefully read End User License Agreement.
12. Tick *I accept the terms of the license agreement* checkbox.
13. Click **Next**.

    Account is created. Your temporary password is send to the email address. The ***Change password*** page is displayed.
14. Change your temporary password. See **Changing password** section above for details.

# Network activation

When the several users from one company simultaneously work with MAGNET Tools, we recommend to perform the software activation via network activation. This way supposes:

- the users computers are joined in a local subnet
- a server is organized.

This server (a computer) should be located in the same subnet. The special software should be installed on the server for the coordination the use of a licensed application by multiple computers. You must know the server network address and port for connection to the server. Contact your Administrator to get this information.

Before running MAGNET Tools, all users have not activated MAGNET Tools on their computers. After running the software, the user selects the network activation. During activation the software sends a request for a license across the network to the license server. The server will grant license authorization to the requesters after verifying licensing conditions for the given product or will deny requests when all available licenses are in use.

To perform the network activation:

1. At the ***Activation type*** page, select the *Network* radiobutton and click **Next**.

   The ***Network Server Setup*** page is displayed.
2. In the *Server* editbox, type the server address network.
3. In the *Port* editbox, type the port name.
4. From the *Product Name* drop-down list, select the required product.
5. Click **Next**.

   The ***License agreement page*** is displayed.
6. Carefully read the End User License Agreement.
7. Tick the *I have read, understand and agree with license* checkbox.
8. Click **Next**.

   The application checks the license availability at the server. If the license is available the MAGNET Tools is activated and the table, listing available modules is displayed.

# Offline activation

You must have the activation code to perform the offline activation. Contact your Administrator to obtain it.

To perform the offline activation:

1. At the ***Activation type*** page, select the *Offline* radiobutton.
2. Click **Next**.

   The ***Offline activation*** page is displayed.
3. In the *Serial number* field, specify your serial number.
4. From the *Device-id* drop-down list, select the device to which your serial number will be assigned. You may select one of the following:
   - An identification number of the computer. In this case, the serial number ties to the computer and operation system (OS) of this computer. If the OS is reinstalled, the system identical number changes and activation is disabled.
   - An identification number of the computer's network card. In this case, the serial number ties to the network adapter. A reinstallation of the OS does not affect the application activation.
   - An identification number of the external USB flash drive. The type of the given driver must be approved by Topcon company to use in MAGNET activation procedure. In this case, the serial number ties to the external USB flash drive. You can use the given serial number and the given USB flash drive for activation of the application on any computer.

     *NOTE*

     *The application is activated only if the USB flash drive is plugged to the USB port. Removing of the USB flash drive will disable the ativation. You may re-plug the USB flash drive and any time – the activation will be restored after the next launch.*
5. Specify the activation code. Do one of the following:
   - Select the *Use activation code* radiobutton and specify the code in the appropriate editbox.
   - Select the *Import activation code from file* radiobutton and click **Browse** to define the license (**.lic*) file, containing and activation code.
6. Click **Next**.

The ***License agreement*** page is displayed.

7. Carefully read the End User License Agreement.
8. Tick the *I have read, understand and agree with license* checkbox.
9. Click **Next**.

   The application is activated and the table, listing available modules is displayed.

#### Fields of the *Offline activation* page

| Field | Description |
|---|---|
| *Serial Number* | Defines your serial number for the software. |
| *Device ID* | Defines the device, to which your serial number will be assigned. |
| *Use activation code* | Defines manual input of the activation code, by typing it or copying from the clipboard. |
| *Import activation code from file* | Defines the automatic import of the activation code from a license (*.*lic*) file. |

# Ribbon Icon Functions

The ribbon for the application has eleven tabs: *Job*, *Edit*, *View*, *Window*, *Add*, *Select*, *Process*, *Report*, *COGO*, *Enterprise*, and *Help*. Each ribbon tab contains groups, and each group contains icons. See the descriptions of tabs in the appropriate sections:

- "Job tab" section below
- "Edit tab" section on page 38
- "View tab" section on page 41
- "Window tab" section on page 46
- "Add tab" section on page 49
- "Select tab" section on page 62
- "Process tab" section on page 72
- "Report tab" section on page 76
- "Calculate tab" section on page 76
- "Enterprise tab" section on page 84
- "Help tab" section on page 88

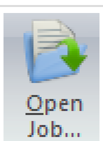
## Job tab

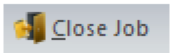
The *Job* tab of the MAGNET Tools ribbon is separated to four groups, described in the corresponding sections:

- "Job group" section below
- "Exchange group" section on page 34
- "Print group" section on page 37
- "Information group" section on page 38

### Job group

The *Job* group from the *Job* tab of the MAGNET Tools ribbon allows you to perform basic operations with projects. The group contains five icons:

| | |
|---|---|
|   | New Job icon<br>Click it to create a new job. |
|   | Open Job icon<br>Click it to open an existing job. |
|   | Save Job icon<br>Click it to save the current job. |

| | |
|---|---|
|   | Save Job As icon<br>Click it to save the current job under a new name and/or in a new directory. |
|   | Close icon<br>Click it to close the current job without closing the MAGNET Tools application. |

## New Job icon

The **New Job** icon of the Job group allows you to create a new job.

To create a new job:

1. In the *Job* group of the *Job* tab, click the **New Job** icon.

   The ***Create a new job*** dialog is displayed.
2. In the *Job name* edibox, type the name of the new job.
3. In the *Job location* field, define the location of the job, by clicking **Browse**.
4. In needed, configure the additional parameters. Fields are described in the table below.
5. Do one of the following:
   - Click **Next** to see more additional parameters. The dialog contains three pages.
   - Click **Create** to create the job.

#### Fields of the first page of the *Create a new job* dialog

| Field | Description |
|---|---|
| *Job name* | Defines the name of the new job. |
| *Job location* | Defines the location of the new job. Click **Browse** to navigate to the required location. |
| *Created by* | Defines the name of person who created the job. |
| *Date Created* | Displays the data of the job creation. |
| *Comment* | Type any additional text information about the job. |

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Configurations</td><td>This field contains a list of default configurations, where each configuration has specific set of job parameters. The default configurations differ in the current coordinate type (Ground or Datum Lat,Lon, Ell. H), precisions and automatic test for Points, GPS Obs, TS Obs, DL Obs, and Loop Closure:
<ul>
<li>Design — for viewing and edit road data.</li>
<li>DGPS — for processing and adjustment GNSS raw data with meter accuracy. The threshold value of RTK horizontal precision is 1 meter and RTK vertical precision is 3 meters.</li>
<li>GPS+ — for processing and adjustment GNSS raw data with centimeter accuracy. The threshold value of RTK horizontal precision is 0.02 meter and RTK vertical precision is 0.05 meter.</li>
<li>Imaging — for processing Total Station raw data with image data. The threshold value of precision for a distance is 0.03 meter and for vertical angle /horizontal angle is 0°00'10.0000"</li>
<li>TS — for processing and adjustment Total Station and Digital Level raw data. The threshold value of precision for a distance is 0.03 meter and for vertical angle /horizontal angle is 0°00'10.0000"</li>
<li>GIS configuration — for processing and adjustment GIS data with meter accuracy. The threshold value of RTK horizontal precision and PP kinematic horizontal precision is 1 meter and RTK vertical precision and PP kinematic vertical precision is 3 meters.</li>
<li>GIS Advanced configuration — for processing and adjustment GIS data with centimeter accuracy. The threshold value of RTK horizontal precision and PP kinematic horizontal precision is 0.02 meter and RTK vertical precision and PP kinematic vertical precision is 0.05 meter.</li>
</ul></td></tr>
</table>

**Fields of the second page of the *Create a new job* dialog**

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Angles</td><td>Defines the format for such angular units as Azimuth, Horizontal Circle, Vertical Angle, Zenith Angle, Azimuth Residual, Horizontal Angle Residual, Vertical Angle Residual, Zenith Angle Residual.</td></tr>
<tr><td>Lat. Lon</td><td>Defines the format for such angular units as Latitude and Longitude.</td></tr>
<tr><td>Azimuth As</td><td>Defines the directions displaying format. Select the appropriate radiobutton:
<ul>
<li>Bearing — the directions is displayed as angles in quadrants. Quadrants are pictured at the figure below. Angles are counted clockwise within each quadrant.<br>For example: azimuth angle of 130 degrees will be displayed as S 50° E.</li>
<li>Azimuth — the directions is displayed as azimuth angles. The North axis is zero and angles are counted clockwise.</li>
</ul></td></tr>
<tr><td>Distances</td><td>Defines the quantity of digits displayed after the decimal for distances. The default values is 3.</td></tr>
</table>

| Field | Description |
| --- | --- |
| *Coordinates (N,E;X,Y,Z)* | Defines the quantity of digits displayed after the decimal for plane and Cartesian coordinates (northing and easting, or X, Y, Z). The default value is 3. |
| *Heights* | Defines the quantity of digits displayed after the decimal for all height measurements. The default value is 3. |
| *Angles (seconds)* | Defines the quantity of digits displayed after the decimal for seconds of angular observations represented in degrees, minutes, and seconds. The default value is 4. |
| *Angles (dec. degrees)* | Defines the quantity of digits displayed after the decimal for angular observation format in decimal degrees (dd.ddd). The default value is 7. |
| *Lat. Lon (seconds)* | Defines the quantity of digits displayed after the decimal for the seconds in latitudes and longitudes. The default value is 5. |
| *Lat. Lon (dec. degrees)* | Defines the quantity of digits after the decimal for the latitude and longitude format in decimal degrees (dd.ddd). The default value is 8. |
| *Area* | Defines the quantity of digits displayed after the decimal for all area data. The default value is 0. |
| *Volumes* | Defines the quantity of digits displayed after the decimal for all volume data. The default value is 1. |
| *Time (seconds)* | Defines the quantity of digits displayed after the decimal for time. The default value is 0. |

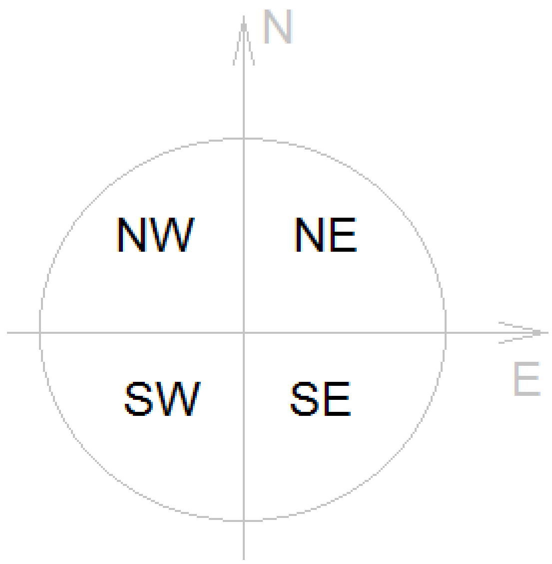
| Field | Description |
|---|---|
| *Station display format* | Defines the distance view for the center line position.<br>• *Stationing* — the number of the station is a value equal to the ratio of distance from the start point of the road and the interval for the station. This number consists of two parts — the first part is an integer, defined by the following formula:<br>$\left(\sum_{i=1}^{n}(Length)\right)/(IntervalforStation)$<br>Where "*i*" is the number of elements in the alignment; "*Length*" is a distance of “i-element” from the start point; and the “Interval for Station” is equal to 100 current linear units. (This parameter is not editable).<br>The second part is a remainder from this ratio.<br>*For example: the length of the line is 1288.50 meters; the number of the end station for this line is 12+88.5.*<br>You may use the following stationing formats:<br>• US Stationing — 1+234 (US feet)<br>• EU Stationing — 1+234 (meters)<br>• Sweden Stationing — 1/234 (meters)<br>• *Chainage* — the number of the station is a value equal to the distance from the start point.<br>*For example: the length of the line is 1288.50 meters; the number of the end station for this line is 1288.5.* |

**Fields of the third page of the *Create a new job* dialog**

| Field | Description |
|---|---|
| *Convert to/from NAD27 using* | Defines the conversion option:<br>• NAD27 Datum — the application will apply parameters NAD27 from the its own database for transformation between NAD27 and NAD83_NO_TRANS datums,<br>• NADCON — the application will apply the Federal standard (NADCON program) for NAD 27 to NAD83_NO_TRANS datum transformations. |
| *Convert to/from NAD27(CSRS) using* | Defines the conversion option:<br>• NAD27 Datum — the application will apply parameters NAD27 from the its own database for transformation between NAD27(CSRS) and NAD83_NO_TRANS datums,<br>• NTv2 NAD27 Canada — the application will apply the Canadian standard for NAD27(CSRS) to NAD83_NO_TRANS datum transformations. |
| *Datum NAD27 (CSRS) Data File* | Defines the file, containing NAD27 datum data. Click **Browse Data** to open the required file. |

| Field | Description |
|---|---|
| *Datum NAD83 (CSRS) Data File* | Defines the file, containing NAD83 datum data. Click **Browse Data** to open the required file. |
| *Projection* | Displays the in-use grid projection for the current job. The *Projection* drop-down list contains the pre-defined and user defined grid projections for the job.<br><br>Select the required projection from the drop-down list, or click **Custom** to create your own one. See "Adding custom projection to the projection list" section on page 334 for details. |
| *Datum* | Displays the corresponding datum for the grid projection, defined in the *Projection* drop-down list.<br><br>When either None, or UTMNorth, or UTMSouth, or UPS grid projections is used, you can select any predefined or custom datum from the drop-down list; or create your own custom datum. See "Adding custom datum to the datum list" section on page 333 for details.<br><br>When any other projection is used, only the corresponding datum is shown and you cannot open the datum list.<br><br>The MAGNET Tools supports two following datums for projections with NAD-83 as the reference datum:<br>• NAD83 — has the following transformation parameters (shifts, rotations and scale) to WGS-84 datum:<br>DX=-0.9956 m, DY=1.9013 m, DZ=0.5215m<br>RX=-0.025915", RY=-0.009426", RZ=-0.011599"<br>Scale=0.00062<br>• NAD83_NO_TRANS — has zero values of transformation parameters (shifts, rotations and scale) to WGS-84 datum. |
| *Grid->Ground* | Tick to perform the grid to ground transformation for the job. Click **...** to select the desired transformation method and set the corresponding parameters for each method. See "Grid->Ground dialog" section on page 361 for details<br><br>*NOTE*<br>*The checkbox only enabled when a projection is selected in the Projection drop-down list. Otherwise the checkbox is disabled. Also it is disabled if the Localization projection is selected.* |

| Field | Description |
|---|---|
| *Geoid* | Defines the used geoid for the current job. You can manually select a corresponding geoid type from the geoid list. Also you can add a geoid to the list. See "Adding geoid to the job" section on page 335. After importing a MAGNET Field job into the current job, the geoid which was selected in the MAGNET Field job will be automatically set as current in the MAGNET Tools job, if the geoid list contains this file.<br>*NOTES*<br>*A geoid transforms the ellipsoidal heights measured by GPS to heights based on a physical reference surface, if the geoid covers the area where file's points are located.*<br>*The orthometric heights will be equal to ellipsoidal heights if a geoid file is not downloaded to the application and/or the geoid does not cover the area where file's points are located.* |
| *Coordinate type* | Displays the used coordinate type for the current job. The following coordinate types are available:<br>• Ground<br>• Grid<br>• WGS84 Lat, Lon, Ell.H<br>• WGS84 X, Y, Z<br>• Datum Lat, Lon, Ell.H<br>• Datum Lat, Lon, Elevation<br>The coordinate system types are available depending on the projection and datum settings. See table of the coordinate system types availability for details. |
| *GPS Time Zone Offset* | Select the local time zone. If a zone is defined the application will display the local time instead of the GPS time. |
| *Daylight Saving Time* | Tick to perform daylight saving time automatically. |
| *Linear Unit* | Defines the linear units for the current job. Select the required unit from the drop-down list. |
| *Angular Unit* | Defines the angular units for the current job. Select the required unit from the drop-down list. |




**Bearing quadrants**

## Open Job icon

The **Open Job** icon of the Job group allows you to open an existing job.

After clicking the icon, the ***Open a job*** dialog is displayed. Select the desired job in the list of the window and click **Open job**. If the desired job is not present in the list, click **Browse** and select the job on the corresponding disk/folder.

To close the ***Open a job*** dialog, click the **Close** button.

## Save Job icon

The **Save Job** icon of the Job group allows you to save the current job.

After clicking the icon, all changes are saved, and the icon becomes gray until any change is made in the job.

## Save Job As icon

The **Save Job As** icon of the Job group allows you to save the current job under a new name and/or in another directory.

After clicking the icon, the ***Save As*** dialog is displayed. Enter a new name and select the desired folder, if required. Click **Save** to save the job.

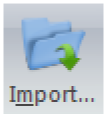
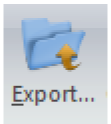
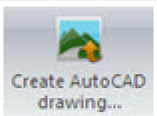
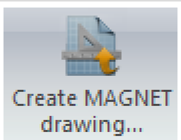
## Close icon

The **Close Job** icon of the Job group allows you to close the current job without closing the application.

If all made changes were saved, after clicking the icon, the job will be closed. If a job was modified without being saved, after clicking the icon, a dialog box prompts to save the job. After clicking **Yes**, the job will be saved and closed.

## Exchange group

The *Exchange* group from the *Job* tab of the MAGNET Tools ribbon allows you to import/export data to/from the current job. The group contains six icons:

| | |
|---|---|
|  | Import icon<br>Click it to import data to the current job. |
|  | Export icon<br>Click it to export data from the current job. |
|  | Create AutoCAD drawing icon<br>Click it to export data to an AutoCAD job. |
|  | Create MAGNET drawing icon<br>Click it to export data to a MAGNET Office job. |
|  | Import from Internet icon<br>Click it to find RINEX files in the Internet. |
|  | Assist Import from Internet icon<br>Click it to select an external server for downloading RINEX and ephemeris files. |

### Import icon

The **Import** icon of the Exchange group allows you to import a file from the computer or a connected device to the current job.

To import a file from your computer:

1. In the *Exchange* group of the *Job* tab, click the **Import** icon.

   The ***Import*** dialog is displayed.
2. From the *Format name* drop-down list, select the required format of the file.
3. Navigate to the required file and open it.

To import a file from device:

1. In the *Exchange* group of the *Job* tab, click the **Import** icon.

   The ***Import*** dialog is displayed.
2. From the *Format name* drop-down list, select the required format of the file.
3. From the *Look in* drop-down list, select the required device.
   - If you have selected the Topcon/Sokkia GNSS Receiver, the application will automatically search for receivers connected to the computer COM or USB port. When finished, all the receivers

connected to the computer will be displayed in the ***Import*** dialog.

- If you select the Mobile Device, Microsoft ActiveSync (for Window XP computer) automatically establishes a connection with the controller, then double-click Mobile Device or My Windows Mobile -Based Device in the ***Import*** dialog.
- If you select the Topcon/Sokkia Total Station:
    1. From the *Format name* drop-down list, select the required format type.
    2. Double click the *file1.txt* file.
    3. The ***Download file from Total Station*** dialog is displayed.
    4. Take all the steps listed in the ***Download File From Total Station*** dialog to prepare the Total Station.
    5. Select the required file in the Total Station for downloading to the computer.
- If you select the Topcon/Sokkia digital level:
    1. From the *Format name* drop-down list, select the required format type.
    2. Double click the *file1.dl* file.
    3. The ***Download file from Digital Level*** dialog is displayed.
    4. Take all the steps listed in the ***Download File From Digital Level*** dialog to prepare the Digital Level.
    5. Select the required file in the Digital Level for downloading to the computer.

4. Navigate to the required file and open it.

To add a new Topcon/Sokkia Total Station:

1. In the *Exchange* group of the *Job* tab, click the **Import** icon.

   The ***Import*** dialog is displayed.
2. From the *Look in* drop-down list, the *Topcon Total Station* or *Sokkia Total Station.*
3. Double click **Add New Station**.

   The ***Create Station*** dialog is displayed.
4. Define the personal parameters for the Total Station.
5. Click **OK**.

To add a new Topcon/Sokkia Digital Level:

1. In the *Exchange* group of the *Job* tab, click the **Import** icon.

   The ***Import*** dialog is displayed.
2. From the *Look in* drop-down list, the *Topcon Digital Levels* or *Sokkia Digital Levels*.
3. Double click **Add New Station**.

   The ***Create Station*** dialog is displayed.
4. Define the personal parameters for the Total Station.
5. Click **OK**.

   NOTES
   GNSS receivers of Topcon family collects raw data to the TPS (**.tps*) file format.

   GNSS receivers of Sokkia family collects raw data to PDC(**.pdc*) and SDR *(*. sdr*) file formats.

   Microsoft® ActiveSync needs to be installed on the computer with Windows XP. If the user's computer operates under Windows Vista, ActiveSync is not needed. A connection between the computer and an external device with Windows CE will be automatically established after connecting your device to your computer physically.

The application supports importing MAGNET Field job (**.mjf*), TopSURV job (**. tsj*) and Spectrum Survey Field job (**. tsj*) files.

*Auto Import of GPS occupation to the current job*

MAGNET Tools allows you to automatically download a reference station occupation from the Internet to the job. For a GPS occupation, which does not have corresponding data from any base station, the application will find an appropriate RINEX file from the Internet, import the file to the current job and process that GPS observation.

To activate the option:

1. In the *Information* group of the *Job* tab, click the **Job Configuration** icon.

   The ***Job configuration*** dialog is displayed.
2. In the left panel, select the GPS+ PostProcess item.
3. At the *General* tab, tick the *Use auto import* checkbox.
4. Click **OK**.
5. In the *GPS* group of the *Process* tab, click the **GPS+ PostProcessing** icon.

   MAGNET Tools transmits the coordinates and time interval for the given GPS occupation to the Topcon Server.

   Then the Topcon Server will find a reference station presented on the Topcon Server database by the criterion of the minimal distance from the GPS occupation. If this reference station is found and the collected raw data file of the reference station covers the given time interval, the RINEX file will be imported to the job and the created GPS observation will be automatically processed with the parameters defined in the GPS+ PostProcess item of the Job configuration dialog. See "GPS+ PostProcess item" section on page 105 for details.

NOTE
If the current job contains a GPS observation, the Auto Import will not be performed for the occupation. To run Auto Import, delete or disable the GPS observation(s) at the *GPS Observation* tab from the Tabular view.

## Export icon

The **Export** icon of the Exchange group allows you to export a data from the current job to another file on the computer, a connected controller or Topcon/Sokkia Total Station.

To export data from the job:

1. In the *Exchange* group of the *Job* tab, click the **Export** icon.

   The ***Export*** dialog is displayed.
2. In the *Select objects to export* list, select objects to be exported.
3. Click **Next >**.
4. From the *Save in* drop-down list, select the required format of the file.
   - If you have selected the Topcon/Sokkia GNSS Receiver, the application will automatically search for receivers connected to the computer COM or USB port. When finished, all the receivers connected to the computer will be displayed in the ***Export*** dialog.
   - If you select the Mobile Device, Microsoft ActiveSync (for Window XP computer) automatically establishes a connection with the controller, then double-click Mobile Device or My Windows Mobile -Based Device in the ***Export*** dialog.
5. From the *Format name* drop-down list, select the required format of the file.
6. If needed, expand the Advanced options panel to configure the additional export parameters.
7. Navigate to the required directory.

8. In the *File name* editbox, type the name for the data file.
9. Click **Save**.

### Create AutoCAD drawing icon

If AutoCAD Civil 3D is installed on the computer, you can directly export data (points, lines, surfaces) of the current job into the current Civil 3D drawing. After clicking the icon, the ***Export to Civil 3D*** dialog is appeared. In the dilaog, you can select the metric unit, coordinate type, datum/projection, coordinate order, point/line style and labels text size for displaying in Civil 3D.

### Create MAGNET drawing icon

The **Import from Internet** icon of the Exchange group allows you to export your MAGNET Tools job to a MAGNET Office job.

It is active only if the MAGNET Tools application was opened from the MAGNET Office applicaltion.

If the MAGNET Office is not installed on your computer, the icon will not be displayed.

### Import from Internet icon

The **Import from Internet** icon of the Exchange group allows you to find RINEX files (with broadcast/precise ephemeris) from the Internet according to your request and to download the files to the current job.

After clicking the icon MAGNET Tools automatically requests the Topcon Server. Then this server generates the Web Import page and the Web Import page is displayed in MAGNET Tools.

> *NOTE*
> *The type of the Web Import page depends on the version of Topcon Sever's software and can be updated regardless of MAGNET Tools version.*

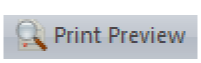
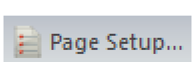
To obtain information about how to find the desired RINEX/ephemeris file, click the Help link on the Web Import page.

### Assist Import from Internet icon

The **Assist Import from Internet** icon of the Exchange group allows you to select an external server to download a RINEX and ephemeris files. An external server is a server that does not belong to Topcon. Only the selected server will perform searching data using its own rules and techniques.

## Print group

The *Print* group from the *Job* tab of the MAGNET Tools ribbon allows you to print any view or tab and update the print parameters. The group contains three icons:

| | |
|---|---|
|   | Print icon<br>Click it to print the current view. |
|   | Print Preview icon<br>Click it to preview the print. |
|   | Page Setup icon<br>Click it to configure the paper settings for printing. |

### Print icon

The **Print** icon of the Print group allows you to print the current view or tab.

After clicking the icon, the ***Print*** dialog is displayed. Select the required printer, the print range and the number of the copies before printing. Click **OK** to start printing the selected view or tab.

### Print Preview icon

The **Print Preview** icon of the Print group allows you to view a final result of page settings before printing.

After clicking the icon, the Print Preview is shown. You can zoom the view. Also you can print from the view.

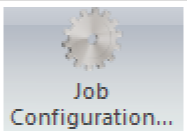
### Page Setup icon

The **Page Setup** icon of the Print group allows you to set the size, orientation and margins of the page.

After clicking the icon, the ***Page Setup*** dialog is displayed. The parameters entered in this dialog will be used for all next printouts.

## Information group

The *Information* group from the *Job* tab of the MAGNET Tools ribbon allows you to configure the current job and see the information about the opened job. The group contains two icons:

| | |
|---|---|
|  | Job Configuration icon<br>Click it to configure the current job. |
|  | Job Info icon<br>Click it to view the basic info about the current job. |

### Job Configuration icon

The **Job Configuration** icon of the Information group allows you to configure the current job.

After clicking the icon, the ***Job Configuration*** dialog is displayed. See "Job Configuration dialog" section on page 91 for details.

### Job Info icon

The **Job Info** icon of the Information group allows you to configure the current job.

You can see the information about the opened job. After clicking the icon, the ***Properties*** dialog for the current job is displayed. The *General* tab of the dialog contains the whole path to the file, date of creating, the person who created the job and comments. The *Objects* tab contains the quantities of objects of each type.

# Edit tab

The *Edit* tab of the MAGNET Tools ribbon contains control icon for work flow operations. It is separated to five groups, described in the corresponding sections:

- "Actions group" section on the facing page
- "Clipboard group" section on the facing page
- "Delete group" section on page 40
- "Enable group" section on page 40
- "Properties group" section on page 41

## Actions group

The *Actions* group from the *Edit* tab of the MAGNET Tools ribbon allows you to reverse the last action and return the last action. The group contains two icons:

| | |
|---|---|
|  | Undo icon<br>Click it to cancel the last performed action. |
|  | Redo icon<br>Click it to restore the last canceled action. |

### Undo icon

The **Undo** icon of the Actions group allows you to cancel last performed action.

The icon will be enabled if any action is performed in the job. The name of the last action is shown on the icon. After clicking the icon, the last action will be undone. You can undo all actions, which you made after opening the job.

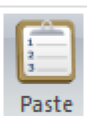
### Redo icon

The **Redo** icon of the Actions group allows you to restore the last cancelled action.

The icon will be enabled after performing the undo action. The name of the previously undone action is shown on the icon. After clicking the icon, the undone action will be redone. You can redo any action, which you undid after opening the job.

## Clipboard group

The *Clipboard* group from the *Edit* tab of the MAGNET Tools ribbon allows you to copy any selected object and put the object to the Windows clipboard, place an objects from the Windows clipboard in the current cursor position, cut any selected object from any view or tab. The group contains three icons:

| | |
|---|---|
|  | Paste icon<br>Click it to insert an object from the clipboard to the job. |
|  | Cut icon<br>Click it to cut an object to the clipboard. |
|  | Copy icon<br>Click it to copy an object to the clipboard. |

### Paste icon

The **Paste** icon of the Clipboard group allows you to place objects from the Windows clipboard in the current cursor position.

The icon will be enabled if any object is present in the clipboard. After clicking the icon, the selected objects will be inserted in the corresponding place. The combination Copy and Paste can be used to transfer the selected objects from one job to another.

### Cut icon

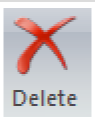
The **Cut** icon of the Clipboard group allows you to cut any selected object from any view or tab and put the object to the Windows clipboard. The icon will be enabled if any object is present in the clipboard. After clicking the icon, the object will be removed from the job, the icon will be disabled, but the Paste icon will be enabled to past the object. The command is present in the pop up menu for the given object.

### Copy icon

The **Copy** icon of the Clipboard group allows you to copy any selected object and put the object to the Windows clipboard. The icon will be enabled if an object is selected. After clicking the icon, the selected object will be put to the clipboard, the Paste and Cut icons will be enabled. The command is present in the pop up menu for the given object.

## Delete group

The *Delete* group from the *Edit* tab of the MAGNET Tools ribbon allows you to remove any selected object from any view or tab. The group contains one icon:

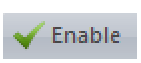
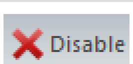
| | |
|---|---|
|   | Delete icon<br>Click it to delete a selected object. |

### Delete icon

The **Delete** icon of the Delete group allows you to remove any selected object from any view or tab. The icon will be enabled if any object is selected. After clicking the icon, the object will be removed from the job, the icon will be disabled. The command is present in the pop up menu for the given object.

## Enable group

The *Enable* group from the *Edit* tab of the MAGNET Tools ribbon allows you to enable or disable any selected object in any view or tab. The group contains two icons:

| | |
|---|---|
|   | Enable icon<br>Click it to enable any selected object in any view |
|   | Disable icon<br>Click it to disable any selected object in any view |

### Enable icon

The **Enable** icon of the Enable group allows you to enable any selected object in any view or tab. The icon will be enabled after selection of an object. After clicking the icon, the selected object is included in adjustment, coordinate calculation and export. The command is present in the pop up menu for the given object.

### Disable icon

The **Disable** icon of the Enable group allows you to disable any selected object in any view or tab. The icon will be enabled after selection of an object. After clicking the icon, the adjustment, coordinate calculation and export will ignore the object. A disabled object is grayed-out in all views. The command is present in the pop up menu for the given object.

## Properties group

The *Properties* group from the *Edit* tab of the MAGNET Tools ribbon allows you to see the Properties window for selected object(s) in any view or tab. The group contains one icon:

| | |
|---|---|
|   | Properties icon<br>Click it to view/edit properties of the selected object. |

### Properties icon

The **Properties** icon of the Properties group allows you to view the ***Properties*** dialog for selected objects in any view or tab. The icon will be enabled if any object is present in the clipboard.

After clicking the icon, the ***Properties*** dialog is displayed. If you select more than one object, the ***Properties*** dialog will display the fields, where the selected objects have the same parameters (code, layer, color, point symbol and so on). The fields for every parameter (name, coordinates, errors and so on) will be empty. See "MAGNET Tools Entities Properties" section on page 218 for details.

# View tab

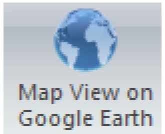
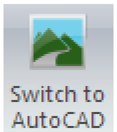
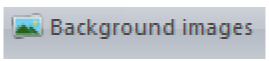
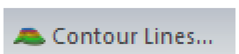
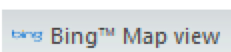
The *View* tab of the MAGNET Tools ribbon contains control icons for layout configuring. It contains six groups:

- "Spatial group" section below
- "GPS group" section on page 44
- "Equipment group" section on page 44
- "CAD group" section on page 45
- "Filters group" section on page 45
- "Options group" section on page 45

## Spatial group

The *Spatial* group from the *View* tab of the MAGNET Tools ribbon allows you to show or hide different viewers of the observations or objects of the job. The group contains nine icons:

| | |
|---|---|
|   | Observation View icon<br>Click it to display the Observation view. |
|   | Map View icon<br>Click it to display the Map view. |

| | |
|---|---|
|  | 3D View icon<br>Click it to display the 3D view. |
|  | Map View on Google Earth icon<br>Click it to display the data from job in Google Earth application. |
|  | Switch to AutoCAD icon<br>Click it to open your job in AutoCAD. |
|  | Switch to MAGNET Office icon<br>Click it to open your job in MAGNET Office. |
|  | Background images icon<br>Click it to manage background images. |
|  | Contour Lines icon<br>Click it to manage contour lines. |
|  | Bing Map view icon<br>Click it to display the data from job on Bing maps. |

## Observation View icon

The **Observation View** icon of the Spatial group opens a graphic representation of the GPS, RTK, TS and DL survey data. In the Observation View the following information displays:

- GPS, RTK, TS and DL measured points with survey symbols and manual points
- Unprocessed and processed GPS observations in both static and kinematic modes, and also RTK and TS observations
- Background image in the selected coordinate system

In the Observations View Options dialog you can:

- show or hide the coordinate grid, scale bar, legend window, background image, graphic accuracy indicators for the adjusted points
- change the background color

See "Observations View Options dialog" section on page 317 for details.

## Map View icon

The **Map View** icon of the Spatial group opens a graphic representation of the points, lineworks, surfaces and roads. In the Map View you can select a different plotting style for drawing these objects using separate layers.

In the Map View Options window you can:

- show or hide the coordinate grid, scale bar, legend window, background image
- change the background color

See "Map View Options dialog" section on page 319 for details.

## 3D View icon

The **3D View** icon of the Spatial group opens a three-dimensional graphical representation of the points, line-works, surfaces and roads. You can turn the object clockwise /counterclockwise in the screen plane and increase/-decrease the vertical scale in 3D View.

In the 3D View Options window you can:

- display either the solid model or the wireframe model or both the solid and a wireframe models
- show or hide the coordinate grid, scale bar, legend window, background image
- change the background color

See "3D View Options dialog" section on page 319 for details.

## Map View on Google Earth icon

The **Map View on Google Earth** icon of the Spatial group opens a graphic representation of the points, line-works, surfaces and roads in Google Earth. To see this view you

need the following:

- an Internet connection
- the Google Earth program installed on the computer

## Switch to AutoCAD icon

The **Switch to AutoCAD** icon of the Spatial group opens Civil 3D window. This icon will be enabled when AutoCAD Civil 3D is installed on the computer.

## Background images icon

The **Background images** icon of the Spatial group opens ***Background Images*** dialog, where you can:

- see all available images for the current job
- add any georeferenced image to the list of the available images for the current job
- select from the list an image to display in the current job
- convert an existing image to any coordinate system
- georeference an image

TIP
The georeferenced image - an image for which the relationship between pixel coordinates and real datum/grid/ground /local coordinates is established.

See "Creating background map for work area" section on page 336 for details.

## Contour Lines icon

The **Contour Lines** icon of the Spatial group opens ***Contour Lines*** dialog to plot contour lines for an existing surface. The Map View and 3D View display the contour lines.

TIP
Contour lines are lines joining the surface’s points of equal elevation.

See "Drawing Contour Lines for surface" section on page 343 for details.

## Bing Map view icon

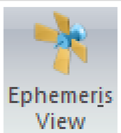
The **Bing Map view** icon of the Spatial group opens Bing maps for Map View. The Bing maps will be displayed in WebSphereMercator map projection only to display the job objects on the Bing maps, MAGNET Tools automatically transforms the objects coordinates from the current coordinate system to the WebSphereMercator projection. In the *Points* tab of the Tabular view, the coordinates of all objects of the job are displayed in the current coordinate system.

### Switch to MAGNET Office icon

The **Switch to MAGNET Office** icon of the Spatial group opens MAGNET Office application. This icon will be enabled when MAGNET Office is installed on the computer.

## GPS group

The *GPS* group from the *View* tab of the MAGNET Tools ribbon allows you to see a time-scale graph of the GPS occupations and list of the ephemeris which were imported to the current job. The group contains two icons:

| | |
|---|---|
|  | Occupation View icon<br>Click it to display the occupation view. |
|  | Ephemeris View icon<br>Click it to display the ephemeris view. |

### Occupation View icon

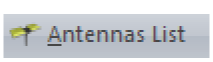
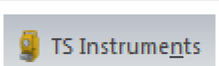
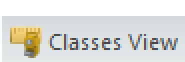
The **Occupation View** icon of the GPS group allows you to open the Occupation view. See "Occupation View" section on page 211 for details.

### Ephemeris View icon

The **Ephemeris View** icon of the GPS group allows you to open the Ephemeris view. See "Ephemeris View" section on page 213 for details.

## Equipment group

The *Equipment* group from the *View* tab of the MAGNET Tools ribbon allows you to see parameters of all GPS antennas which were calibrated either by NGS, or TPS, Total Station parameters and classes of Total Station measurements. The group contains three icons:

| | |
|---|---|
|  | Antenna List<br>Click it to display the list of all available antennas. |
|  | TS Instruments<br>Click it to display the list of all available Total Stations. |
|  | Classes View<br>Click it to display the list of all available total station measurement classes. |

## CAD group

The *CAD* group from the *View* tab of the MAGNET Tools ribbon allows you to see all codes and their attributes, all layers and their plotting styles used in the job. The group contains two icons:

| | |
|---|---|
|  | Codes<br>Click it to display the list of all available survey codes. |
|  | Layers<br>Click it to display the list of all available layers. |

## Filters group

The *Filters* group from the *View* tab of the MAGNET Tools ribbon allows you to select or create a filter to hide or display points, occupations, and observations in all MAGNET Tools viewers. The group contains one icon:

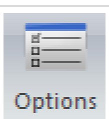
| | |
|---|---|
|  | Filters icon<br>Click it to manage MAGNET Tools data filters. |

### Filters icon

The **Filters** icon of the Filters group allows you to access the ***Filters*** dialog, where you can manage MAGNET Tools data filters. See "Filters dialog" section on page 387 for details.

## Options group

The *Options* group from the *View* tab of the MAGNET Tools ribbon allows you to display or hide different columns in the Tabular View and elements in Observation/ Map/Occupation/Image/Stereopair/Google Earth Map View. The group contains two icons:

| | |
|---|---|
|  | View Options icon<br>Click it to open an ***Options*** dialog for any view. |
|  | Options icon<br>Click it to open an ***Options*** dialog for MAGNET Tools. |

### View Options icon

The **View Options** icon of the Options group allows you to open an ***Options*** dialog for any MAGNET Tools viewers from the list.

See "Options dialog" section on page 316 for details.

### Options icon

The **Options** icon of the Options group allows you to open an ***Options*** dialog where you may configure MAGNET Tools preferences.

The ***Options*** dialog appears after clicking. It contains two panels. The left panel lists items of the job configuration. The right panel displays parameters for the selected item. Configuration items are described in the sections below.

### *Product update item*

It allows you to configure the auto check for MAGNET Tool updates.

**Fields of the *Product Update* item**

| Field | Description |
|---|---|
| *Check for updates* | When ticked, the application will automatically check for available updates within interval, defined in the *Update checking interval* drop-down list. |
| *Update checking interval* | Defines the interval for automatic update check. |

### *Show or hide dialogs item*

It allows you to configure the displaying of several MAGNET Tools dialogs.

**Fields of the *Show or hide dialogs* item**

| Field | Description |
|---|---|
| *Show Startup Wizard* | When ticked, the MAGNET Tools will display the ***Startup Wizard*** dialog each time when application is launched. |
| *Show Startup Wizard for External Start* | When ticked, the MAGNET Tools will display the ***Startup Wizard*** dialog each time when application is launched from other application. |
| *Allow to Select Objects for Export* | When ticked, the ***Export*** dialog will be preceded by the selection of objects to export. |

### *Dispaly item*

It allows you to configure the layout of all MAGNET Tools views.

See "Options dialog" section on page 316 for details.

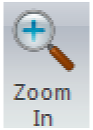
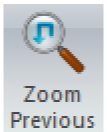
# Window tab

The *Window* tab of the MAGNET Tools ribbon contains control icons which allows you to operate with the MAGNET Tools views. It is separated to two groups, described in the corresponding sections:

- "Zoom group" section below
- "Windows group" section on page 48

## Zoom group

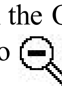
The *Zoom* group from the *Window* tab of the MAGNET Tools ribbon allows you to set Zoom and Pan Modes for Observation View, Map View, 3D View and Occupation View, and can set Rotate Mode for 3D View. The group contains seven icons:

| | |
|---|---|
|  | Zoom In icon<br>Click it to zoom in the current view. |
|  | Zoom Out icon<br>Click it to zoom out the current view. |
|  | Zoom Previous icon<br>Click it to return the previous scale of the current view. |
|  | Restore All icon<br>Click it to fit all data to the screen in the current view. |
|  | Zoom to Selection icon<br>Click it to fit the selected objects to the screen in the current view. |
|  | Pan Mode icon<br>Click it to manually move the current view. |
|  | Rotate Mode icon<br>Click it to manually rotate the current view. |

## Zoom In icon

The **Zoom In** icon of the Zoom group allows you to change the magnification of the selected area in the Observation View, Map View, 3D View and Occupation View. Clicking on the icon changes the cursor into  'zoom in' cursor. Click on a point in the View and extend the rectangle for the desired area. MAGNET Tools will redraw the selected area with scaling up.

## Zoom Out icon

The **Zoom Out** icon of the Zoom group allows you to change the magnification of the selected area in the Observation View, Map View, 3D View and Occupation View. Clicking on the icon changes the cursor into  'zoom out' cursor. Click on a point in the View and extend the rectangle for the desired area. MAGNET Tools will redraw the selected area with scaling down.

### Zoom Previous icon

The **Zoom Previous** icon of the Zoom group allows you to restore the previous scale of the Observation View, Map View, 3D View and Occupation View. The icon will be enabled after using Zoom In, Zoom Out or Zoom to Selection procedure. After clicking the icon, automatically the previous scale of the View will be set. You can restore all actions with Zoom, which you made after opening the job.

### Restore All icon

The **Restore All** icon of the Zoom group allows you to fit all data in the Observation View, Map View, 3D View and Occupation View into the viewable extents of the given view.

### Zoom to Selection icon

The **Zoom to Selection** icon of the Zoom group allows you to zoom in / zoom out to the selected object(s) in the Observation View, Map View, 3D View and Occupation View. Clicking on the icon moves the selected object(s) to the center of the View. For a point object selected, the view will be scaled to display the nearby objects.

### Pan Mode icon

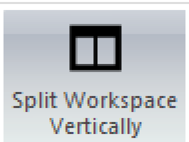
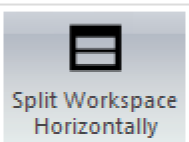
The **Pan Mode** icon of the Zoom group allows you to move the objects in the Observation View, Map View, 3D View and Occupation View. Clicking on the icon changes the cursor into 'pan' cursor. Click on any place and move.

### Rotate Mode icon

The **Rotate Mode** icon of the Zoom group allows you to rotate an object in 3D View. Clicking on the icon changes the cursor into 'rotate' cursor. Click on any place and rotate.

## Windows group

The *Windows* group from the *Window* tab of the MAGNET Tools ribbon allows you to configure the window layout. The group contains two icons:

| | |
|---|---|
|  | Split Workspace Vertically icon<br>Click it to tile windows in the working area Vertically. |
|  | Split Workspace Horizontally icon<br>Click it to tile windows in the working area horizontally. |

### Split Workspace Vertically icon

The **Split Workspace Vertically** icon of the Windows group allows you to tile opened in the MAGNET Tool windows vertically.

### Split Workspace Horizontally icon

The **Split Workspace Horizontally** icon of the Windows group allows you to tile opened in the MAGNET Tools windows horizontally.

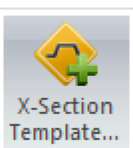
# Add tab

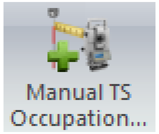
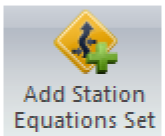
The *Add* tab of the MAGNET Tools ribbon contains control icons which allows you to add various entities to your job. It has two groups, described in the following sections:

- "Add group" section below
- "Snap group" section on page 59

## Add group

The *Add* group from the Add tab of the MAGNET Tools ribbon contains twelve icons. It allows you to add a point, line, area, surface, layer, code, X-section Template, Road, create a surface from a Geoid, and manually insert TS occupation or/and DL run into the current job:

| | |
|---|---|
|   | Point icon<br>Click it to create a new point. |
|   | Line icon<br>Click it to create a new line. |
|   | Area icon<br>Click it to create a new area. |
|   | Surface icon<br>Click it to create a new surface. |
|   | Surface from Geoid icon<br>Click it to convert a geoid into a new surface. |
|   | Layer icon<br>Click it to create a new layer. |
|   | Code icon<br>Click it to create a new survey code. |
|   | Road icon<br>Click it to create a new road. |
|   | X-section Template icon<br>Click it to create a new X-Section template for a road. |

| | |
|---|---|
|   | Manual TS Occupation icon<br>Click it to manually create a new TS occupations. |
|   | Manual DL Run icon<br>Click it to manually create a new DL run. |
|   | Text icon<br>Click it to create a new text object. |
|   | Add Station Equations Set icon<br>Click it to create a new station equation set. |

## Point icon

The **Point** icon of the Add group allows you to add a new point in the job.

To add a point:

1. In the *Add* group of the *Add* tab, click the **Point** icon.

   The pointer is changed to +∘
2. Click the required place in the Observation or Map view.

   The ***Add Point*** dialog is displayed.

You can edit:

- name, code, layer, note for the point in the *General* tab of the ***Add Point*** dialog. See "General tab" section on page 219 for details.
- coordinates in the current coordinate system in the *Coordinates* tab of the ***Add Point*** dialog. See "Coordinates tab" section on page 220 for details.
- color and point symbol in the *Code and Style* tab of the ***Add Point*** dialog. See "Codes and Style tab" section on page 224 for details.

Click **OK** to create the point in the Observation view, Map view and the *Points* tab of the Tabular view.

Click the icon again to deactivate "add point" mode and to return the pointer to a normal view.

## Line icon

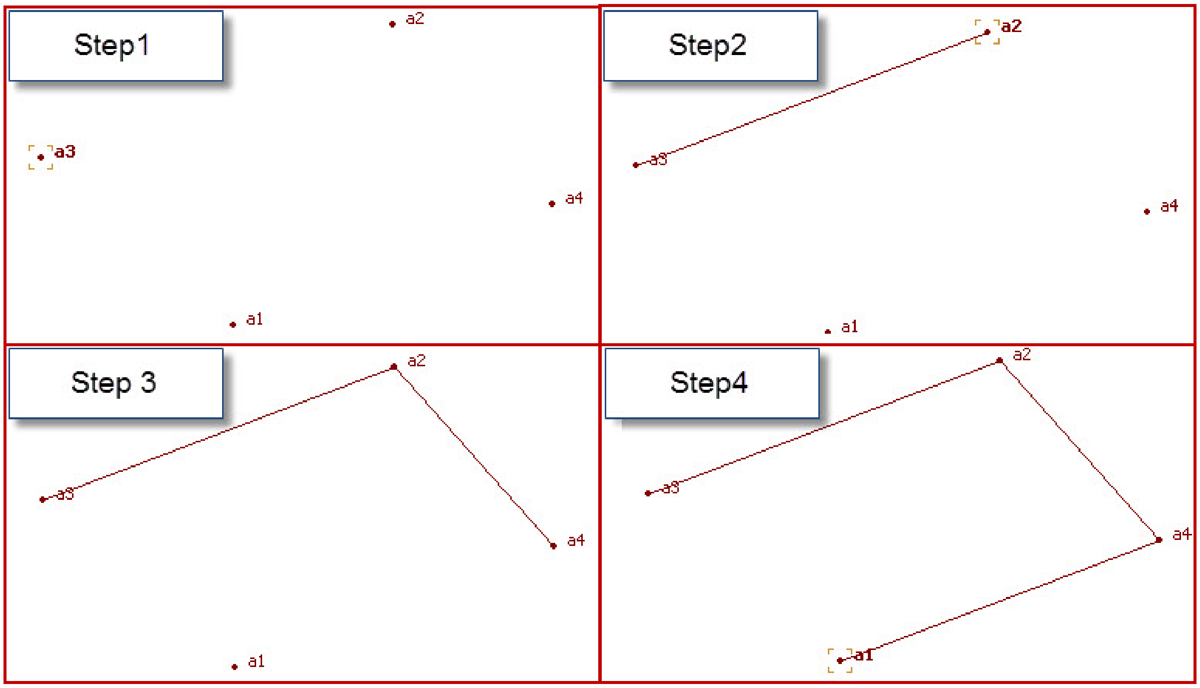
The **Line** icon of the Add group allows you to add a new polyline in the job. After clicking the icon, the pointer will change ( + ), “add line” mode will become active. Select the desired segment type for the polyline from the list of the Segment type field in the ***Add Line*** dialog:

- Line
- Curve
- Curve by 2 points
- Curve by 3 points

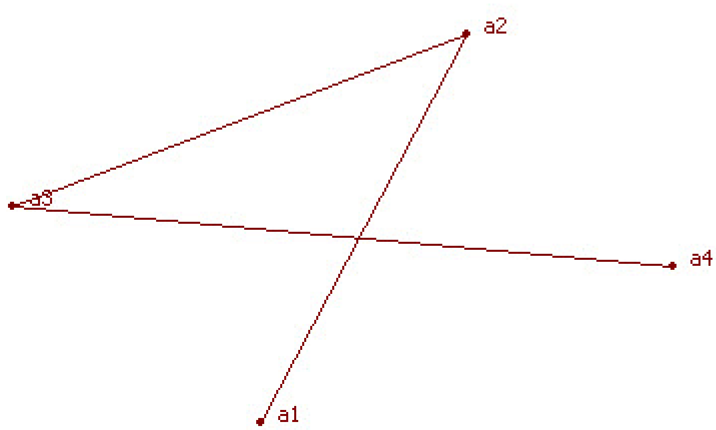
For the Curve type, select a radius (in the current units) and a turn direction.

After “add line” mode is activated, you can use one way from the following ways to plot a polyline:

- *Between two and more existing points* — click the ‘add line’ cursor on the first point on the Map View, then click on the second point. The polyline will be created between those points.




- *Between selected points* — select the desired points in the Map View or *Points* tab of the Tabular view. Then the polyline will be automatically created by connecting the points in the order of the point numbers/names.




- *Without points* — click the ‘add line’ cursor on any area within the Map view. Repeat this step as needed. Vertexes of the polyline will be appended to the line. These vertexes have no name, and the Points tab does not display the coordinates for them. The right panel of the Lines tab displays only the icon and the order for the vertexes.

The *Lines* tab of the Tabular view contains information about the created polyline. In the left panel of the tab you can edit the layer of the polylines. See "Lines tab" section on page 159 for details.

## Area icon

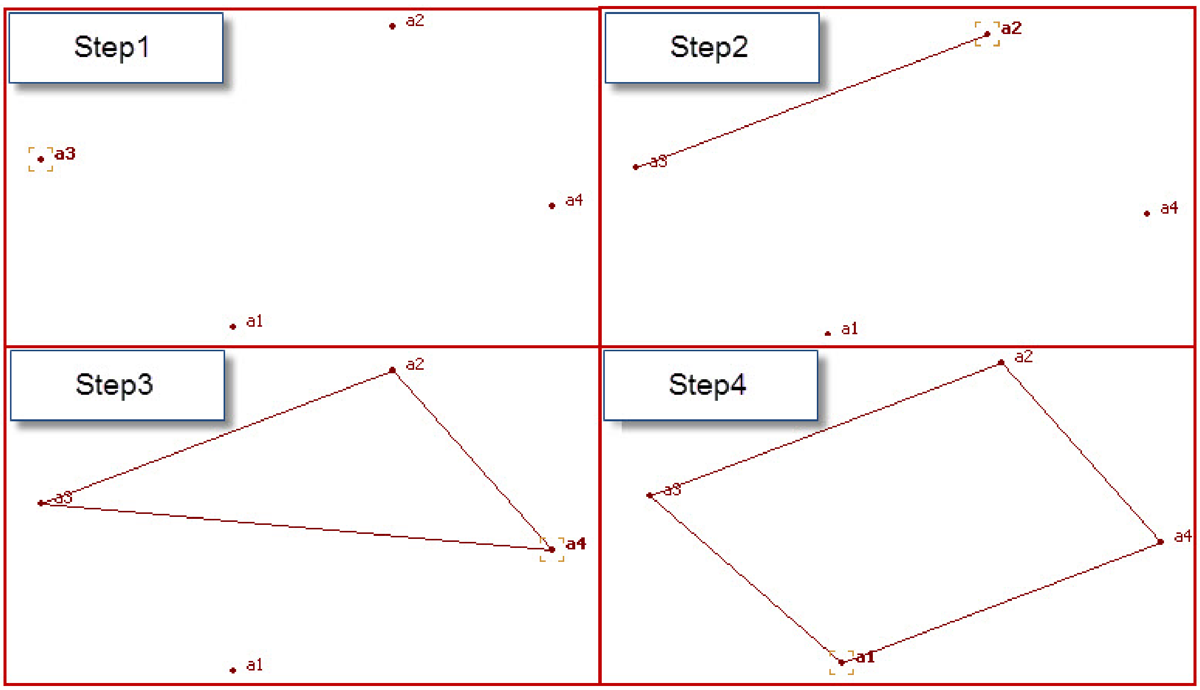
The **Area** icon of the Add group allows you to add a new area in the job. The area is closed a polyline. After clicking the icon, the pointer will change ( ), “add area” mode will become active. Select the desired segment type for the area from the list of the Segment type field on the Add Area window:

- Line
- Curve
- Curve by 2 points
- Curve by 3 points

For the Curve type, select a radius (in the current units) and a turn direction.

After “add area” mode is activated, you can use one way from the following ways to plot the area:

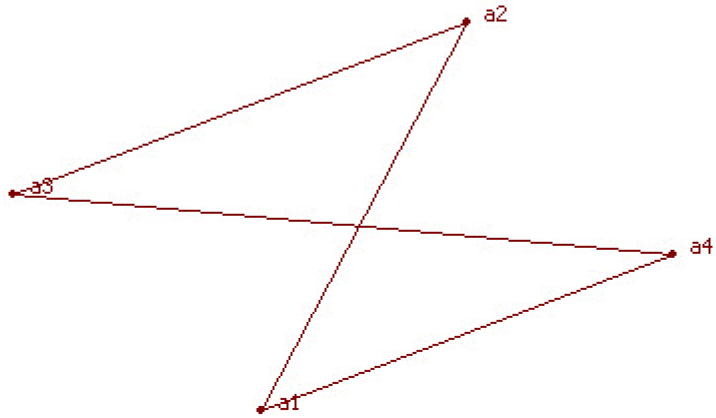
- *For existing points and non existing points* — click the ‘add area’ cursor on the first point or any place within the Map view, then click on the second point / any place. A polyline will be created between those points. Then click on the third point/any place, and all three points will be connected by the line. The area defined by the three points is created. Any click on an existing or non existing point will automatically create a area with the given set of points.




*NOTE*

*When you click the cursor on any place of the Map View, the vertexes of the polyline have no name, and the Points tab of the Tabular view does not display the coordinates for them. The right panel of the Lines tab of the Tabular view displays only the icon and the order for the vertexes.*

- *For selected points* — select the desired points in the Map View or *Points* tab of the Tabular view. Then the area will be automatically created for three and more selected points. The points will be connected in the order of the point numbers/names.




The *Lines* tab of the Tabular view contains information about the created area. In the left panel of the tab you can edit the layer of the polylines. See "Lines tab" section on page 159 for details.

## Surface icon

The **Surface** icon of the Add group allows you to add a new surface in the job. Before creating a new surface, open the Map View, set either the grid or ground coordinates using the Status bar and select (on the Map View or the *Points* tab of the Tabular view) the desired points which will enter into the surface.

After clicking the icon, the ***Add Surface*** dialog is displayed. In the *General* tab of the dialog, enter a name of the surface being created, if needed set the focus point and select a layer for the surface. To automatically update the surface if changes are made, tick the *Auto Update* checkbox. See "Surface Properties dialog" section on page 269 for details.

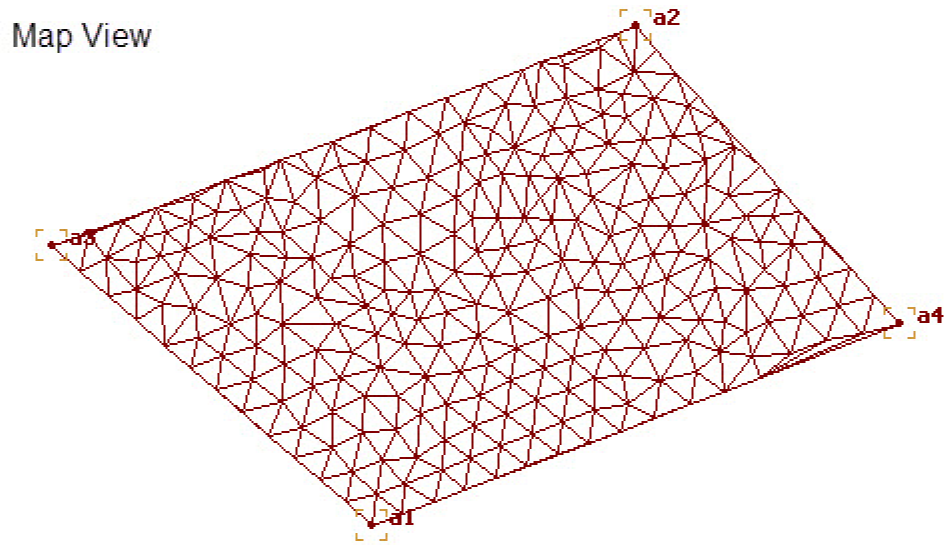
In the *Option* tab of the dialog, set constraints for creating triangles inside the surface:

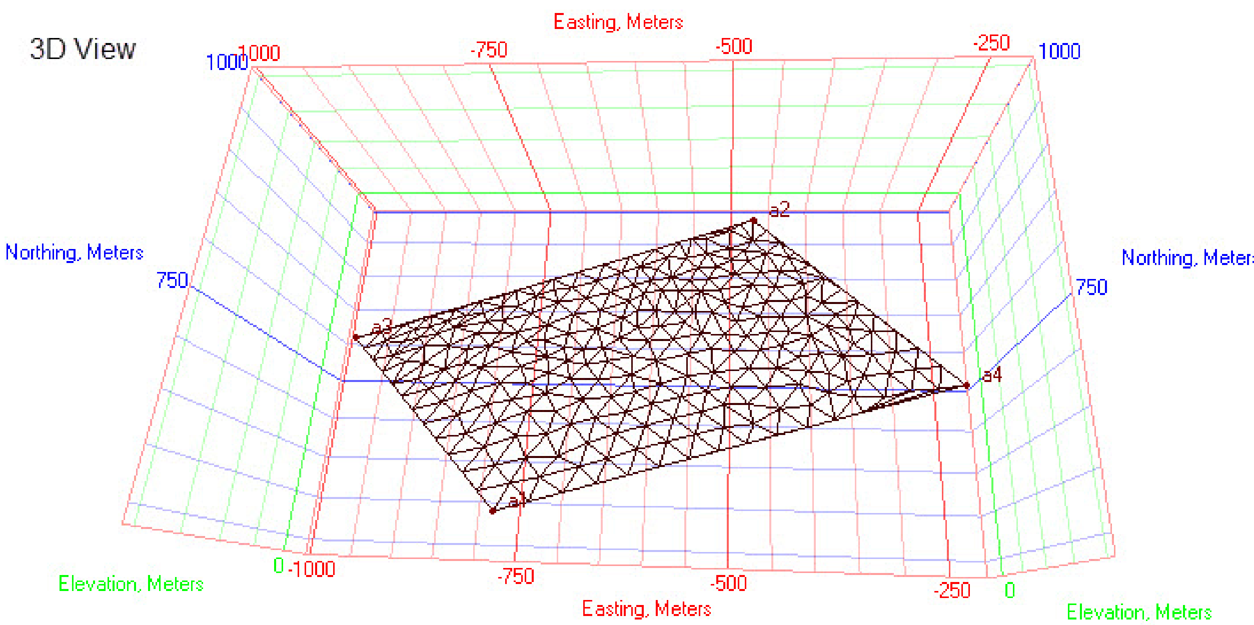
- minimal allowable interior angle of a triangle in the *with Interior Angle*< editbox.
- minimal allowable area of a triangle in the *with Area*> editbox.

The parameters, which are set in the *Options* tab, will define the number of triangles in the Surface. See "Options tab" section on page 271 for details.

Click **OK**. The new surface is created. The *Surfaces* tab of the Tabular view displays the parameters of the created surface.

The application displays the surface in the Map View and/or in the 3D View.




## Surface from Geoid icon

The **Surface from Geoid** icon of the Add group allows you to create a surface of undulations of the selected geoid and then view the surface image in Map View or 3D View. Before creating such a surface:

- Be sure that the desired geoid is the current geoid of the opened job: the *Geoid* field at the *Setup* tab of the *Coordinate Systems* item from the ***Job Configuration*** dialog displays the given geoid.
- Be sure that the geoid covers the work area.
- In the *Points* tab of the Tabular view enter and highlight the boundary points for the desired area. A minimal number of two boundary points must be selected. These points will define the opposite diagonal points of the rectangular surface being created. You can use points from the job.
- Set Grid coordinates in the Status bar.

After clicking the icon, the ***Add Surface*** dialog is displayed. In the *General* tab of the dialog, enter a name of the surface being created, if needed set the focus point and select a layer for the surface. To automatically update the surface if changes are made, tick the *Auto Update* checkbox. See "Surface Properties dialog" section on page 269 for details.

Click **OK**. The new surface is created. The *Surfaces* tab of the Tabular view displays the parameters of the created surface.

The application displays the surface in the Map View and/or in the 3D View.

## Layer icon

The **Layer** icon of the Add group allows you to open the ***Add Layer*** dialog to set layer properties.

## Code icon

The **Code** icon of the Add group allows you to open the ***New Code*** dialog to set the properties of the new code.

## Road icon

The **Road** icon of the Add group allows you to activate the ***Add Road*** dialog to create a new road. Before creating a new road, set Grid or Ground coordinates in the Status bar and create a start point for this road in the *Points* tab of the Tabular view. Clicking the icon opens the ***Add Road*** dialog.

At the *General* tab of the dialog, enter the following parameters:

- A name for the road being created in the *Name* editbox.
- Select the start point of the road from the *Start Point* drop-down list.
- The starting station or chainage in the *Start Station / Chainage* editbox.
- The stationing stakeout interval in the *Station Stakeout Interval* editbox.
- The layer in which the road resides in the *Layer* drop-down list.

In the *Alignment names* tab of the ***Add Road*** dialog, you can select a pre-defined horizontal alignment, vertical alignment and cross-section template to design the road. See "Road Properties" section on page 274 for details.

Click **OK**. The left panel of the *Roads* tab of the Tabular view displays the name of the road being created; the right panel displays the horizontal/ vertical alignments and the x-sections of the road in table and graphic modes. The Add Horz Element window is displayed to continue or to begin if a horizontal alignment is not selected in the *Alignment names* tab of the Properties dialog for the road creating a horizontal alignment. You can close the window or enter the desired parameters in the window.

## X-section Template icon

The **X-section Template** icon of the Add group allows you to activate the ***Add X-Section Template*** dialog to create a cross-section Template. At the *General* tab of the dialog, enter the following parameters:

- A name for the new template in the *Name* editbox.
- A cut slope value in the *Cut Slope* field.
- A fill slope value in the *Fill Slope* field.

See "X-Section station Properties dialog" section on page 294 for details.

Click **OK** to create the cross section template. The left panel of the *X-section Template* tab of the Tabular view displays the name of the created template.

The created template has zero values of offsets. To edit the offsets, right click the created template in the left panel of the *X-section Template* tab. Select the **Add Offset** command from the pop-up menu and specify the required parameters in the *General* tab of the ***Add Offset*** dialog.

## Manual TS Occupation icon

The **Manual TS Occupation** icon of the Add group allows you to activate the ***Add Manual TS Occupation*** dialog to add a new TS Occupation manually to the current job. At the *General* tab of the dialog, enter the following parameters:

- A name of the point at which the Total Station is set in the *Point Name* field.
- A vertical distance from the Instrument Center Mark to the ground in the current linear units in the *Instrument Height* field.

At the *Accuracy* tab you can enter the following parameters, in the current linear units:

- An error of centering the Total Station position over the mark in the *Instrument Centering Error* field.
- A measurement error of the Total Station height over the mark in the *Instrument Height Error* field.
- An error of centering the reflector position over the mark in the *Reflector Centering Error* field.
- A measurement error of the reflector height over the mark in the *Reflector Height Error* field.

In the *Instrument Type* tab you can select the desired instrument type from the list or create a custom instrument type by clicking the Custom button. See "TS Obs Properties dialog" section on page 246 and "Adding TS Instrument Type" section on page 331 for more details.

Click **OK** in the ***Add Manual TS Occupation*** dialog to close it and open the ***Add Manual TS Obs*** dialog.

In the *Observation* tab you can enter the following parameters, in the current linear units:

- A name of the point at which the reflector is set in *Point To* field.
- Select the type of the measured point in the *Type* field.
- A vertical distance from the Reflector Center Mark to the ground in the *Reflector Height* field.
- An azimuth value that defines orientation of TS measurements by the backsight from the station in the horizontal plane in the *Azimuth* field.
- A measured horizontal angle from the previous to the next observation in the *Horizontal Circle* field.
- A vertical angle to the reflector measured from zenith in the *Zenith Angle* field.
- A slope distance between the TS station (Point From) and the TS occupation (Point To) in the *Slope Distance* field.
- A vertical angle to the reflector measured from horizon in the *Vertical Angle* field.
- A distance between the TS station (Point From) and the TS occupation (Point To) in the horizontal plane in the *Horizontal Distance* field.
- A distance between the TS station (Point From) and the TS occupation (Point To) in the vertical plane in the *Vertical Distance* field.

Clicking **OK** in the ***Add Manual TS Obs*** dialog saves the observation at the *TS Obs* tab of the Tabular view. The next ***Add Manual TS Obs*** dialog will display to add a new observation, if the *Add Next Obs* checkbox was ticked.

## Manual DL Run icon

The **Manual DL Run** icon of the Add group allows you you to activate the ***Add Manual DL Run*** dialog to add a new DL Run manually to the current job. In the *General* tab of the dialog, enter the following parameters:

- a name of the leveling job created in a digital level, in the *Level Run* field.
- the number of the DL run (DL occupation) contained in the current job in the # field.
- any user's comment in the *Note* field.

and tick the *Enabled* checkbox.

Clicking OK in the Add Manual DL Run window closes this window and opens the Add Manual DL Obs window. See "DL Obs Properties dialog" section on page 257 for details.

At the *Observation* tab you can enter data for a manual observation, in the current linear units:

- a current type of the Digital Level observation in the *Type* field. This field contains the list of the DL observation types. You can select a type from the list:
  - SS- sideshot — the measurement to a sideshot point.
  - BS - backsight — the measurement to the previous occupation point in the DL run.
  - FS - foresight — the measurement to the next occupation point in the DL run.
  - End of Changing Pt — the end measurement (of the given DL run) to the point that is used to carry the measurements forward in the DL run.
  - End of Bench Mark — the end measurement (of the given DL run) to a point of known elevation.
- a name of the turning or sideshot point in the *Point* field. You can select a point from the list.
- a rod reading at the given point in the current linear units in the *Ht. Measurements* field.
- a vertical offset from the horizontal plane for traverse and sideshot points in the *Vert Offset* field.
- a measured distance from DL to the given point in the *Distance* field.
- a standard deviation for the level measurement in the *Std Dev* field.

Clicking **OK** in the Add Manual DL Obs window saves the observation in the *DL Obs* tab. The next Add Manual DL Obs window will display to add a new observation, if the *Add Next Obs* checkbox was ticked.

## Text icon

The **Text** icon of the Add group allows you to add a new text object into the current job. After clicking the icon, the pointer will change ( ), "add text" mode will become active.

Click anywhere in the Map view to create the object. You can edit:

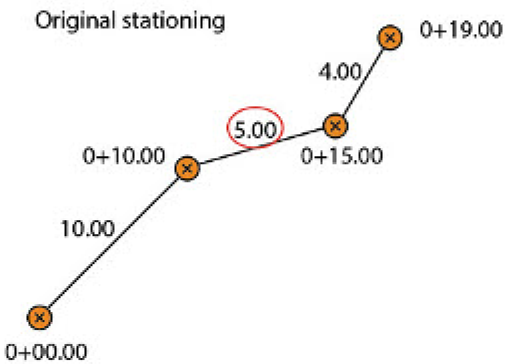
- contents, layer, color, angle, text height in the current linear units, font name, font style (bold, italic, underline) of the text and insertion point of the text box at the *Text* tab of the ***Add Text*** dialog. See "Text tab" section on page 309 for details.
- a name and coordinates (in the current coordinate system) of the start point of the of the text box in the *Location* tab of the ***Add Text*** dialog. See "Location tab" section on page 310 for details.

After clicking **OK** the text object is created. The Map View displays the object and the *Text* tab from the Tabular view displays the properties of the text . See "Text tab" section on page 197 for details.

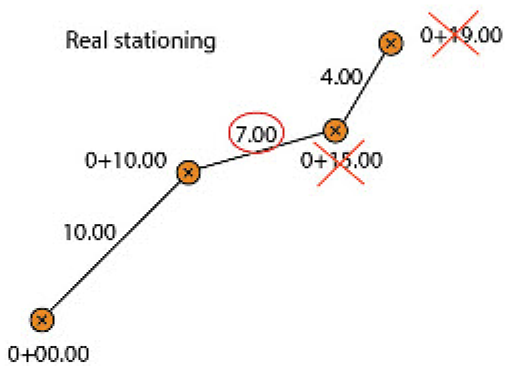
Click the icon again to deactivate "add text" mode and to return the pointer to a normal view.

## Add Station Equations Set icon

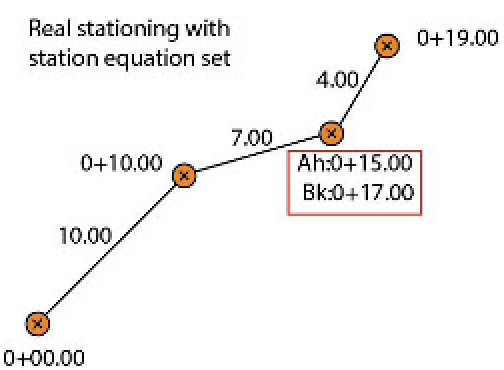
While designing a road there may be a situation when the original stationing does not fit to the actual alignment, and a new center line stationing may be needed. Station Equations are a method to link an old and a new roadway stationing. Station equations are used to change the stationing forward or back from a some spot along the alignment. Approaching stationing, behind the spot, where station equation applied is called Back Station, departing stationing, which is after this spot is called Ahead Station.




Original stationing — second segment is 5 meters long, the third station is 0+15.00, and the end station is 0+19.00.




The second segment has been prolonged to 7 meters. Third station became 0+17.00, and the end station became 0+21.00.




The Station Equation is applied to the third station. Its formula is *Back Station = 0+17.00, Ahead Station = 0+15.00*. The end station is 0+19.00 again.

The **Add Station Equations Set** icon of the Add group allows you to create a new set station equations. A set may contains several station equations for a road. You may assign only one set for one road, so you have to create all necessary equations for a road in one set.

To add a new station equations set:

1. In the *Add* group of the *Add* tab, click the **Add Station Equations Set** icon.

   The ***Add Station Equations Set*** dialog is displayed.
2. In the *Name* editbox, type the name of the station equations set.
3. Click **OK**.

The newly created station equations set is displayed in the left panel of the *Station Equations* tab from the Tabular view.

To add a new station equation to the set:

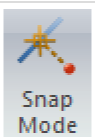
1. In the left panel of the *Station Equations* tab from the Tabular view, select the required station equations set.
2. In the right panel of the *Station Equations* tab, right click and select **Add Station Equation** from the context menu.

   The ***Add Station Equation*** dialog is displayed.
3. In the *Name* editbox, specify the name of the station equation.
4. In the *Back Station* editbox, specify the stationing for the approaching segment.
5. In the *Ahead Station* editbox, specify the stationing for the departing segment.
6. Click **OK**.

## Snap group

When creating entities in the survey view, they supposed to be on their right places. For example, you might need to place the end point of a line exactly to the start point of another line. It might be easy to do at the small scale, but at large scales it is easy to miss the required point, and place your entity near it. Snap modes are created to help you to place points exactly to the required locations.

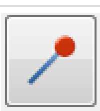
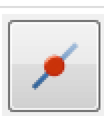
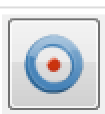
The *Snap* group from the Add tab of the MAGNET Tools ribbon contains one icon, which gives you access to the snap modes.

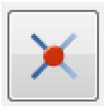
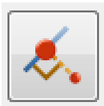
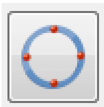
| | |
|---|---|
|   | Snap Mode icon<br>Click it to open the snap modes panel. |

*NOTE*
*Snap modes are mutually exclusive – when one mode is selected, others are disabled*

### Snap Mode icon

The **Snap Mode** icon of the Snap group allows you to open the *Snap Mode* panel. It contains six icons of snap modes, described in the table below.

| | |
|---|---|
|  | End Point snap mode<br>Creates either point at the end of segment, or node of the segment/curve/area using the end points of the existing segment. |
|  | Middle Point snap mode<br>Creates either point, or node of the line/curve/area in the center of the segment. |
|  | Circle Center snap mode<br>Creates either point, or node of the line/curve/area in the center of a curve. |

| | |
|---|---|
|  | Intersection snap mode<br>Creates either point, or node of the line/curve/area at the intersection point of two lines/curve. |
|  | Perpendicular snap mode<br>Creates a polyline perpendicular to an existing polyline. |
|  | Circle Quadrants snap mode<br>Creates points at the circle quadrants. |

### End Point snap mode

Creates either point at the end of segment, or node of the segment/curve/area using the end points of the existing segment.

To use the End Point snap mode:

1. In the *Add* group of the *Add* tab, click the required icon:
   - **Point** — to create a single point.
   - **Line** — to create a node of a line/curve.
   - **Area** — to create a node of an enclosed area.
2. In the *Snap* group of the *Add* tab, click the **Snap Mode** icon.

   The *Snap Mode* panel is displayed.
3. Click the **End Point snap** mode icon.
4. In the Map View, click the required line or curve.

   The new point or line/curve/area node is created at the end point of the selected line/curve.

### Middle Point snap mode

Creates either point, or node of the line/curve/area in the center of the segment.

To use the Middle Point snap mode:

1. In the *Add* group of the *Add* tab, click the required icon:
   - **Point** — to create a single point.
   - **Line** — to create a node of a line/curve.
   - **Area** — to create a node of an enclosed area.
2. In the *Snap* group of the *Add* tab, click the **Snap Mode** icon.

   The *Snap Mode* panel is displayed.
3. Click the **Middle Point** snap mode icon.
4. In the Map View, click the required line or curve.

   The new point or line/curve/area node is created in the center of the selected segment.

### Circle Center snap mode

Creates either point, or node of the line/curve/area in the center of a curve/circle.

To use the Circle Center snap mode:

1. In the *Add* group of the *Add* tab, click the required icon:
   - **Point** — to create a single point.
   - **Line** — to create a node of a line/curve.
   - **Area** — to create a node of an enclosed area.
2. In the *Snap* group of the *Add* tab, click the **Snap Mode** icon.

   The *Snap Mode* panel is displayed.
3. Click the **Circle Center** snap mode icon.
4. In the Map View, click the required curve.

   The new point or line/curve/area node is created in the center of curve.

### *Intersection snap mode*

Creates either point, or node of the line/curve/area at the intersection point of two lines/curves.

To use the Intersection snap mode:

1. In the *Add* group of the *Add* tab, click the required icon:
   - **Point** — to create a single point.
   - **Line** — to create a node of a line/curve.
   - **Area** — to create a node of an enclosed area.
2. In the *Snap* group of the *Add* tab, click the **Snap Mode** icon.

   The *Snap Mode* panel is displayed.
3. Click the **Intersection** snap mode icon.
4. In the Map View, continuously click the required lines/curves.

   The new point or line/curve/area node is created at the intersection of lines/curves.

### *Perpendicular snap mode*

Creates a line segment, perpendicular to an existing line segment.

To use the Perpendicular snap mode:

1. In the *Add* group of the *Add* tab, click the required icon:
   - **Line** — to create a node of a line/curve.
   - **Area** — to create a node of an enclosed area.
2. In the *Snap* group of the *Add* tab, click the **Snap Mode** icon.

   The *Snap Mode* panel is displayed.
3. Click the **Circle Quadrants** snap mode icon.
4. In the Map View, click the line/curve to which the new segment will be perpendicular.
5. In the Map View, click the end point of the new segment.

   The new perpendicular segment is created.

### *Circle Quadrants snap mode*

Creates a point or a line/area node at the circle quadrant.

To use the Circle Quadrants snap mode:

1. In the *Add* group of the *Add* tab, click the required icon:
   - **Point** — to create a single point.
   - **Line** — to create a node of a line/curve.
   - **Area** — to create a node of an enclosed area.
2. In the *Snap* group of the *Add* tab, click the **Snap Mode** icon.

   The *Snap Mode* panel is displayed.
3. Click the **Circle Quadrants** snap mode icon.
4. In the Map View, click the required curve.

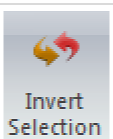
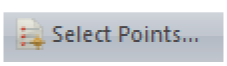
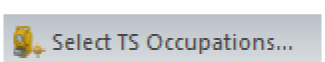
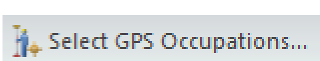
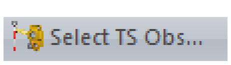
   The new point is created at the quadrant, nearest to the click point.

# Select tab

The *Select* tab of the MAGNET Tools ribbon contains one group of nine icons. It is described in the following section — "Select group" section below.

## Select group

The *Select*group from the *Select* tab of the MAGNET Tools ribbon allows you to perform operations with object selections. It contains nine icons:

| | |
|---|---|
|  | Select All icon<br>Click it to select all objects in the map/observation view. |
|  | Select None icon<br>Click it to remove selection from all objects in the map/observation view. |
|  | Invert Selection icon<br>Click it to invert the selection in the map/observation view. |
|  | Select Points icon<br>Click it to select points in the map/observation view by a certain criteria. |
|  | Select TS Occupations icon<br>Click it to select TS Occupations in the map/observation view by a certain criteria. |
|  | Select GPS Occupations icon<br>Click it to select GPS Occupations in the map/observation view by a certain criteria. |
|  | Select TS Obs icon<br>Click it to select TS Observations in the map/observation view by a certain criteria. |

| | |
|---|---|
|  | Select GPS Obs icon<br>Click it to select GPS Observations in the map/observation view by a certain criteria. |
|  | Arrange tables by selection icon<br>Click it to arrange Tabular view by selection |

## Select All icon

The **Select All** icon of the Select tab allows you to select all active data of your job. Its shortcut is *Ctrl+A*.

Click the icon to select all active objects in the Map/Observation view.

## Select None icon

The **Select None** icon of the Select tab allows you to deselect all currently selected objects.

> TIP
> Other way to cancel any selection is to do the left click outside of the selection area.

## Invert Selection icon

The **Invert Selection** icon of the Select tab allows you to invert current selection.

Click the icon to deselect all currently selected objects, and select all other objects.

## Select Points icon

The **Select Points** icon of the Select tab allows you to select points in the job by a certain criteria.

To select points:

1. In the *Select* group of the *Select* tab, click the **Select Points** icon.

   The ***Select Points*** dialog is displayed.
2. Configure the selection criteria as you need. Fields are descried in the table below.
3. Click **OK**.

**Fields of the *Select Points* dialog**

| Field | Description |
|---|---|
| *Name* | Defines a name or a part of a point name for a selection criteria.<br>You can use the asterisk (*) or question mark (?) wildcards.These wildcards represent one or more real characters when selecting a point or points, and are used instead of one or more unknown characters, any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.<br>By default, the *Name* editbox contains the asterisk (*) character, selecting all Points with names.<br>You can select a group of objects, by using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus sign as a separator. All objects inside this range will be selected. |

| Field | Description |
|---|---|
| *Note* | Defines a note or a part of a point's note for a selection criteria.<br>You can use the asterisk (*) or question mark (?) wildcards.These wildcards represent one or more real characters when selecting a point or points, and are used instead of one or more unknown characters, any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.<br>By default, the *Note* editbox contains the asterisk (*) character, selecting all Points with notes.<br>You can select a group of objects, by using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus sign as a separator. All objects inside this range will be selected. |
| *Code* | Defines a code or a part of a point's code for a selection criteria.<br>You can use the asterisk (*) or question mark (?) wildcards.These wildcards represent one or more real characters when selecting a point or points, and are used instead of one or more unknown characters, any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.<br>By default, the *Code* editbox contains the asterisk (*) character, selecting all Points with notes.<br>You can select a group of objects, by using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus sign as a separator. All objects inside this range will be selected. |
| *Layer* | Defines a layer or a part of a layer's name for a selection criteria. All point from the matching layer will be selected.<br>You can use the asterisk (*) or question mark (?) wildcards.These wildcards represent one or more real characters when selecting a point or points, and are used instead of one or more unknown characters, any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.<br>By default, the *Layer* editbox contains the asterisk (*) character, selecting points from all layers.<br>You can select a group of objects, by using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus sign as a separator. All objects inside this range will be selected. |
| *Source* | Defines the raw data file's path from which these points were imported as the search criteria.<br>Select a path from the list box or set a name or a part of a name with the asterisk (*) or question mark (?) wildcards.You can select a group of objects, using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus as a separator. All objects inside this range will be selected. |

| Field | Description |
|---|---|
| *Std Dev Horizontal* | Selects points according to the standard deviation of a point's adjusted horizontal coordinate .Select one of the three modes: Less than, Greater than, or Do not use. Specify the deviation value in the editbox on the right. |
| *Std Dev Vertical* | Selects points according the standard deviation of a point's adjusted vertical coordinate. Select one of the three modes: Less than, Greater than, or Do not use. Specify the deviation value in the editbox on the right |
| *Point Type* | Defines the type of the points as the selecting criteria. |
| *Enabled for adjustment* | Selects points according to three modes: *Enabled for adjustment*, *Disabled for adjustment*, *Do not use*. |
| *Clear current selection* | Tick to perform the selection only within points that are currently selected. |

## Select TS Occupations icon

The **Select TS Occuaptions** icon of the Select tab allows you to activate the ***Select TS Occupations*** dialog.

To select TS occupations:

1. In the *Select* group of the *Select* tab, click the **Select TS Occupations** icon.

   The ***Select TS Occupations*** dialog is displayed.
2. Configure the selection parameters as you need. Fields are described in the table below.
3. Click **OK**.

#### Fields of the *Select TS Occupations* dialog

| Field | Description |
|---|---|
| *Point Name* | Defines a name or a part of a point name for a selection criteria.<br><br>You can use the asterisk (*) or question mark (?) wildcards.These wildcards represent one or more real characters when selecting a point or points, and are used instead of one or more unknown characters, any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.<br><br>By default, the *Name* editbox contains the asterisk (*) character, selecting all occupations with names.<br><br>You can select a group of objects, by using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus sign as a separator. All objects inside this range will be selected. |
| *Source* | Selects Occupations according to the raw data file's path from which these occupations were imported.<br><br>Sets a name or a part of a name with the asterisk (*) or question mark (?) wildcards. You can select a group of objects, using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus as a separator. All objects inside this range will be selected. |

| Field | Description |
|---|---|
| *Instrument Height* | Selects points according to the instrument height above the station. Select one of the four modes: Less than, Greater than, Equal to, or Do not use.Set the Instrument height value in the editbox on the right. |
| *Related Point* | Check to select TS occupations together with related points. |
| *Related Obs* | Check to select TS occupations together with related observations. |
| *Clear current selection* | Tick to clear the previous selection. |

## Select GPS Occupations icon

The **Select GPS Occupations** icon of the Select tab allows you to activate the ***Select GPS Occupations*** dialog.

To select TS occupations:

1. In the *Select* group of the *Select* tab, click the **Select GPS Occupations** icon.

   The ***Select GPS Occupations*** dialog is displayed.
2. Configure the selection parameters as you need. Fields are described in the table below.
3. Click **OK**.

#### Fields of the *Select GPS Occupations* dialog

| Field | Description |
|---|---|
| *Point Name* | Defines a name or a part of a point name for a selection criteria.<br>You can use the asterisk (*) or question mark (?) wildcards.These wildcards represent one or more real characters when selecting a point or points, and are used instead of one or more unknown characters, any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.<br>By default, the *Name* editbox contains the asterisk (*) character, selecting all occupations with names.<br>You can select a group of objects, by using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus sign as a separator. All objects inside this range will be selected. |
| *Original Name* | Selects GPS occupations according to initial names of the occupations as indicated in the source file.<br>You can use the asterisk (*) or question mark (?) wildcards.These wildcards represent one or more real characters when selecting a point or points, and are used instead of one or more unknown characters, any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.<br>By default, the *Original Name* editbox contains the asterisk (*) character, selecting all occupations with names.<br>You can select a group of objects, by using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus sign as a separator. All objects inside this range will be selected. |

| Field | Description |
|---|---|
| *Point Code* | Selects GPS occupations according to the Point Code.<br>Sets a name or a part of a name with the asterisk (*) or question mark (?) wild-cards. You can selec ta group of objects, using comma as a separator, another way to select the group of objects to set a rangein ascending order, using minus as a separator. All objects inside this range will be selected. |
| *Source* | Selects Occupations according to the raw data file's path from which these occupations were imported.<br>Sets a name or a part of a name with the asterisk (*) or question mark (?) wild-cards. You can select a group of objects, using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus as a separator. All objects inside this range will be selected. |

| Field | Description |
|---|---|
| *Method* | Selects GPS occupations according to the surveying method.<br>Choose the appropriate method from the list:<br>• *Base* — occupations obtained on the base station.<br>• *Topo* — Topo occupations are static phase measurements created in TopSurv and exported from the TopSurv Job. The measurements in TopSurv are collected during some time and after that they are averaged.<br>• *Auto Topo* — AutoTopo Occuptions are kinematic phase measurements created in TopSurv and exported from the TopSurv Job. AutoTopo Points are points corresponding to the AutoTopo Occupation. It is possible in to view these points and to recalculate them from the Base Station (not to process).<br>• *Autonomous* — coordinates of such point are calculated in the Standalone mode (i.e. using code measurements from own receiver only). When the coordinates of the point were calculated the code and phase corrections had not been used.<br>• *CodeDiff* — Topo andAuto Topo code measurements;<br>• *DGPS VBS* — submeter positioning obtained by OmniStar Virtual Base Station technology providing users with accurate positioning with a correction message further enhanced for their location.This multiply reference station solution can provide accuracy to within one meter;<br>• *DGPS HP* — decimeter positioning HP (High Performance) obtained by the OmniStar's HP solution is a dual frequency GPS augmentation service that provides robust and reliable high performance GPS positioning of unmatched accuracy (decimeter level);<br>• *Static* — occupations obtained by the static method of relative (baselines) measurements, when by means of phase method during the long-duration session (near one hour or longer) the delta of coordinate (vector) between base station and rover station is defined.<br>• *Stop* — the static occupation in the Stop and Go session;<br>• *Kinematic* — the type of measurements made when rover is moving. The motion trajectory is obtained during these measurements.<br>• *Go* — the kinematic occupation in the Stop and Go session. |
| *Antenna Height* | Selects GPS Occupations according to the antenna height. Select one of the four modes: Less than, Greater than, Equal to, or Do not use. Specify the antenna height value in the editbox on the right. |
| *Start Time* | Selects GPS occupations according to the Start time (date and time). Select one of the four modes: Less than, Greater than, Equal to, or Do not use. Specify the time and date in the fields on the right. |
| *End Time* | Selects GPS occupations according to the End time (date and time). Select one of the four modes: Less than, Greater than, Equal to, or Do not use. Specify the time and date in the fields on the right. |

| Field | Description |
|---|---|
| *Duration* | Selects GPS occupations according to the duration. Select one of the four modes: Less than, Greater than, Equal to, or Do not use. Set an absolute value for the Duration in the editboxes on the right. |
| *Related Point* | Tick to select GPS occupations together with related points. |
| *Related Obs* | Tick to select GPS occupations together with related observations. |
| *Clear current Selection* | Tick to clear the previous selection. |

## Select TS Obs icon

The **Select TS Obs** icon of the Select tab allows you to activate the ***Select TS Observations*** dialog.

To select TS observations:

1. In the *Select* group of the *Select* tab, click the **Select TS Obs** icon.

   The ***Select TS Obs*** dialog is displayed.
2. Configure the selection parameters as you need. Fields are described in the table below.
3. Click **OK**.

#### Fields of the *Select TS Obs* dialog

| Field | Description |
|---|---|
| *From Point* | Selects TS observations according to Point From names.<br><br>Set a name or a part of a name using the asterisk (*) or question mark (?) wild-cards.These wildcards represent one or more real characters when selecting a point or points, and are used in place of one or more unknown characters,any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.Initially, the Name field contains the asterisk (*) character, selecting all observations with names. You can select a group of objects, using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus as a separator. All objects inside this range will be selected. |
| *To Point* | Selects TS observations according to Point To names.<br><br>Set a name or a part of a name using the asterisk (*) or question mark (?) wild-cards.These wildcards represent one or more real characters when selecting a point or points, and are used in place of one or more unknown characters,any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.Initially, the Name field contains the asterisk (*) character, selecting all observations with names. You can select a group of objects, using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus as a separator. All objects inside this range will be selected. |

| Field | Description |
|---|---|
| *Source* | Selects Occupations according to the raw data file's path from which these occupations were imported.<br>Sets a name or a part of a name with the asterisk (*) or question mark (?) wildcards. You can select a group of objects, using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus as a separator. All objects inside this range will be selected. |
| *Enabled* | Selects points if they are set as *Enabled* in the ***Properties*** dialog for TS occupation. Select one of the three modes: Enabled, Disabled, Do not use. |
| *Hz residuals* | Selects TS observations according to the Horizontal residuals. Select one of the three modes for the horizontal residual: Less than, Greater than, or Do not use. Specify the horizontal residual value in the editbox on the right. |
| *V residuals* | Selects TS observations according to the Vertical residuals. Select one of the three modes: Less than, Greater than, or Do not use. Specify the vertical residual value in the editbox on the right. |
| *Reflector Height* | Selects TS observations according to the reflector height above the point being observed. Select one of the three modes: Less than, Greater than, or Do not use. Specify the reflector height value in the editbox on the right. |
| *Hz angle* | Selects TS observations according to the horizontal angle. Select one of the three modes: Less than, Greater than, or Do not use. Specify the horizontal angle value in the editbox on the right. |
| *V angle* | Selects TS observations according to the vertical angle. Select one of the three modes: Less than, Greater than, or Do not use. Specify the vertical angle value in the editbox on the right. |
| *Z angle* | Select TS observations according to the Zenith angle. Sets one of the three modes: Less than, Greater than, or Do not use. Specify the Zenith angle value in the editbox on the right. |
| *Hz dist* | Selects TS observations according to the horizontal distance. Select one of the three modes: Less than, Greater than, or Do not use. Specify the horizontal distance value in the editbox on the right. |
| *V dist* | Selects TS observations according to the vertical distance. Select one of the three modes: Less than, Greater than, or Do not use. Specify the vertical distance value in the editbox on the right. |
| *Slope Dist* | Selects TS observations according to the Slope distance. Select one of the three modes: Less than, Greater than, or Do not use. Specify the slope distance value in the editbox on the right. |
| *Related Point* | Tick it to select TS observations together with related points. |
| *Clear current selection* | Tick it to clear the previous selection. |

## Select GPS Obs icon

The **Select GPS Obs** icon of the Select tab allows you to activate the ***Select GPS Obs*** dialog.

To select GPS observations:

1. In the *Select* group of the *Select* tab, click the **Select GPS Obs** icon.

   The ***Select GPS Obs*** dialog is displayed.
2. Configure the selection parameters as you need. Fields are described in the table below.
3. Click **OK**.

**Fields of the *Select GPS Obs* dialog**

| Field | Description |
|---|---|
| *From Point* | Selects GPS observations according to Point From names.<br>Set a name or a part of a name using the asterisk (*) or question mark (?) wild-cards.These wildcards represent one or more real characters when selecting a point or points, and are used in place of one or more unknown characters,any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.Initially, the Name field contains the asterisk (*) character, selecting all observations with names. You can select a group of objects, using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus as a separator. All objects inside this range will be selected. |
| *To Point* | Selects GPS observations according to Point To names.<br>Set a name or a part of a name using the asterisk (*) or question mark (?) wild-cards.These wildcards represent one or more real characters when selecting a point or points, and are used in place of one or more unknown characters,any characters in a name, or to select a group of points. You can use the asterisk as a substitute for zero or more characters.Initially, the Name field contains the asterisk (*) character, selecting all observations with names. You can select a group of objects, using comma as a separator, another way to select the group of objects to set a range in ascending order, using minus as a separator. All objects inside this range will be selected. |
| *Type* | Selects GPS observations according to the Observation type.Choose an appropriate type from the list. |
| *Start Time* | Select one of the three modes for the Start time: Less than, Greater than, or Do not use. Set an absolute value for the Start time (time and date) in the field on the right. |
| *Duration* | Selects GPS observations according to the duration. Select one of the three modes for the duration: Less than, Greater than, or Do not use. Set an absolute value for the duration (days, hours, minutes and seconds ) in the editboxes on the right |
| *Solution Type* | Selects GPS observations according to the Solution type. Choose an appropriate type from the list. |
| *Hz precision* | Selects GPS observations according to the horizontal precision. Select one of the three modes: Less than, Greater than, or Do not use. Set an absolute value of the horizontal precision in the editbox on the right. |
| *V precision* | Selects GPS observations according to the vertical precision. Select one of the three modes: Less than, Greater than, or Do not use. Set an absolute value of the vertical precision in the editbox on the right. |

| Field | Description |
|---|---|
| *Hz residuals* | Selects GPS observations according to the horizontal residual. Select one of the three modes: Less than, Greater than, or Do not use. Set an absolute value of the horizontal residual in the editbox on the right. |
| *V residuals* | Selects GPS observations according to the vertical residual. Select one of the three modes: Less than, Greater than, or Do not use.Set an absolute value of the vertical residual in the editbox on the right. |
| *Length* | Selects GPS observations according to the length. Select one of the three modes: Less than, Greater than, or Do not use. Set an absolute value of the length in the editbox on the right. |
| *Enabled* | Selects points if they are set as *Enabled* in the ***Properties*** dialog for GPS observation. Select one of the three modes: Enabled, Disabled, or Do not use. |
| *Slope Dist* | Select one of the three modes for the slope distance: Less than, Greater than, or Do not use.Set an absolute value for the slope distance in the editbox on the right. |
| *Clear current selection* | Tick it to clear the previous selection. |

### Arrange tables by selection icon

The **Arrange tables by selection icon** icon of the Select tab allows you to arrange Tabular View by selection.

All tables will be sorted by selection. If currently activetable does not have any selection, the table with the largest number of selected items will be activated.When this command is checked, selecting any data that is displayed in the Tabular View leads to thefollowing: all tables with changed selection will be sorted by selection, if no selection was addedin the currently active table, the table with the largest number of newly selected lines will be activated.

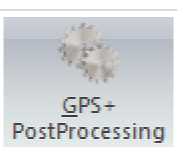
# Process tab

The *Process* tab of the MAGNET Tools ribbon allows you to work with the data processing. It contains five groups, described in the appropriate sections:

- "GPS group" section below
- "Adjustment group" section on the facing page
- "Coordinate systems group" section on page 74
- "Surfaces group" section on page 75
- "Properties group" section on page 75

## GPS group

The *GPS* group from the *Process* tab of the MAGNET Tools ribbon allows you to run the post processing of all enabled GPS observations of the job.The group contains one icon:

| | |
|---|---|
|   | GPS+ Post Processing icon<br>Click it to to run the post processing of GPS observations. |

### GPS+ Post Processing icon

The **GPS+ Post Processing** icon of the GPS group allows you to run the post processing of all enabled GPS observations of the job. After this procedure is finished, the Observation View will display green/red static processed baselines.

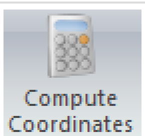
> *NOTE*
> *The post processing is not final procedure to obtain the coordinates of the network points from a control points. We recommend using the adjustment procedure to obtain the final coordinates of the network points with estimation errors.*

## Adjustment group

The *Adjustment* group from the *Process* tab of the MAGNET Tools ribbon allows you to perform:

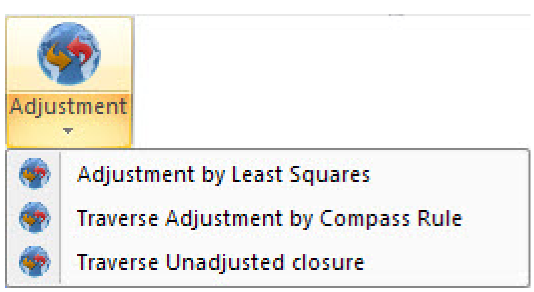
- adjustment of GPS, TS and DL observations with obtaining estimating accuracy for each point of the network,
- compute coordinates of the network point from base coordinates,
- loop closure test for GPS observations which form enclosed figures.

It contains three icons:

| | |
|---|---|
|   | Adjustment icon<br>Click it to perform the adjustment of the TS/GPS/DL observations. |
|   | Compute Coordinates icon<br>Click it to recalculate the network point coordinates. |
|   | Loop Closures icon<br>Click it to perform loop closures test for the post-processed GPS observations that form a closed loop |

### Adjustment icon

The **Adjustment** icon of the Adjustment group allows you to perform the adjustment of the TS observations, GPS observations, and DL observations, either together or separately and either constrained or free. The Least Squares method of adjustment by default is used for adjustment any network. Also for TS networks, you can select traverse adjustment by Compass Rule or traverse unadjusted closure techniques by clicking on the arrow under the icon:




See "Performing Adjustment" section on page 355 for more details.

### Compute Coordinates icon

The **Compute Coordinates** icon of the Adjustment group allows you to recalculate the network point coordinates from the original base coordinates without any estimate of accuracy. If the network has duplicate measurements, only one measurement will be used in compute coordinates.

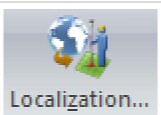
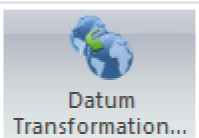
### Loop Closures icon

The **Loop Closures** icon of the Adjustment group allows you to perform loop closures test for the post-processed GPS observations that form a closed loop.

After clicking the icon, the ***Loop Closures*** dialog is displayed. Select all desired GPS observations of the network that form closed figures and click **Finish**. The Loop Closures report is shown. The report contains the residuals in the horizontal and vertical planes which are calculated for each closed loop of the network. If a residual value for a figure is more than a threshold value (horizontal tolerance and vertical tolerance) , the residual is highlighted in red in the report. You can edit the threshold value at the *Loop Closure Precisions* tab of *Quality Control* item from the ***Job configuration*** dialog. See "Loop Closure Precisions tab" section on page 118 for details.

## Coordinate systems group

The *Coordinate systems* group from the *Process* tab of the MAGNET Tools ribbon allows you to perform calculation of transformation parameters between any datum or any grid and ground coordinate systems or determine an unknown datum parameters with respect to the WGS84 datum. The group contains three icons:

| | |
|---|---|
|   | Localization icon<br>Click it to calculate transformation between any datum/grid and ground coordinate systems. |
|   | Datum Transformation icon<br>Click to perform a datum transformation with respect to the WGS84 datum. |
|   | Geoids icon<br>Click it to manage geoids. |

### Localization icon

The **Localization** icon of the Coordinate systems group allows you to calculate transformation parameters between any datum or any grid and ground coordinate systems to determine the point coordinates in the given coordinate system. After clicking the icon, the ***Localization*** dialog is displayed. Click **Add Point** to select a localization points which will use in localization. To start the localization click **Compute Parameters**.

See "Performing Localization" section on page 368 for more details.

### Datum Transformation icon

The **Datum Transformation** icon of the Coordinate systems group allows allows you to:

- determine an unknown datum parameters with respect to the WGS84 datum,
- redefine the parameters of the existing datum with respect to the WGS84 for a local area.

After clicking the icon, the ***Datum Transformation*** dialog is displayed. Click **Add Point** to select a points which will use in datum transformation. To start this transformation click **Compute Parameters**.

See "Performing Datum Transformation" section on page 376 for more details.

### Geoids icon

The **Geoids** icon of the Coordinate systems group allows you to:

Click it to open the ***Geoids List*** dilaog, where you can:

- view downloaded geoids in the current job,
- add a geoid to the list. See "Adding geoid to the job" section on page 335 for details.
- convert a selected geoid to the Topcon Geoid (**.gff*) file format, by clicking **Export**.
- remove the selected geoid from the list, by clicking **Remove**.

See "Geoid List dialog" section on page 335 for details.

## Surfaces group

The *Surfaces* group from the *Process* tab of the MAGNET Tools ribbon allows you to update a surface if a change of the surface is made. The group contains one icon:

| | |
|---|---|
|  | Update Surface(s) icon<br>Click to update surfaces in the current job. |

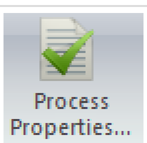
### Update Surface(s) icon

The **Update Surface(s)** icon of the Surfaces group allows you to update a surface. The icon is available when:

- a change of the surface is made
- the *Auto Update* checkbox is not ticked in the ***Properties*** dialog for surfaces.

## Properties group

The *Properties* group from the *Process* tab of the MAGNET Tools ribbon allows you to select the adjustment parameters, parameters for calculating TS point coordinates from TS raw data, parameters for post-processing GPS observations.  The group contains one icon:

| | |
|---|---|
|  | Process Properties icon<br>Click it to configure the processing properties. |

### Process Properties icon

The **Process Properties** icon of the Properties group allows you to open the ***Process Properties*** dialog, where you can select:

- the adjustment parameters for Least Squares adjustment type. See "Adjustment item" section on page 100 for details.
- a method of traverse adjustment in the Total Station network and parameters for calculating TS point coordinates from TS raw data. See "TS Computations item" section on page 104 for details.

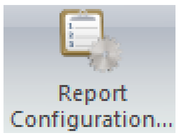
- parameters for post-processing GPS observations. See "GPS+ PostProcess item" section on page 105 for details.

# Report tab

The *Report* tab of the MAGNET Tools ribbon allows you to get the job information. It contains one group. See Report group for details.

## Report group

The *Report* group from the *Report* tab of the MAGNET Tools ribbon allows you to open the ***Report Configuration*** dialog and execute any type's report from the list. The group contains two icons:

| | |
|---|---|
|  | Report Configuration icon<br>Click it to configure a report. |
|  | Execute Report icon<br>Click it to execute a report. |

### Report Configuration icon

The **Report Configuration** icon of the Report group allows you to configure a report.

After clicking the icon, the ***Report Configuration*** dialog is displayed. In the window you can create your own type of report to include or exclude certain information from already generated reports

See "Creating custom report" section on page 340 for details.

### Execute Report icon

The **Execute Report** icon of the Report group allows you to execute a report.

By clicking on the arrow under the icon you can see the list of the available reports. This list does not contain the reports created by the **New Adj report** button. You can start the executing of any type's report from the list.

# Calculate tab

The *Calculate* tab of the MAGNET Tools ribbon contains one group of four icons. It is described in the following section — Calculate group.

## Calculate group

The *Calculate* group from the *Calculate* tab of the MAGNET Tools ribbon allows you to calculate the coordinate geometry. The group contains four icons:

| | |
|---|---|
|  | Inverse icon<br>Click it to calculate the distance and azimuth between any two points of the job. |

| | |
|---|---|
|  | Compare Surfaces icon<br>Click it to compute difference between existing surfaces. |
|  | Translate Points icon<br>Click it to translate a selection of points from one position to another. |
|  | Rotate Points icon<br>Click it to rotate a selection of points around specified point. |

## Inverse icon

The **Inverse** icon of the Calculate group allows you to calculate the distance and azimuth between any two points of the job.

You may calculate these parameters between:

- any two points,
- a point and a set of points (if the points have names)
- the start and end points of a selected line's segment or a horizontal alignment of a road

To calculate the distance and azimuth between points:

1. In the *COGO* group of the *Report* tab, click the **Inverse** icon.

   The ***Inverse*** panel is displayed. By default it is located above the Map/Observation view.
2. In the *From* and *To* editboxes, specify the points for the Inverse. There are three ways to specify a point in the editbox:
   - Enter the point name or enter point coordinates using format {123.456,322.778} for the Grid and/or Ground coordinate system and {11 12 14.555N, 07 08 09.444E} for the Datum coordinate system:
   - Selecting the point from a list which will appear after entering the first common letter or digit of the point name.
   - Using the drug-and-drop technique the select points or/and segment of line or/and alignment of road in the Tabular and/or Map/CAD View.

     You can specify either a single point or multiple points. To select multiple points, do one of the following:
     - Use a comma as the delimiter. For example: *A,A2,A3,A4*.
     - Use a semicolon as the delimiter. For example: *A;A2;A3;A4*.
     - Use a range of point names. For example: *A-A4*.

       *NOTE*
       *If you specify multiple points, the software will calculate the inverse task for all point combinations.*
3. Click **Calculate**.

   Calculated values are displayed at the *Inverse* tab from the Tabular view.

## Compare Surfaces icon

The **Compare Surfaces** icon of the Calculate group allows you to compute one of the following:

- difference between the volumes of two surfaces;
- difference between the volumes of a road and a surface;
- the volume of a surface/road relative to the horizontal plane of the defined level.

To compare surfaces:

1. In the *GOGO* group of the *Report* tab, click the **Compare Surfaces** icon.

   The ***Compare Surfaces*** panel is displayed.
2. From the *Design* drop-down list, select the first surface or road for comparison.
3. Do one of the following:
   - Select a surface for comparison. To do so:
     1. From the *Existing* drop-down list, select *Surface*.
     2. From the adjacent drop-down list, select the required surface.
   - Define a horizontal plane for comparison. To do so:
     1. From the *Existing* drop-down list, select *Level*.
     2. In the adjacent editbox, type the required level of the plane.
4. If needed, tick the *Save as Surface* checkbox, to save the result as an independent surface.
5. Click **Calculate**.

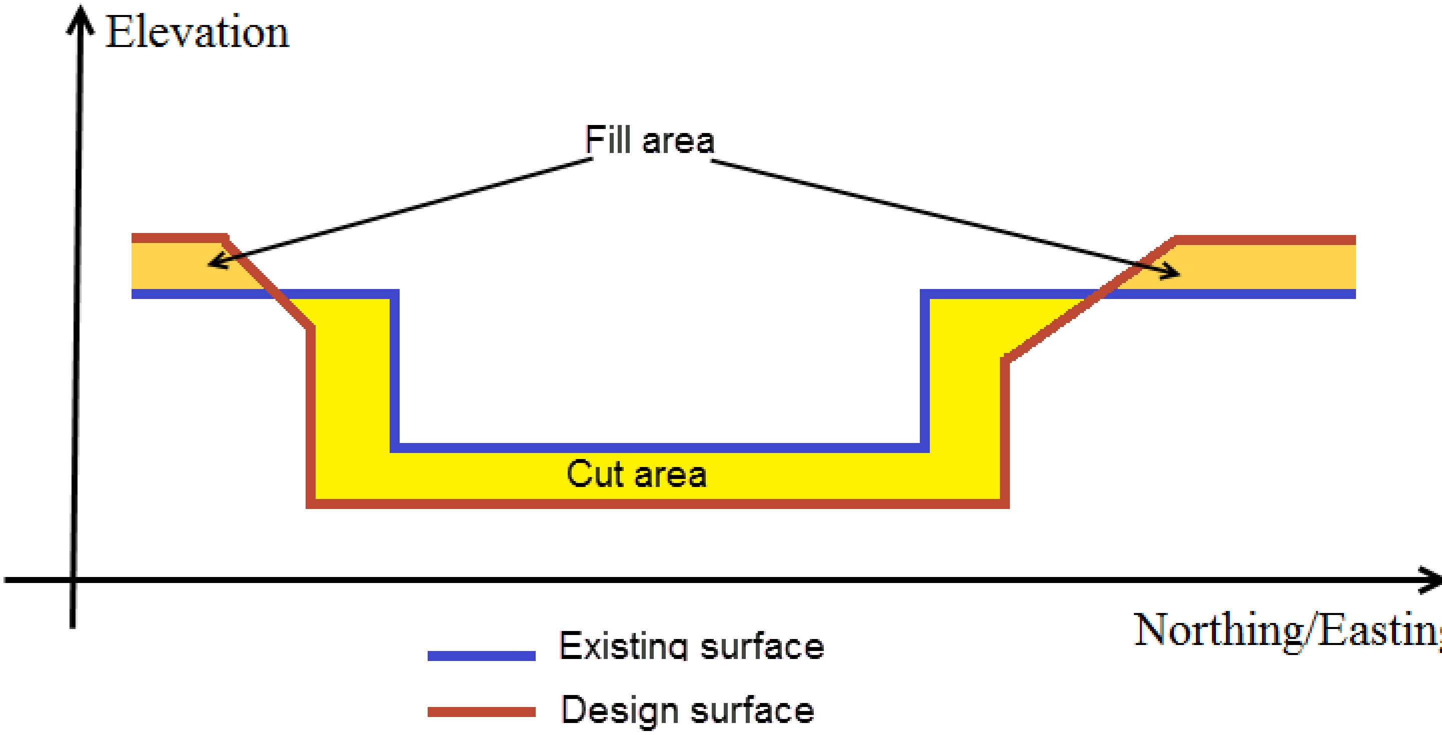
   If you have selected a road in the step 2, MAGNET Tools automatically converts road to surface and displays the***Convert road to surface*** dialog. You need to define the interval between the points in that surface. To do so:
   1. In the *Interval* editbox, specify the required interval.
   2. Click **OK**.

   The *Compare Surface* tab from the tabular view displays the result of comparing. Fields are described in the table below.

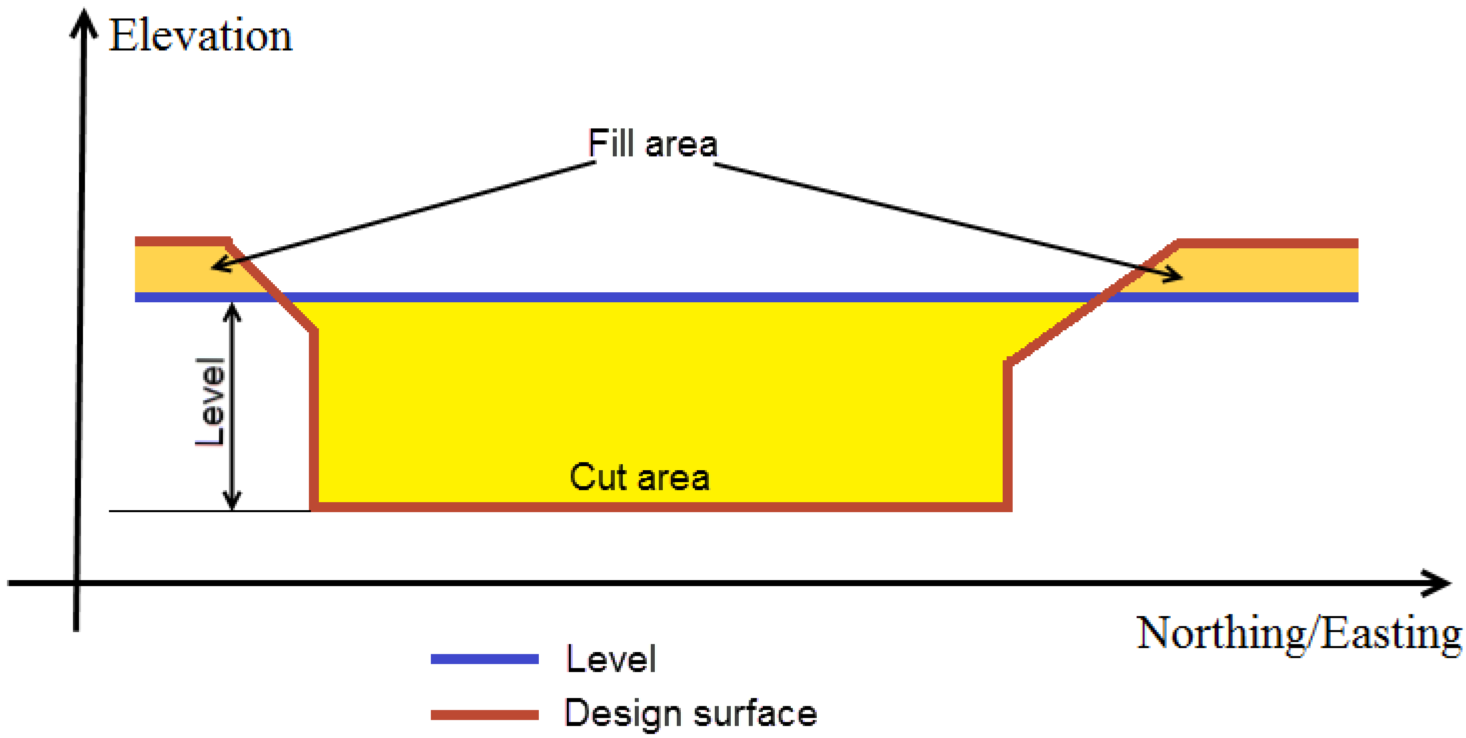
**Fields of the *Compare Surfaces* tab**

| Field | Description |
|---|---|
| *Design* | Displays the name of the first surface/road from comparison. |
| *Existing* | Displays the name of the second surface from comparison. |
| *Level* | Displays the level of the horizontal pane from comparison. |
| *Cut* | If two surfaces were compared — displays the cut volume to correct the existing surface to the design surface. See *Comparing two surfaces* picture below.<br><br>If a surface and a level were compared — displays the cut volume to correct the design surface to the specified level. See *Comparing surfaces and a level* picture below. |
| *Fill* | If two surfaces were compared — displays the fill volume to correct the existing surface to the design surface. See *Comparing two surfaces* picture below.<br><br>If a surface and a level were compared — displays the fill volume to correct the design surface to the specified level. See *Comparing a surface and a level* picture below. |

| Field | Description |
| --- | --- |
| *Area* | Displays the common area of two surfaces or a surface and a horizontal pane. |
| *Note* | Defines any additional notes about comparison. |
| *Save as Surface* | Tick to save the result of comparison as a new surface. |




**Comparing two surfaces**




**Comparing a surface and a level**

### Translate Points icon

The **Translate Points** icon of the Calculate group allows you to translate a selection of points from one position to another. You may define the data translation in one of the following ways:

- specifying the offset of translation in the current coordinate system;
- specifying defining origin and destination point of translation;
- specifying bearing and distance of translation.

To translate points by translation offset:

1. In the *COGO* group of the *COGO* tab, click the **Translate Points** icon.

   The ***Translate Points*** panel is displayed.
2. In the *Offset* group box, specify the translation offset for each coordinate in the appropriate editboxes.
3. In the *Treat result* group box, define the treatment of the result points, by selecting the appropriate radiobutton:
   - *Overwrite existing points* — to delete the original points, and use their names for points at the new position.
   - *Rename existing points* — to keep the original points on their positions, and create new points with prefix or/and suffix added to the original name. In that case, specify the required prefix/suffix in the *Prefix* or *Suffix* editboxes respectively.
4. In the either Map view, or Observation view, or in the *Points* tab of the tabular view, select the points for translation.

5. Click **Translate**.

   The points are translated.

To translate points by original and destination points:

1. In the *COGO* group of the *COGO* tab, click the **Translate Points** icon.

   The ***Translate Points*** panel is displayed.
2. In the *Original Point* group box, specify the original point. Do one of the following:
   - In the *Name* editbox, type the name of the job's point. The rest of the group box's fields are displayed the coordinates of the selected point in the current coordinate system.
   - Drag the required point to the *Name* editbox from either Map view, or Observation view, or from the *Points* tab of the tabular view. The rest of the group box's fields are displayed the coordinates of the selected point in the current coordinate system.
   - In the appropriate editboxes, type the required coordinates in the current coordinate system.
3. In the *Destination Point* group box, specify the destination point in a same way.

   The fields of the *Offset* group box display the coordinate offsets of the translation.

   The fields of the *Define by distance/angle* group box display the bearing and distance of the translation.
4. In the *Treat result* group box, define the treatment of the result points, by selecting the appropriate radiobutton:
   - *Overwrite existing points* — to delete the original points, and use their names for points at the new position.
   - *Rename existing points* — to keep the original points on their positions, and create new points with prefix or/and suffix added to the original name. In that case, specify the required prefix/suffix in the *Prefix* or *Suffix* editboxes respectively.
5. In the either Map view, or Observation view, or in the *Points* tab of the tabular view, select the points for translation.

   The points are translated.

To translate points by bearing and distance:

1. In the *COGO* group of the *COGO* tab, click the **Translate Points** icon.

   The ***Translate Points*** panel is displayed.
2. In the *Define by distance/angle* group box, specify the azimuth and distance of the translation in the appropriate editboxes.

   The fields of the *Offset* group box display the coordinate offsets of the translation.
3. In the *Treat result* group box, define the treatment of the result points, by selecting the appropriate radiobutton:
   - *Overwrite existing points* — to delete the original points, and use their names for points at the new position.
   - *Rename existing points* — to keep the original points on their positions, and create new points with prefix or/and suffix added to the original name. In that case, specify the required prefix/suffix in the *Prefix* or *Suffix* editboxes respectively.
4. In the either Map view, or Observation view, or in the *Points* tab of the tabular view, select the points for translation.
5. Click **Translate**.

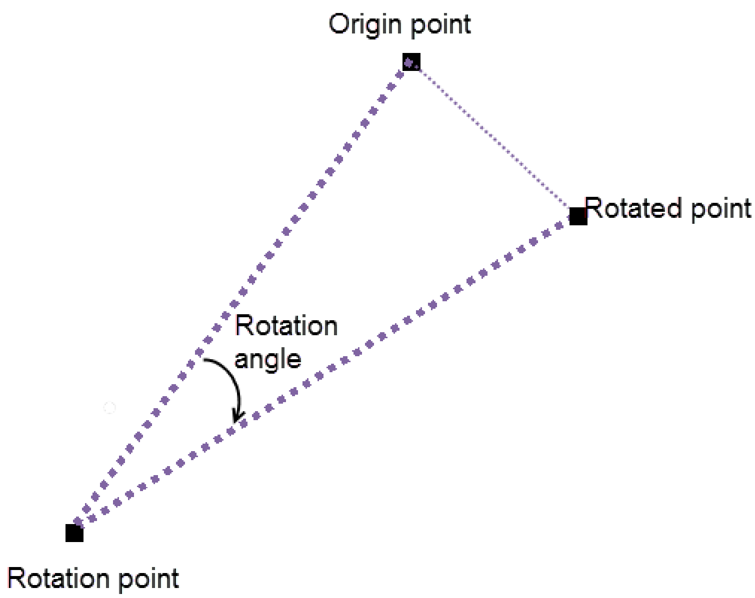
   The points are translated.

**Fields of the *Translate Points* panel**

| Field | Description |
|---|---|
| *Offset* | Defines the offset of each coordinate in the current coordinate system. |
| *Original Point* | Defines the origin point of translation by its name or coordinates in current coordinate system. |
| *Destination Point* | Defines the destination point of translation by its name or coordinates in current coordinate system. |
| *Define by distance/angle* | Defines the bearing and distance of translation. |
| *Treat result* | Defines the treatment of the result points. You may choose one of the following options:<br>• *Overwrite existing points* — deletes the original points, and uses their names for points at the new position.<br>• *Rename existing points* — keeps the original points on their positions, and creates new points with prefix or/and suffix added to the original name. In that case, specify the required prefix/suffix in the appropriate editboxes. |

## Rotate Points icon

The **Rotate Points** icon of the Calculate group allows you to rotate a selection of points around a reference point. See picture below for details.




### Points rotation

You may straightly specify the rotation angle or define it as an angle between reference and the destination bearings.

To rotate points by specifying the rotation angle:

1. In the *COGO* group of the *COGO* tab, click the **Rotate Points** icon.

   The ***Rotate Points*** panel is displayed.
2. In the *Rotation Point* group box, specify the rotation point. Do one of the following:
   - In the *Point Name* editbox, type the name of the job's point.
   - Drag the required point to the *Point Name* editbox from either Map view, or Observation view, or from the *Points* tab of the tabular view.
3. In the *Angle* editbox, from the *Rotation* angle group box, specify the rotation angle. Positive direction is clockwise.
4. In the *Treat result* group box, define the treatment of the result points, by selecting one of the following radiobuttons:
   - *Overwrite existing points* — to delete the original points, and use their names for points at the new position.
   - *Rename existing points* — to keep the original points on their positions, and create new points with prefix or/and suffix added to the original name. In that case, specify the required prefix/suffix in the *Prefix* or *Suffix* editboxes respectively.
5. In the either Map view, or Observation view, or in the *Points* tab of the tabular view, select the points for rotation.
6. Click **Rotate**.

   The points are rotated.

To rotate points by specifying original and destination bearings:

1. In the *COGO* group of the *COGO* tab, click the **Rotate Points** icon.

   The ***Rotate Points*** panel is displayed.
2. In the *Rotation Point* group box, specify the rotation point. Do one of the following:
   - In the *Point Name* editbox, type the name of the job's point.
   - Drag the required point to the *Point Name* editbox from either Map view, or Observation view, or from the *Points* tab of the tabular view. The rest of the group box's fields are displayed the coordinates of the selected point in the current coordinate system.
   - In the appropriate editboxes, type the required coordinates in the current coordinate system.
3. In the *Original azimuth/bearing* group box, specify the original bearing. Do one of the following:
   - In the *Azimuth* editbox, specify the required original bearing.
   - Specify the "from" and "to" points in the appropriate editboxes in one of the following ways:
     - Type the name of the point.
     - Drag the required point to the editbox from either Map view, or Observation view, or from the *Points* tab of the tabular view.
4. In the *Destination azimuth/bearing* group box, specify the destination bearing in the same way.

   The rotation angle is calculated as the difference between the original and destination bearings its value is displayed in the *Rotation angle* group box.
5. In the *Treat result* group box, define the treatment of the result points, by selecting one of the following radiobuttons:
   - *Overwrite existing points* — to delete the original points, and use their names for points at the new position.
   - *Rename existing points* — to keep the original points on their positions, and create new points with prefix or/and suffix added to the original name. In that case, specify the required prefix/suffix in the *Prefix* or *Suffix* editboxes respectively.

6. In the either Map view, or Observation view, or in the *Points* tab of the tabular view, select the points for rotation.
7. Click **Rotate**.

   The points are rotated

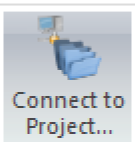
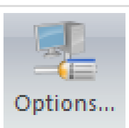
# Enterprise tab

The *Enterprise* tab of the MAGNET Tools ribbon contains control icons for using MAGNET Enterprise service. It contains three groups, described in the appropriate sections:

- "Common group" section below
- "Files group" section on the facing page
- "Realtime group" section on page 87
- "Tasks group" section on page 87
- "Redlines group" section on page 88

## Common group

The *Common* group from the *Enterprise* tab of the MAGNET Tools ribbon allows you to connect with the Enterprise server, send a text message to a user or a group of users of your company, create a Project, and edit your account (e-mail and password) and options of connection with the Enterprise server. The group contains four icons:

| | |
|---|---|
|   | Logon icon<br>Click it to connect to the Enterprise server. |
|   | Chat icon<br>Click it to chat with your colleagues. |
|   | Connect to Project icon<br>Click it to connect to the project at the Enterprise server. |
|   | Options icon<br>Click it to configure the connection options. |

### Logon icon

The **Logon** icon of the Common group allows you to connect to the MAGNET Enterprise server.

After clicking the icon, the ***Logon*** dialog is displayed. In this window you can connect with the Enterprise server. To do it, you need enter login (e-mail) and password provided by the Enterprise administrator of your company or by dealer.

### Chat icon

The **Chat** icon of the Common group allows you to communicate via the text messages with the MAGNET users in your company.

After clicking the icon, the ***Chat***dialog is displayed. In this window you can send a text message to a user or a group of users of your company. Also you can receive a text message from any user of the company.

### Connect to Project icon

The **Connect to Project** icon of the Common group allows you to upload/download data of your project to the Enterprise server.

After clicking the icon, the Project window is displayed. In this window you can create a Project on the Enterprise service. Only after creating a project you can upload / download data to the project. You can create unlimited number of projects. To create a project, enter a name in the New project field and click the Create button.

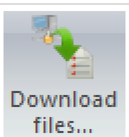
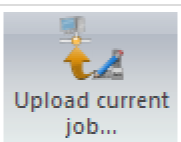
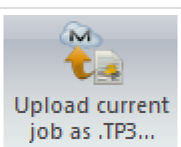
### Options icon

The **Options** icon of the Common group allows you to edit your account (e-mail and password) and options of connection to the Enterprise server.

After clicking the icon, the ***Options*** dialog is displayed. In this window you can edit your account (e-mail and password) and options of connection with the Enterprise server.

## Files group

The *Files* group from the *Enterprise* tab of the MAGNET Tools ribbon allows you to upload selected files to the server, and download a file from the server to the computer. The group contains three icons:

| | |
|---|---|
|   | Upload files icon<br>Click it to upload files to the Enterprise server. |
|   | Download files icon<br>Click it to download files from the Enterprise server. |
|   | Upload current job icon<br>Click it to upload current job to the Enterprise server. |
|   | Upload current job as .MJF icon<br>Click it to upload current job to the Enterprise server as the MAGNET Field job. |
|   | Upload current job as .TP3 icon<br>Click it to upload current job to the Enterprise server as the Topcon 3DMC project. |

### Upload files icon

The **Upload files** icon of the Files group allows you to upload your files to the Enterprise server.

After clicking the icon, the ***Upload files*** dialog is displayed. In the dialog you can upload selected files to the server. In the left panel of the window you can select the desired files. In the right panel check the folder where you want to store the files. Click **Upload** to start uploading selected files to the selected Inboxes. The ***Progress*** dialog displays the uploading to the server in progress.

## Download files icon

The **Download files** icon of the Files group allows you to download files from the Enterprise server.

After clicking the icon, the ***Download files*** dialog is displayed. In the dialog you can download a file from the server to the computer. In the left panel of the dialog you can select the corresponding Inbox. The right panel of the dialog displays the files located in the Inbox.

## Upload current job icon

The **Upload current job** icon of the Files group allows you to upload current job to the Enterprise server.

To upload a job to the Enterprise server:

1. In the *Files* group of the *Enterprise* tab, click the **Upload current job as .MJF** icon.

   The ***Upload Current Job*** dialog is displayed.
2. In the *Recipients* list, tick the required inboxes where you want to store the files.
3. Click **Upload**.

   The ***Progress*** dialog displays the progress of uploading.

## Upload current job as .MJF icon

The **Upload current job as .MJF** icon of the Files group allows you to upload current job to the Enterprise server as the MAGNET Field job (**.mjf*) file.

To upload a job to the Enterprise server:

1. In the *Files* group of the *Enterprise* tab, click the **Upload current job as .MJF** icon.

   The ***Upload Current Job*** dialog is displayed.
2. In the *Recipients* list, tick the required inboxes where you want to store the files.
3. Click **Upload**.

   The ***Progress*** dialog displays the progress of uploading.

## Upload current job as .TP3 icon

The **Upload current job as .TP3** icon of the Files group allows you to upload current job to the Enterprise server as the Topcon 3DMC project (**.tp3*) file.

To upload a job to the Enterprise server:

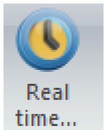
1. In the *Files* group of the *Enterprise* tab, click the **Upload current job as .TP3** icon.

   The ***Upload Current Job*** dialog is displayed.
2. In the *Recipients* list, tick the required inboxes where you want to store the files.
3. Click **Upload**.

   The ***Progress*** dialog displays the progress of uploading.

## Realtime group

The *Realtime* group from the *Enterprise* tab of the MAGNET Tools ribbon allows you to automatically receive the coordinates of measured or added points from MAGNET Field in real time. The group contains one icon:

| | |
|---|---|
|   | Real Time icon<br>Click it to get coordinates from the MAGNET Field in real-time. |

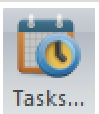
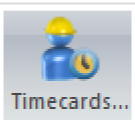
### Real Time icon

The **Real Time** icon of the Realtime group allows you to automatically receive the coordinates of measured or added points from MAGNET Field in real time.

After clicking the icon, the ***Real time*** dilaog is displayed. In the window you can automatically receive the coordinates (not raw data and observations) of measured or added points from MAGNET Field in real time. The measured/added points will automatically send from the MAGNET Field to the MAGNET Enterprise and then send to the current job of the application. The *Points* tab displays the points.

## Tasks group

The *Tasks* group from the *Enterprise* tab of the MAGNET Tools ribbon allows you to use the working time tracking feature of MAGNET Enterprise. The group contains two icons:

| | |
|---|---|
|   | Tasks icon<br>Click it to view Enterprise tasks. |
|   | Timecards icon<br>Click it to submit a timesheet card. |

### Tasks icon

The **Tasks** icon of the Tasks group allows you to view the tasks for Enterprise project.

After clicking the icon the ***Tasks*** dialog is displayed. To view tasks, from the *Project* drop-down list, select the required project and click **Connect**. Tasks from the project will be displayed in the table from *Tasks* group box. For each task its name, start date, end date, and completed percentage are displayed.

### Timecards icon

The **Timecards** icon of the Tasks group allows you to track the time spent for tasks from an Enterprise project.

To submit a timesheet:

1. In the Tasks group of the Enterprise tab, click the Timecards icon.

   The ***Timecards*** dialog is displayed.
2. From the *Project* drop-down list, select the required project and click **Connect**.

   Tasks are displayed in the table from the *Tasks* group box.
3. Select the required week, using the **Prev** and **Next** buttons.

NOTE

To return to the current week, click **Current**.

4. Select the required task and specify daily working hours spent for it.
5. Click **Submit**.

NOTES

If you specify only working hours, the Completed percentage will be calculated by Enterprise service after submitting timecard. If you specify the Completed percentage manually, Enterprise will set this value for task and automatic calculations for this task will stop.

The task has a completed status, when completion percentage reaches 100%. You can submit working hours for completed task.

## Redlines group

Redlines are small sketches generated by a manager to communicate with field engineers and to use in processing data in MAGNET Tools. They are stored in projects at the Enterprise server, and may only be displayed in the Map View, when connected to the Enterprise project.

To display redlines connect to the Enterprise project. All existing redlines will be displayed in Map View. automatically. You may switch them on/off, by ticking the required checkboxes in the drop-down list in the *Redlines* group.

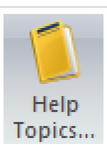
# Help tab

The *Help* tab of the MAGNET Tools ribbon contains control icons, which allows you to display help and licenses information. It contains four groups, described in the appropriate sections:

- "Help group" section below
- "Feedback group" section on the facing page
- "Information group" section on the facing page
- "Licensing and Version group" section on page 90

## Help group

The *Help* group from the Help tab of the MAGNET Tools ribbon allows you to update a cursor function to get help for any tab/window/field/icon of MAGNET Tools and open MAGNET Tools help. The group contains two icons:

| | |
|---|---|
|   | Context Help icon<br>Click it to call for a context help. |
|   | Help Topics icon<br>Click it to open the MAGNET Tools help. |

### Context Help icon

The **Context Help** icon of the Help group allows you to get help for any tab/window/field/icon /view of MAGNET Tools.

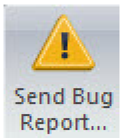
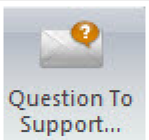
After clicking the icon, the cursor changes. Navigate the cursor on any objects and right click to open the corresponding help topic.

### Help Topics icon

The **Help Topics** icon of the Help group allows you to open MAGNET Tools help.

## Feedback group

The *Feedback* group from the Help tab of the MAGNET Tools ribbon allows you to send an e-mail with attached log files and an e-mail with question to Topcon Technical Support.

| | |
|---|---|
|   | Send Bug Report icon<br>Click it to send an email with attached log files to Topcon Technical Support. |
|   | Question to Support icon<br>Click it to send a technical question to Topcon Technical Support. |

### Send Bug Report icon

The **Send Bug Report** icon of the Feedback group allows you to send an email with attached log files to Topcon Technical Support.

After clicking the icon, an email opens with short descriptions of the current version of MAGNET Tools, activated modules and OS of the computer, and log files for the job are automatically attached. You can add a description of your activities being performed when an issue occurred and send to Topcon Technical Support.

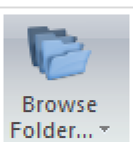
### Question to Support icon

The **Question to Support** icon of the Feedback group allows you to send a technical question to Topcon Technical Support.

After clicking the icon, an email opens with short descriptions of the current version of MAGNET Tools, activated modules and OS of the computer. You can write a question, describing activities in detail, and send the email to Topcon Technical Support.

## Information group

The *Information* group from the Help tab of the MAGNET Tools ribbon allows you to browse one of the folders where program data is located in Windows Explorer. The group contains one icon:

| | |
|---|---|
|   | Browse Folder icon<br>Click it to open project related folders in Windows explorer. |

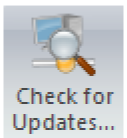
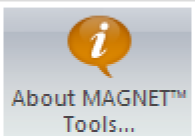
### Browse Folder icon

The **Browse Folder** icon of the Information group allows you to browse one of the folders from the following list:

- User folder. This folder contains user text format, user datum, user projection, user antenna parameters, user device (for TS and DL instrument), user job configuration, user class for TS.
- Temp folder.
- Application folder. This folder contains MAGNET Tools program files.
- Current job folder. This folder contains MAGNET Tools jobs.

## Licensing and Version group

The *Licensing and Version* group from the Help tab of the MAGNET Tools ribbon allows you to receive information about the program's activated modules and expiration date for each module, MAGNET Tools version, serial number and device ID for which the serial number will work. The group contains two icons:

| | |
|---|---|
|  | Check for Updates icon<br>Click it to check for available updates for MAGNET Tools. |
|  | Licenses icon<br>Click it to receive information about the program's activated modules and expiration date for each module. |
|  | About MAGNET Tools icon<br>Click it to display application info. |

### Check for Updates icon

The **Check for Updates** icon of the Licensing and Version group allows you to check whether any updates are available for your MAGNET Tools application.

### Licenses icon

The **Licenses** icon of the Licensing and Version group allows you to receive information about the program's activated modules and expiration date for each module.

After clicking the icon, the ***Product Activation*** dialog opens. You can run the procedure of reactivation for any module from the list. See "MAGNET Tools activation" section on page 21 for details.

### About MAGNET Tools icon

The **About MAGNET Tools** icon of the Licensing and Version group allows you to receive information about MAGNET Tools version, the program's activated modules, serial number and device ID for which the serial number will work.

# Job Configuration Dialog

The ***Job configuration*** dialog allows you to define application settings for data viewing, adjusting and analysis. To open the dialog in the *Information* group of the *Job* tab, click the **Job Configuration** icon

The dialog contains two panels. The left panel lists items of the job configuration. The right panel displays parameters for the selected item. Configuration items are described in the appropriate sections:

- "Display item" section on the next page
- "Coordinate Systems item" section on page 95
- "Units item" section on page 98
- "Equipment item" section on page 98
- "Save item" section on page 99
- "Process item" section on page 99
- "Quality Control item" section on page 114

You can save any settings defined in any items in your configuration and then use this configuration in your further jobs. To do so:

1. Make the required configurations.
2. Click **Save configuration**.

   The ***Enter configuration name*** dialog is displayed.
3. In the *Configuration name* editbox, type the name for your set.
4. Click **OK**.

   The configuration set is saved. You may access it in the List configurations dialog. See section below for details.

## List configurations

MAGNET Tools contains a list of default configurations, where each configuration has specific set of job parameters and set of the threshold values of precision for points, GPS/TS/DL observations for the specific survey task. Click **List configurations** to view this list.

- Design — for viewing and edit road data.
- DGPS — for processing and adjustment GNSS raw data with meter accuracy. The threshold value of RTK horizontal precision is 1 meter and RTK vertical precision is 3 meters.
- GPS+ — for processing and adjustment GNSS raw data with centimeter accuracy. The threshold value of RTK horizontal precision is 0.02 meter and RTK vertical precision is 0.05 meter.
- Imaging — for processing Total Station raw data with image data. The threshold value of precision for a distance is 0.03 meter and for vertical angle /horizontal angle is 0°00'10.0000"
- TS — for processing and adjustment Total Station and Digital Level raw data. The threshold value of precision for a distance is 0.03 meter and for vertical angle /horizontal angle is 0°00'10.0000"
- GIS configuration — for processing and adjustment GIS data with meter accuracy. The threshold value of RTK horizontal precision and PP kinematic horizontal precision is 1 meter and RTK vertical precision and PP kinematic vertical precision is 3 meters.
- GIS Advanced configuration — for processing and adjustment GIS data with centimeter accuracy. The threshold value of RTK horizontal precision and PP kinematic horizontal precision is 0.02 meter and RTK vertical precision and PP kinematic vertical precision is 0.05 meter.

To delete a configuration set from the list, select it and click **Delete**.

To rename a configuration set, select it and click **Rename**.

To use a configuration set in the current job, select it and click **Load**.

# Display item

The *Display* item of the Job Configuration dialog contains four tabs in the right panel:

- *Precision* tab allows you to set the viewing number of digits after the decimal for the various measurements. See "Precisions tab" section below for details
- *Time* tab allows you to set the GPS time zone offset and automatic fixing clock for daylight saving changes. See "Time tab" section on the facing page for details.
- *Roads* tab allows you to set the type of number to use for the center line position. See "Roads tab" section on the facing page for details.
- *Angles* tab allows you to set the format of angular values. See "Angles tab" section on page 94 for details.

## Precisions tab

The *Precisions* tab of the Display item from the ***Job configuration*** dialog allows you to set the viewing number of digits to display after the decimal for various measurements.

To configure the displaying precision, type the required quantity of digits after decimal in the appropriate edit-boxes.

**Fields of the *Precisions* tab of the *Display* item**

| Field | Description |
|---|---|
| *Distances* | Defines the quantity of digits displayed after the decimal for distances. The default values is 3. |
| *Coordinates (N,E;X,Y,Z)* | Defines the quantity of digits displayed after the decimal for plane and Cartesian coordinates (northing and easting, or X, Y, Z). The default value is 3. |
| *Heights* | Defines the quantity of digits displayed after the decimal for all height measurements. The default value is 3. |
| *Angles (seconds)* | Defines the quantity of digits displayed after the decimal for seconds of angular observations represented in degrees, minutes, and seconds. The default value is 4. |
| *Angles (dec. degrees)* | Defines the quantity of digits displayed after the decimal for angular observation format in decimal degrees (dd.ddd). The default value is 7. |
| *Lat. Lon (seconds)* | Defines the quantity of digits displayed after the decimal for the seconds in latitudes and longitudes. The default value is 5. |
| *Lat. Lon (dec. degrees)* | Defines the quantity of digits after the decimal for the latitude and longitude format in decimal degrees (dd.ddd). The default value is 8. |
| *Area* | Defines the quantity of digits displayed after the decimal for all area data. The default value is 0. |

| Field | Description |
|---|---|
| *Volumes* | Defines the quantity of digits displayed after the decimal for all volume data. The default value is 1. |
| *Time (seconds)* | Defines the quantity of digits displayed after the decimal for time. The default value is 0. |

## Time tab

The *Time* tab of the Display item from the ***Job configuration*** dialog allows you to select a time zone and display the local time instead of the GPS time. Also you can set performing the daylight saving time automatically.

**Fields of the *Time* tab of the *Display* item**

| Field | Description |
|---|---|
| *GPS Time Zone Offset* | Select the local time zone. If a zone is defined the application will display the local time instead of the GPS time. |
| *Daylight Saving Time* | Tick to perform daylight saving time automatically. |

## Roads tab

The *Road* tab of the Display item from the ***Job configuration*** dialog allows you to set the type of distance view to use for the center line position.

**Fields of the *Roads* tab of the *Display* item**

| Field | Description |
|---|---|
| *Station display format* | Defines the distance view for the center line position.<br>• *Stationing* – the number of the station is a value equal to the ratio of distance from the start point of the road and the interval for the station. This number consists of two parts—The first part is an integer, defined by the following formula:<br>$\left(\sum_{i=1}^{n}(Length)\right)/(IntervalforStation)$<br>Where "*i*" is the number of elements in the alignment; "*Length*" is a distance of “i-element” from the start point; and the “Interval for Station” is equal to 100 current linear units. (This parameter is not editable).<br>The second part is a remainder from this ratio. For example: the length of the line is 1288.50 meters; the number of the end station for this line is 12+88.5.<br>You may use the following stationing formats:<br>• US Stationing — 1+234 (US feet)<br>• EU Stationing — 1+234 (meters)<br>• Sweden Stationing — 1/234 (meters)<br>• *Chainage* – the number of the station is a value equal to the distance from the start point. For example: the length of the line is 1288.50 meters; the number of the end station for this line is 1288.5. |

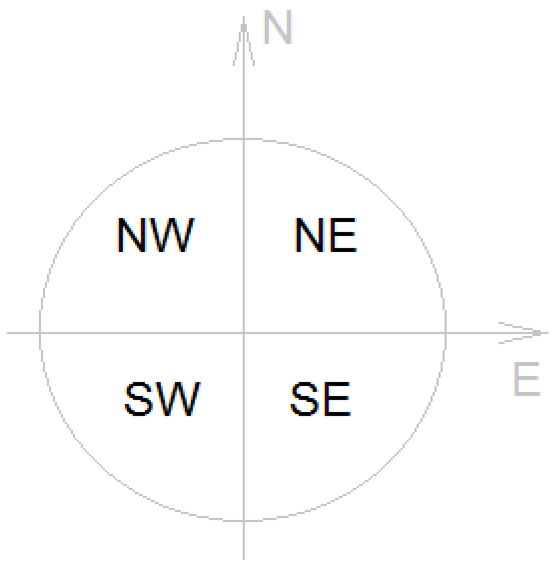
## Angles tab

The *Angles* tab of the Display item from the ***Job configuration*** dialog allows you to set the format of angular values.

**Fields of the *Angles* tab of the *Display* item**

| Field | Description |
|---|---|
| *Angles* | Defines the format for such angular units as Azimuth, Horizontal Circle, Vertical Angle, Zenith Angle, Azimuth Residual, Horizontal Angle Residual, Vertical Angle Residual, Zenith Angle Residual. |
| *Lat. Lon* | Defines the format for such angular units as Latitude and Longitude. |

| Field | Description |
|---|---|
| *Azimuth As* | Defines the directions displaying format. Select the appropriate radiobutton:<br>• *Bearing* — the directions is displayed as angles in quadrants. Quadrants are pictured at figure below. Angles are counted clockwise within each quadrant.<br>*For example: azimuth angle of 130 degrees will be displayed as S 50° E.*<br>• *Azimuth* — the directions is displayed as azimuth angles. The North axis is zero and angles are counted clockwise. |




**Bearing quadrants**

# Coordinate Systems item

The *Coordinate Systems* item of the Job Configuration dialog contains the two tabs in the right panel:

- *Setup* tab allows you to set the current coordinate system and the desired geoid for the current job. See "Setup tab" section below for details.
- *Conversion* tab allows you to select the way of transformation between NAD27 and NAD83_NO_TRANS datums. See "Conversion tab" section on page 97 for details.

## Setup tab

The *Setup* tab of the Coordinate Systems item from the ***Job configuration*** dialog allows you to set the current coordinate system, the parameters of grid to ground transformation, the corresponding geoid and select the desired coordinate type for the current job.

**Fields of the *Setup* tab of the *Coordinate Systems* item**

| Field | Description |
|---|---|
| *Projection* | Displays the in-use grid projection for the current job. The *Projection* drop-down list contains the pre-defined and user defined grid projections for the job.<br>Select the required projection from the drop-down list, or click **Custom** to create your own one. See "Adding custom projection to the projection list" section on page 334 for details. |
| *Datum* | Displays the corresponding datum for the grid projection, defined in the *Projection* drop-down list.<br>When either None, or UTMNorth, or UTMSouth, or UPS grid projections is used, you can select any predefined or custom datum from the drop-down list; or create your own custom datum. See "Adding custom datum to the datum list" section on page 333 for details.<br>When any other projection is used, only the corresponding datum is shown and you cannot open the datum list.<br>The MAGNET Tools supports two following datums for projections with NAD-83 as the reference datum:<br>• NAD83 – has the following transformation parameters (shifts, rotations and scale) to WGS-84 datum:<br>DX=-0.9956 m, DY=1.9013 m, DZ=0.5215m<br>RX=-0.025915", RY=-0.009426", RZ=-0.011599"<br>Scale=0.00062<br>• NAD83_NO_TRANS – has zero values of transformation parameters (shifts, rotations and scale) to WGS-84 datum. |
| *Grid->Ground* | Tick to perform the grid to ground transformation for the job. Click **...** to select the desired transformation method and set the corresponding parameters for each method. See "Grid->Ground dialog" section on page 361 for details<br>*NOTE*<br>*The checkbox only enabled when a projection is selected in the Projection drop-down list. Otherwise the checkbox is disabled. Also it is disabled if the Localization projection is selected.* |

| Field | Description |
| --- | --- |
| *Geoid* | Defines the used geoid for the current job. You can manually select a corresponding geoid type from the geoid list. Also you can add a geoid to the list. See Adding geoid to the job. After importing a MAGNET Field job into the current job, the geoid which was selected in the MAGNET Field job will be automatically set as current in the MAGNET Tools job, if the geoid list contains this file.<br>*NOTES*<br>*A geoid transforms the ellipsoidal heights measured by GPS to heights based on a physical reference surface, if the geoid covers the area where file's points are located.*<br>*The orthometric heights will be equal to ellipsoidal heights if a geoid file is not downloaded to the application and/or the geoid does not cover the area where file's points are located.* |
| *Coordinate type* | Displays the used coordinate type for the current job. The following coordinate types are available:<br>• Ground<br>• Grid<br>• WGS84 Lat, Lon, Ell.H<br>• WGS84 X, Y, Z<br>• Datum Lat, Lon, Ell.H<br>• Datum Lat, Lon, Elevation<br>The coordinate system types are available depending on the projection and datum settings. See table of the coordinate system types availability for details. |

**Table of the coordinate system types availability**

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="2">Projection</th></tr>
<tr><th>Not defined (None or Localization is set)</th><th>Defined</th></tr>
<tr><td rowspan="2">Datum</td><td>Defined</td><td>•Ground<br>•WGS84 Lat, Lon, Ell.H<br>•WGS84 X, Y, Z<br>•Datum Lat, Lon, Ell.H<br>•Datum Lat, Lon, Elevation</td><td>•Grid<br>•WGS84 Lat, Lon, Ell.H<br>•WGS84 X, Y, Z<br>•Datum Lat, Lon, Ell.H<br>•Datum Lat, Lon, Elevation</td></tr>
<tr><td>Not defined</td><td>•Ground</td><td></td></tr>
</table>

## Conversion tab

The *Conversion* tab of the Coordinate Systems item from the ***Job configuration*** dialog allows you to select the way of transformation between NAD27 and NAD83_NO_TRANS datums.

**Fields of the *Conversion* tab of the *Coordinate Systems* item**

| Field | Description |
|---|---|
| *Convert to/from NAD27 using* | Defines the conversion option:<br>• NAD27 Datum — the application will apply parameters NAD27 from the its own database for transformation between NAD27 and NAD83_NO_TRANS datums,<br>• NADCON — the application will apply the Federal standard (NADCON program) for NAD 27 to NAD83_NO_TRANS datum transformations. |
| *Convert to/from NAD27(CSRS) using* | Defines the conversion option:<br>• NAD27 Datum — the application will apply parameters NAD27 from the its own database for transformation between NAD27(CSRS) and NAD83_NO_TRANS datums,<br>• NTv2 NAD27 Canada— the application will apply the Canadian standard for NAD27(CSRS) to NAD83_NO_TRANS datum transformations. |
| *Datum NAD27 (CSRS) Data File* | Defines the file, containing NAD27 datum data. Click **Browse Data** to open the required file. |
| *Datum NAD83 (CSRS) Data File* | Defines the file, containing NAD83 datum data. Click **Browse Data** to open the required file. |

# Units item

The *Units* item of the Job Configuration dialog allows you to set linear and angular units of measurement as current units for the job.

**Fields of the *Units* item**

| Field | Description |
|---|---|
| *Linear Unit* | Defines the linear units for the current job. Select the required unit from the drop-down list. |
| *Angular Unit* | Defines the angular units for the current job. Select the required unit from the drop-down list. |

# Equipment item

The *Equipment* item of the Job Configuration dialog allows you to select the default type of GPS antenna calibrations. The initial set is "Default absolute". Also you can import any other antenna calibration from a file to the job.

To import antenna calibration set:

1. In the left panel of the ***Job configuration*** dialog, select the *Equipment* item.
2. In the right panel, click **Import antenna clibration**.

The ***Open*** dialog is displayed.

3. Navigate to the required file and open it.

The NGS and TPS calibration contains the absolute and relative calibrations:

- Relative — the antenna offsets and phase center variations are computed with respect to the AOAD/M_T antenna.
- Absolute — the recalculated relative calibration that takes into account the absolute values for AOAD/M_ T antenna.

*NOTES*
*The custom antenna contains only the absolute calibration.*

*You can change the default type of GPS antenna calibration for any GPS antenna in the Antenna Type of the Antenna tab in the tabular view. See "GPS Occupations tab" section on page 133 for details.*

# Save item

The *Save* item of the Job Configuration dialog allows you to set the interval for automatic saving (AutoSave) of the current job.

The AutoSave feature is useful in case a job crashes. Any unsaved data of this job (not saved by the user) will be lost. But if you turn on the AutoSave feature, then in case of crash, the application will offer to open the last automatically saved job condition.

If the checbox is ticked (default setting), any changed data of the job will be automatically saved within the defined interval time. The minimal Interval is one (1) minute. Untick the checkbox to disable this option.

*NOTE*
*After manual saving the job, the autosave copy is automatically deleted. A new autosave copy is created at the end of the next time interval.*

*When the job (or system) is closed accidentally, the next time the application is run, you will be prompted to open the autosave copy.*

# Process item

The *Process* item of the Job Configuration dialog have four items, described in the approrpriate sections:

- "Linework item" section below — you may disable/enable the creating a polyline for points which have the same code and string combination here.
- "Adjustment item" section on the next page — you may configure adjustment of both Total Station and GPS networks here.
- "TS Computations item" section on page 104 — you may configure computation and adjustment of Total Station coordinates here.
- "GPS+ PostProcess item" section on page 105 — you may configure post-processing GPS observations here.

## Linework item

The *Linework* item of the Job Configuration dialog allows you to disable/enable the creating a polyline for points which have the same code and string combination.

Tick the *Process feature codes* checkbox to create a polyline for points which have the same code and string combination.

## Adjustment item

The *Adjustment* item of the Job Configuration dialog allows you to select the adjustment parameters for Least Squares adjustment type for Total Station and GPS networks. It contains two tabs in the right panel, described in the appropriate sections:

- "General tab" section below
- "A priori UWE tab" section on page 103

### General tab

The *General* tab of the Adjustment item of the ***Job configuration dialog*** allows you to select the adjustment parameters.

**Fields of the *General* tab of the *Adjustment* item**

| Field | Description |
|---|---|
| *Confidence Level* | Defines the current value of the confidence level for rejecting suspect observations during adjustment when *Tau Criterion* is selected in the *Rejection Criterion field* group box. You can select either 68%, 95%, or 99%. The less the value of the confidence level, the less the Tau_critical value and accordingly the more suspect observations will be rejected from the adjusted procedure. The default confidence level is 95%. |

| Field | Description |
|---|---|
| *Rejection Criterion* | Defines the current criterion for rejecting bad observations. You can select either *By Quality Control* or *Tau Criterion*. The default criterion is *By Quality Control*.<br><br>If you have selected the *By Quality Control* test, the application will reject the following network components from adjustment with residuals worse than the values set for the current job. These residuals are calculated in the process of adjustment for the closed figures and/or for repeated observations in the network:<br>• all plane components of the GPS observations and distances and/or horizontal angles of the TS observations for the plane adjustment,<br>• all height components of the GPS observations and vertical angles of the TS observations for the vertical adjustment.<br><br>If you have selected the *Tau Criterion* test, the application will reject the following network components from the adjustment with a Tau value more than Tau_critical. These residuals are calculated in the process of adjustment for the closed figures and/or for repeated observations in the network:<br>• all plane components of the GPS observations and distances and/or horizontal angles of the TS observations for the plane adjustment,<br>• all height components of the GPS observations and vertical angles of the TS observations for the vertical adjustment.<br><br>The formula for calculating Tau is the following:<br><br>Tau = (RES) / δRes<br><br>Where<br>• (RES) — designates the residual calculated for the corresponding component of the observation,<br>• δRes — the RMS residual error.<br><br>*NOTE*<br>*The value of Tau_critical depends on the number of degrees of freedom and the selected level of confidence in the Confidence Level group box.* |

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Adjust Dimension</td><td>Defines the current dimension for adjustment. You can select one of the following values:
<ul>
<li>1D — adjustment is performed ONLY in the vertical plane</li>
<li>2D — adjustment is performed ONLY in the horizontal plane</li>
<li>2D +1D — adjustment is performed separately in the horizontal and vertical planes.</li>
<li>3D — adjustment is simultaneously performed in 3D space.</li>
<li>AUTO — the adjustment will run either in 1D, or 2D, or 2D +1D mode for each component depending on presence of control points:
<ul>
<li>If control points are not selected, the plane and vertical adjustments (2D+1D) are performed from an arbitrary point.</li>
<li>If control points are fixed only in the horizontal plane, only the horizontal adjustment (2D) is performed. The vertical adjustment are not performed.</li>
<li>If control points are fixed only in the vertical plane, only the vertical adjustment (1D) is performed. The horizontal adjustment are not performed.</li>
<li>If control points are fixed in both planes, the adjustment (2D+1D) will be done for both planes, respectively.</li>
<li>When a job contains one or more GPS observations with the baseline length more than 200 km, the adjustment is simultaneously performed in 3D space for all GPS observations.</li>
</ul></li>
</ul>
The default value is "Auto".<br><br>
NOTE<br>
<u>Inner constraint adjustment</u> — adjustment is performed in the horizontal or vertical plane from an arbitrary point (selected by MAGNET Tools).<br><br>
<u>Constraint adjustment</u> — adjustment is performed in the plane, in which you fixed a point of the job.</td></tr>
<tr><td>Adjustment Type</td><td>Defines the current adjustment type. You can select one of the following options:
<ul>
<li>Automatic Blunder Rejection — the application will automatically reject a blunder observation from adjustment and calculate the final residuals for all adjusted points without the blunder components.</li>
<li>Interactive Blunder Rejection — the application will interrupt the adjustment process and show a list of blunders. You can manually delete any blunder component from the adjustment or continue the adjustment process.</li>
</ul>
The default type is Automatic Blunder Rejection.</td></tr>
</table>

| Field | Description |
|---|---|
| *Analyse Repeated Observation* | Tick to perform the test of the repeated observations. The repeated observations are two ore more observations with common start/end names. The observations N1-N2 and N2-N1 are assumed to be repeated.<br>A successful test is where the difference between any two repeated observations is less than the horizontal/vertical observation precision set in the *Quality Control* item of the ***Job Configuration*** dialog.<br>A failed test is where the difference is more than the horizontal/vertical observation precision set in the *Quality Control* item of the ***Job Configuration*** dialog. The network adjustment process will be interrupted and the ***Adjustment Diagnostic*** dialog will display. |
| *Analyse Identical Points* | Tick to perform the test of the identical points:<br>A successful test is where the coordinate difference for a pair of identical points is more than horizontal/vertical point precision set in the *Quality Control* item of the ***Job Configuration*** dialog.<br>A failed test is where the difference is less than the values set in the *Quality Control* item of the ***Job Configuration*** dialog. The network adjustment process will be interrupted and the ***Adjustment Diagnostic*** dialog will display. |
| *Control Tie Analysis* | Tick to perform the test of the coordinates of the control points. The Control Tie Analysis test compares the control coordinates with the corresponding coordinates computed using GPS/ TS/DL observations.<br>A successful test is where the difference is less than horizontal/vertical point precision set in the *Quality Control* item of the ***Job Configuration*** dialog.<br>A failed test is where the difference is more than the value of horizontal/vertical point precision set in the *Quality Control* item of the ***Job Configuration*** dialog. The network adjustment process will be interrupted and the ***Control Tie Analysis*** dialog will display. |

## A priori UWE tab

The *A priori UWE* tab of the Adjustment item of the ***Job configuration dialog*** allows you to select a priory the unit of weight error for the GPS vector in vertical, horizontal or 3D adjustment, and for slope distance, horizontal angle, vertical angle of TS measurements in network adjustment. The default confidence level is 1.

**Fields of the *A priori UWE* tab of the *Adjustment* item**

| Field | Description |
|---|---|
| *GPS vector (3D) or GPS Horiz* | Definess the current value of the unit of weight error for the vector in horizontal adjustment or in 3D-adjustment. |
| *GPS vector, Vert* | Defines the current value of the unit of weight error for the vector in vertical adjustment. |
| *TS Measurement, SD* | Defines the current value of the unit of weight error for the Slope Distance in Total Station measurement. |

| Field | Description |
|---|---|
| *TS Measurement, HA* | Defines the current value of the unit of weight error for the Horizontal Angle in Total Station measurement. |
| *TS Measurement, VA* | Defines the current value of the unit of weight error for the Vertical Angle in Total Station measurement. |

*NOTE*
*Changing a priory UWE affects the blunder search algorithm and does not affect the final point precision.*

## TS Computations item

The *TS Computations* item of the Job Configuration dialog allows you to set the Refraction Coefficient for calculating TS point coordinates from TS raw data, and can select a method of traverse adjustment in the Total Station network.

**Fields of the *TS Computation* item**

| Field | Description |
|---|---|
| *Refraction Coefficient* | Defines the current value of the coefficient of refraction. This coefficient is used to correct the horizontal and vertical distances measured by Total Station for refraction and earth curvature. You can select either *0*, or *0.14*, or *0.2* depending on the measured distance and survey conditions. |
| *TS-Traverse Adjustment Type* | Defines the current type of traverse adjustment in the Total Station network. You may select one of the following adjustment types:<br>• *Least Squares* — statistical method for providing a best fit for survey point positions, and detecting and automatic rejecting error measurements (blunders) by minimizing the sum of the squares of measurement residuals.<br>• *Compass Rule* — this method assumes that the precision in angles or directions is equivalent of the precision in distances. This method works for closed traverses or traverses between two fixed control points.<br>• *Unadjusted closure* — calculates the network coordinates from the original station coordinates without estimating the accuracy. If the network has duplicate measurements, only one measurement will be used to compute the coordinates. |
| *Use Elevation* | This checkbox is available when *Compass Rule* or *Unadjusted closure* adjustment type is selected.<br>Tick to perform one of the following operations:<br>• If the *Compass Rule* is selected — adjustment in the vertical plane with displaying the elevation precision for each network point.<br>• If the *Unadjusted closure* is selected — calculating elevation for each network point. |

*NOTE*
*The application uses only the least-squares method for adjustment of GPS observations.*

# GPS+ PostProcess item

The *GPS+ PostProcess Properties* item of the Job Configuration dialog allows you to configure the parameters for post-processing GPS observations. It contains three tabs, described in the appropriate sections:

- General tab
- Engine tab
- Troposphere tab

## General tab

The *General* tab of the GPS+ PostProcess item of the ***Job configuration dialog*** allows you to configure the parameters for post processing GPS observations.

**Fields of the *General* tab of the *GPS+ PostProcess* item**

| Field | Descriptions |
|---|---|
| *Elevation Mask* | Defines the elevation mask level to discard satellites with elevations less than this value during post processing the enabled GPS observations of the job. |
| *System* | Defines the current navigation system, which will be used for post processing of the enabled GPS observations of the job. You can select either *GPS+* (GPS and Glonass), or *GPS only* option. |
| *Save Residuals* | When ticked, MAGNET Tools will create double-difference residuals for static GPS-observations in the job after processing. To view the residuals diagram for a GPS observation, right click it in the *GPS Obervations* tab of the tabular view and select **Residual View** from the pop-up menu. See "GPS Obs tab" section on page 140 for details.<br>By using this plot you can see the satellites which were used in post processing of this GPS observation.<br>*NOTE*<br>*The double-difference residuals are not saved for the GPS observation which was post processed in Code Diff or VLBL Engine Mode.* |
| *Max length of vector (km)* | When ticked, you may specify a value in the appropriate editbox to limit the GPS observation distance. MAGNET Tools will not create static GPS observation with distance longer than this value. |
| *Minimum duration* | Defines the way of creating GPS observation in MAGNET Tools. You may select one of the following options:<br>• *Auto* — MAGNET Tools will create a static GPS observation for a pair of occupations that have common observation time (duration) needed for starting the post processing. The time depends on the distances between two points, the number of common satellites observed at these points, the type of the receiver (L1/L2 or L1 only and GPS and GLONASS or GPS only), and so on.<br>• *Fixed Time* — MAGNET Tools will create a **static** GPS observation for a pair of occupations that have common observation time (duration) more than the value set in the *Min observation time* editbox. This feature is useful to remove short in time baseline(s) from post processing. |

| Field | Descriptions |
|---|---|
| *Min observation time (sec)* | Defines the minimum observation time for static mode. MAGNET Tools will automatically create a GPS observation for two static occupations, if the common time of these occupations is more than the minimum observation time.<br>TIP<br>This field is available when the *Fixed Time* is selected in the *Minimum duration* drop-down list. |
| *Enable continuous kinematic* | When ticked, the *GPS Obs* tab of the Tabular view displays the PP Kin GPS observations, the *Points* tab of the tabular view displays the kinematic points and the *Observations View* displays the kinematic trajectory.<br>*NOTE*<br>*A PP Kin G PS Observation is an observation created from one Static and one Kinematic occupations.* |
| *Enable go kinematic* | When ticked, the *GPS Obs* of the data panel displays PP Go GPS observations, the *Points* tab of the tabular view displays the static and kinematic points and the *Observations View* displays the kinematic trajectory to/from static points.<br>*NOTE*<br>*A Go GPS Observation is an observation created from one Static and sequence of Stop and Go occupations.* |
| *Compute DOPs* | When ticked, the values of HDOP, VDOP, and PDOP are automatically calculated during post processing of each GPS observation. The *GPS Observations* tab of the tabular view displays these values in the corresponding fields. |
| *Use auto import* | When ticked, the procedure of auto downloading a reference station occupation from the Internet to the current job is activated. Click **Setup** to set the Auto Import options.<br>*NOTE*<br>*This option requires the Internet connection.* |

## Engine tab

The *Engine* tab of the GPS+ PostProcess item of the ***Job configuration dialog*** allows you to select the engine type for processing static, stop-and-go or kinematic survey data. For each survey you can select Engine Type and Engine Mode. See details in the appropriate sections, listed below.

- "Static survey" section below
- "StopGo survey" section on page 108
- Kinematic survey

### *Static survey*

For the Static survey, you may select one of the following engine types from the appropriate drop-down list:

- *BaseLine* — standard processing two Static GPS occupations. You may select the following Engine Modes for this type:
  - Code Diff — Processing of dual frequency L1/L2 GPS/ GLONASS code measurements (no ambiguity resolution). The final solution type of the processed GPS observation is "Code Diff".

  - L1 Only — Processing of single frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). This mode is ‘default’ when using single frequency receivers). The final solution type of the processed GPS observation is "Fixed, L1 / Float, L1".
  - L2 Only — Processing of L2 GPS/GLONASS code and carrier phase measurements only. The final solution type of the processed GPS observation is "Fixed, L2 / Float, L2".
  - L1&L2 — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length is shorter than 10 km. L1 and L2 observables will be treated by the engine as independent data sets. The final solution type of the processed GPS observation is "Fixed / Float".
  - L1&L2, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 10 km to 30 km interval. After integer ambiguity resolution for a GPS observation with dual frequency measurements, ionofree combinations will be created and ionospheric error is eliminated. The final solution type of the processed GPS observation is "Fixed, IonoFree / Float, IonoFree".
  - Wide Lane, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 30 km to 1500 km interval. At early stages of processing of dual frequency measurements integer ambiguity resolution for L1 and L2 observables is performed with assistance of L1-L2 (Wide Lane) combination. The final solution type of the processed GPS observation is "Fixed, Wide Lane / Float, Wide Lane".
  - Float IonoFree — Processing is performed using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) with ionofree combination for ionospheric error elimination. The final solution type of the processed GPS observation is only Float, IonoFree.
  - VLBL — the processing of very long baselines using triple differences (No ambiguity resolution). The final solution type of the processed GPS observation is "VLBL".
  - AUTO — MAGNET Tools automatically selects an optimal processing mode:
    - L1 Only — if only single frequency measurements available
    - L1&L2 — if GPS observation length is shorter than 10 km
    - L1&L2, Fixed IonoFree — if GPS observation length falling into the 10 km to 30 km interval
    - Wide Lane — if GPS observation length falling into the 30 km to 1500 km interval
    - VLBL — if GPS observation length is more than 1500 km
- *MultiSite* — simultaneous processing a Static GPS occupation of unknown point and Static GPS occupation of several base stations. This type allows you to improve position accuracy by using more satellite raw data for processing. You may select the following Engine Modes for this type:
  - Code Diff — Processing of dual frequency L1/L2 GPS/ GLONASS code measurements (no ambiguity resolution). The final solution type of the processed GPS observation is "Code Diff".
  - L1 Only — Processing of single frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). This mode is ‘default’ when using single frequency receivers). The final solution type of the processed GPS observation is "Fixed, L1 / Float, L1".
  - L2 Only — Processing of L2 GPS/GLONASS code and carrier phase measurements only. The final solution type of the processed GPS observation is "Fixed, L2 / Float, L2".
  - L1&L2 — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length is shorter than 10 km. L1 and L2 observables will be treated by the engine as independent data sets. The final solution type of the processed GPS observation is "Fixed / Float".
  - L1&L2, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 10 km to 30 km interval. After integer ambiguity resolution for a GPS observation with dual frequency

measurements, ionofree combinations will be created and ionospheric error is eliminated. The final solution type of the processed GPS observation is "Fixed, IonoFree / Float, IonoFree".

- Wide Lane, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 30 km to 1500 km interval. At early stages of processing of dual frequency measurements integer ambiguity resolution for L1 and L2 observables is performed with assistance of L1-L2 (Wide Lane) combination. The final solution type of the processed GPS observation is "Fixed, Wide Lane / Float, Wide Lane".
- Float IonoFree — Processing is performed using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) with ionofree combination for ionospheric error elimination. The final solution type of the processed GPS observation is only Float, IonoFree.
- VLBL — the processing of very long baselines using triple differences (No ambiguity resolution). The final solution type of the processed GPS observation is "VLBL".
- AUTO — MAGNET Tools automatically selects a processing mode:
  - L1 Only — if only single frequency measurements available
  - L1&L2, Fixed IonoFree — for dual frequency data

- *Extended RTK* — Real Time Kinematic type of processing two Static GPS occupations. You may select the following Engine Modes for this type:
  - Code Diff — Processing of dual frequency L1/L2 GPS/ GLONASS only code measurements (no ambiguity resolution). The final solution type of the processed GPS observation is "Code Diff".
  - L1 Only — Processing of single frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). The final solution type of the processed GPS observation is "Fixed, L1 / Float,L1".
  - Iono Free — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) so that, after integer L1/L2 ambiguity resolution, ionosphere-free (IF) combinations are formed to produce IF positioning results. The final solution type of the processed GNSS observations is "Fixed, IonoFree / Float, IonoFree". The mode is recommended for baselines within 10-50 km, or shorter, if ionosphere is disturbed.
  - Wide Lane — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) so that, “Wide Lane” (WL) carrier phase combinations (L1 minus L2) are formed and used in ambiguity resolution and positioning. The final solution type of the processed GNSS observations is “WL Fixed / WL Float”. The mode is recommended for baselines longer 50 km.
  - Auto — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) so that, after integer L1/L2 ambiguity resolution, “standard” L1/L2 solution is formed. The final solution type of the processed GNSS observations is “ Fixed / Float”. The mode is recommended for baselines shorter 10 km, and "calm" ionosphere.
- *Auto* — the Baseline type will be applied.

### *StopGo survey*

For the stop and go survey, you may select one of the following engine types from the appropriate drop-down list:

- *Baseline* — standard processing a sequence of Stop and Go GPS occupations and Static GPS occupation of a base station. You may select the following Engine Modes for this type:
  - Code Diff — Processing of dual frequency L1/L2 GPS/ GLONASS code measurements (no ambiguity resolution). The final solution type of the processed GPS observation is "Code Diff".
  - L1 Only — Processing of single frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). This mode is ‘default’ when using single frequency receivers). The final solution type of the processed GPS observation is "Fixed, L1 / Float, L1".

  - L2 Only — Processing of L2 GPS/GLONASS code and carrier phase measurements only. The final solution type of the processed GPS observation is "Fixed, L2 / Float, L2".
  - L1&L2 — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length is shorter than 10 km. L1 and L2 observables will be treated by the engine as independent data sets. The final solution type of the processed GPS observation is "Fixed / Float".
  - L1&L2, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 10 km to 30 km interval. After integer ambiguity resolution for a GPS observation with dual frequency measurements, ionofree combinations will be created and ionospheric error is eliminated. The final solution type of the processed GPS observation is "Fixed, IonoFree / Float, IonoFree".
  - Wide Lane, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 30 km to 1500 km interval. At early stages of processing of dual frequency measurements integer ambiguity resolution for L1 and L2 observables is performed with assistance of L1-L2 (Wide Lane) combination. The final solution type of the processed GPS observation is "Fixed, Wide Lane / Float, Wide Lane".
  - Float IonoFree — Processing is performed using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) with ionofree combination for ionospheric error elimination. The final solution type of the processed GPS observation is only Float, IonoFree.
  - VLBL — the processing of very long baselines using triple differences (No ambiguity resolution). The final solution type of the processed GPS observation is "VLBL".
  - AUTO — MAGNET Tools automatically selects a processing mode:
    - L1 Only — if only single frequency measurements available
    - L1&L2, Fixed IonoFree — for dual frequency data
- *MultiSite* — simultaneous processing a sequence of Stop and Go GPS occupation(s) and Static GPS occupation of several base stations. This type allows you to improve position accuracy by using more satellite raw data for processing. You may select the following Engine Modes for this type:
  - Code Diff — Processing of dual frequency L1/L2 GPS/ GLONASS code measurements (no ambiguity resolution). The final solution type of the processed GPS observation is "Code Diff".
  - L1 Only — Processing of single frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). This mode is ‘default’ when using single frequency receivers). The final solution type of the processed GPS observation is "Fixed, L1 / Float, L1".
  - L2 Only — Processing of L2 GPS/GLONASS code and carrier phase measurements only. The final solution type of the processed GPS observation is "Fixed, L2 / Float, L2".
  - L1&L2 — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length is shorter than 10 km. L1 and L2 observables will be treated by the engine as independent data sets. The final solution type of the processed GPS observation is "Fixed / Float".
  - L1&L2, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 10 km to 30 km interval. After integer ambiguity resolution for a GPS observation with dual frequency measurements, ionofree combinations will be created and ionospheric error is eliminated. The final solution type of the processed GPS observation is "Fixed, IonoFree / Float, IonoFree".
  - Wide Lane, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 30 km to 1500 km interval. At early stages of processing of dual frequency measurements integer ambiguity resolution

for L1 and L2 observables is performed with assistance of L1-L2 (Wide Lane) combination. The final solution type of the processed GPS observation is "Fixed, Wide Lane / Float, Wide Lane".

- Float IonoFree — Processing is performed using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) with ionofree combination for ionospheric error elimination. The final solution type of the processed GPS observation is only Float, IonoFree.
- VLBL — the processing of very long baselines using triple differences (No ambiguity resolution). The final solution type of the processed GPS observation is "VLBL".
- AUTO — MAGNET Tools automatically selects a processing mode:
  - L1 Only — if only single frequency measurements available
  - L1&L2, Fixed IonoFree — for dual frequency data

- *Extended RTK* — Real Time Kinematic type of processing a sequence of Stop and Go GPS occupations from a base station. You may select the following Engine Modes for this type:
  - Code Diff — Processing of dual frequency L1/L2 GPS/ GLONASS only code measurements (no ambiguity resolution). The final solution type of the processed GPS observation is "Code Diff".
  - L1 Only — Processing of single frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). The final solution type of the processed GPS observation is "Fixed, L1 / Float,L1".
  - Iono Free — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) so that, after integer L1/L2 ambiguity resolution, ionosphere-free (IF) combinations are formed to produce IF positioning results. The final solution type of the processed GNSS observations is "Fixed, IonoFree / Float, IonoFree". The mode is recommended for baselines within 10-50 km, or shorter, if ionosphere is disturbed.
  - Wide Lane — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) so that, “Wide Lane” (WL) carrier phase combinations (L1 minus L2) are formed and used in ambiguity resolution and positioning. The final solution type of the processed GNSS observations is “WL Fixed / WL Float”. The mode is recommended for baselines longer 50 km.
  - Auto — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) so that, after integer L1/L2 ambiguity resolution, “standard” L1/L2 solution is formed. The final solution type of the processed GNSS observations is “ Fixed / Float”. The mode is recommended for baselines shorter 10 km, and "calm" ionosphere.
- AUTO — the Baseline type will be applied.

### *Kinematic survey*

For the kinematic survey, you may select one of the following engine types from the appropriate drop-down list:

- Baseline — standard processing Kinematic and Static GPS occupations. You may select the following Engine Modes for this type:
  - Code Diff — Processing of dual frequency L1/L2 GPS/ GLONASS code measurements (no ambiguity resolution). The final solution type of the processed GPS observation is "Code Diff".
  - L1 Only — Processing of single frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). This mode is ‘default’ when using single frequency receivers). The final solution type of the processed GPS observation is "Fixed, L1 / Float, L1".
  - L2 Only — Processing of L2 GPS/GLONASS code and carrier phase measurements only. The final solution type of the processed GPS observation is "Fixed, L2 / Float, L2".
  - L1&L2 — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length is shorter than 10 km. L1 and L2 observables will

be treated by the engine as independent data sets. The final solution type of the processed GPS observation is "Fixed / Float".

- L1&L2, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 10 km to 30 km interval. After integer ambiguity resolution for a GPS observation with dual frequency measurements, ionofree combinations will be created and ionospheric error is eliminated. The final solution type of the processed GPS observation is "Fixed, IonoFree / Float, IonoFree".
- Wide Lane, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 30 km to 1500 km interval. At early stages of processing of dual frequency measurements integer ambiguity resolution for L1 and L2 observables is performed with assistance of L1-L2 (Wide Lane) combination. The final solution type of the processed GPS observation is "Fixed, Wide Lane / Float, Wide Lane".
- Float IonoFree — Processing is performed using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) with ionofree combination for ionospheric error elimination. The final solution type of the processed GPS observation is only Float, IonoFree.
- VLBL — the processing of very long baselines using triple differences (No ambiguity resolution). The final solution type of the processed GPS observation is "VLBL".
- AUTO — MAGNET Tools automatically selects a processing mode:
  - L1 Only — if only single frequency measurements available
  - L1&L2, Fixed IonoFree — for dual frequency data

- MultiSite — simultaneous processing Kinematic GPS occupation and Static GPS occupation of several base stations. This type allows you to improve position accuracy by using more satellite raw data for processing. You may select the following Engine Modes for this type:
  - Code Diff — Processing of dual frequency L1/L2 GPS/ GLONASS code measurements (no ambiguity resolution). The final solution type of the processed GPS observation is "Code Diff".
  - L1 Only — Processing of single frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). This mode is ‘default’ when using single frequency receivers). The final solution type of the processed GPS observation is "Fixed, L1 / Float, L1".
  - L2 Only — Processing of L2 GPS/GLONASS code and carrier phase measurements only. The final solution type of the processed GPS observation is "Fixed, L2 / Float, L2".
  - L1&L2 — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length is shorter than 10 km. L1 and L2 observables will be treated by the engine as independent data sets. The final solution type of the processed GPS observation is "Fixed / Float".
  - L1&L2, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 10 km to 30 km interval. After integer ambiguity resolution for a GPS observation with dual frequency measurements, ionofree combinations will be created and ionospheric error is eliminated. The final solution type of the processed GPS observation is "Fixed, IonoFree / Float, IonoFree".
  - Wide Lane, Fixed IonoFree — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 30 km to 1500 km interval. At early stages of processing of dual frequency measurements integer ambiguity resolution for L1 and L2 observables is performed with assistance of L1-L2 (Wide Lane) combination. The final solution type of the processed GPS observation is "Fixed, Wide Lane / Float, Wide Lane".
  - Float IonoFree — Processing is performed using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) with ionofree combination for ionospheric error elimination. The final solution type of the processed GPS observation is only Float, IonoFree.

  - VLBL — the processing of very long baselines using triple differences (No ambiguity resolution). The final solution type of the processed GPS observation is "VLBL".
  - AUTO — MAGNET Tools automatically selects a processing mode:
    - L1 Only — if only single frequency measurements available
    - L1&L2, Fixed IonoFree — for dual frequency data
- Extended RTK — the RTK (Real Time Kinematic) type of processing Kinematic and Static GPS occupations. You may select the following Engine Modes for this type:
  - Code Diff — Processing of dual frequency L1/L2 GPS/ GLONASS only code measurements (no ambiguity resolution). The final solution type of the processed GPS observation is "Code Diff".
  - L1 Only — Processing of single frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). The final solution type of the processed GPS observation is "Fixed, L1 / Float,L1".
  - Iono Free — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) so that, after integer L1/L2 ambiguity resolution, ionosphere-free (IF) combinations are formed to produce IF positioning results. The final solution type of the processed GNSS observations is "Fixed, IonoFree / Float, IonoFree". The mode is recommended for baselines within 10-50 km, or shorter, if ionosphere is disturbed.
  - Wide Lane — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) so that, “Wide Lane” (WL) carrier phase combinations (L1 minus L2) are formed and used in ambiguity resolution and positioning. The final solution type of the processed GNSS observations is “WL Fixed / WL Float”. The mode is recommended for baselines longer 50 km.
  - Auto — Processing of dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) so that, after integer L1/L2 ambiguity resolution, “standard” L1/L2 solution is formed. The final solution type of the processed GNSS observations is “ Fixed / Float”. The mode is recommended for baselines shorter 10 km, and "calm" ionosphere.
- AUTO — the Baseline type will be applied.

## Troposphere tab

MAGNET Tools allows you to select from three standard tropospheric models: Goad-Goodman, Niell and UNB-abc. The post-processing engine uses each model with a default parameters set. However, using the actual meteo parameters for the time of data collection can improve the final solution, especially in problem situations (long baselines, noisy data etc.)

The *Troposphere* tab of the GPS+ PostProcess item of the ***Job configuration dialog*** allows you to either specify measured meteo parameters or use the Meteo model option.

**Fields of the *Troposphere* tab of the *GPS+ PostProcess* item**

| Field | Description |
|---|---|
| *Troposphere model* | Defines the current troposphere model. You can select one of the three standard tropospheric models:<br>• Goad-Goodman<br>• Niell<br>• UNBabc |

| Field | Description |
|---|---|
| *Meteo Model* | In the group box, you may define meteo model of the troposphere. There are three available options:<br>• None — select if you have information about actual values of meteo parameters such as temperature, pressure and humidity; and fill in the appropriate parameters manually.<br>• NRLMSISE — This model describes the neutral temperature and densities in Earth's atmosphere from ground to thermospheric heights as functions of solar activity, geomagnetic activity, latitude, longitude and altitude, day of year and time of day.<br>• GPT — Global Pressure and Temperature model — this model is based on spherical harmonics up to degree and order nine, and provides pressure and temperature at any site in the vicinity of the Earth's surface. Input parameters of GPT are the station coordinates and the day of the year, this also allows modeling the annual variations of the parameters.<br>The troposphere parameters will correspond to a point, defined in the *Default meteo parameter at height* editbox (default is 0 meters). You can specify the real value of the height for the point where the meteo parameters were measured. Then, by using the meteo parameters specified for the known height, the engine will calculate the troposphere model for each occupation of the job with the given height for the occupation. |
| *Default meteo parameter at height(m)* | Defines the height where the actual meteo parameters for the time of data collection were measured. The MAGNET Tools engine will calculate the troposphere model for each occupation of the job with the given height for the occupation. |
| *Dry temperature* | Defines the temperature for the time of data collection. The editbox only available when *None* is selected in the *Meteo Model* group box. |
| *Pressure* | Defines the pressure for the time of data collection. The editbox only available when *None* is selected in the *Meteo Model* group box. |
| *Humidity* | Defines the humidity for the time of data collection. |
| *Use* | When ticked, the option Estimate Zenith Troposphere Delay is activated. In this case, MAGNET Tools will estimate the zenith troposphere delay basing on the available raw data measurements and troposphere parameters (dry temperature, pressure, humidity). It is assumed that the actual troposphere can be adequately described by scaling the a priori (computed) troposphere with a certain unknown factor. This unknown factor has to be estimated using the collected raw data measurements. |
| *If vector length exceeds* | You can specify a value to limit the GPS observation distance here. MAGNET Tools will not apply the option Estimate Zenith Troposphere Delay for GPS observation with distance less than this value. |
| *And session time exceeds* | You can specify a value to limit the GPS observation duration here. MAGNET Tools will not apply the option Estimate Zenith Troposphere Delay for GPS observation with duration less than this value. |

| Field | Description |
|---|---|
| *Zenith delay is considered constant over* | You can set the minimum time during which the zenith delay is considered to be constant here. |

# Quality Control item

The *Quality Control* item of the Job Configuration dialog allows you to set:

- the threshold value of precision for points, GPS/TS/DL observations,
- the horizontal and vertical tolerances for loop closures,
- enable / disable of performing of quality control tests from the predefined list.

There are two ways to change the values in the tabs:

- manually: open the corresponding tab and enter the desired value.
- automatically: load the corresponding job configuration which contains the desired values for all tabs.

The Quality Control item contains six tabs, described in the appropriate sections:

- "TS Obs Precisions tab" section below
- "GPS Observation Precisions tab" section on the facing page
- "Automatic Tests tab" section on page 116
- "Loop Closure Precisions tab" section on page 118
- "Point Precisions tab" section on page 118
- "DL Observation Precisions tab" section on page 120

## TS Obs Precisions tab

The *TS Obs Precisions* tab of the Quality Control item from the ***Job configuration*** dialog allows you to set the threshold value of precision for a slope distance and horizontal/vertical angle of Total Station observations.

**Fields of the *TS Obs Precisions* tab of the *Quality Control* item**

| Field | Description |
|---|---|
| *TS Distance Precision* | Defines the current threshold value of the slope distance precision for the Total Station observations. If the slope distance residuals for a Total Station observation after adjusting the network is worse than the value in the settings, the TS observation will be highlighted in red in the *TS Obs* tab, Observation View and Report. When *Allowed* is set in the *AutoReject field* of the TS Obs tab the TS observation will be automatically reject from the adjustment process. |
| *TS VA Precision* | Defines the current threshold value of the vertical angle precision for the Total Station observations. If the vertical angle residuals for a Total Station observation after adjusting the network is worse than the value in the settings, the TS observation will be highlighted in red in the *TS Obs* tab, Observation View and Report. When *Allowed* is set in the *AutoReject field* of the TS Obs tab the TS observation will be automatically reject from the adjustment process. |

| Field | Description |
|---|---|
| *TS HA Precision* | Defines the current threshold value of the horizontal angle precision for the Total Station observations. If the horizontal angle residuals for a Total Station observation after adjusting the network is worse than the value in the settings, the TS observation will be highlighted in red in the TS Obs tab, Observation View and Report. When *Allowed* is set in the *AutoReject field* of the TS Obs tab the TS observation will be automatically reject from the adjustment process. |

## GPS Observation Precisions tab

The *GPS Obs Precisions* tab of the Quality Control item from the ***Job configuration*** dialog allows you to set the threshold value of horizontal and vertical precisions for the post-processed and RTK GPS Observations.

**Fields of the *GPS Observation Precisions* tab of the *Quality Control* item**

| Field | Description |
|---|---|
| *RTK Horizontal Precision* | Defines the current threshold value of the horizontal precision for the RTK vectors (GPS Observations). If the horizontal precision for a RTK vector is worse than the value in the settings, both RTK Topo and RTK Auto Topo GPS Observation will be highlighted in red in the *GPS Obs* tab, Observation View and Report, when you tick the *RTK Precisions* checkbox at the *Automatic Test* of the Quality Control item. See "Automatic Tests tab" section on the next page for details. |
| *RTK Vertical Precision* | Defines the current threshold value of the vertical precision for the RTK vectors (GPS Observations). If the vertical precision for a RTK vector is worse than the value in the settings, both RTK Topo and RTK Auto Topo GPS Observation will be highlighted in red in the *GPS Obs* tab, Observation View and Report, when you tick the *RTK Precisions* checkbox at the *Automatic Test* of the Quality Control item. See "Automatic Tests tab" section on the next page for details. |
| *PP Static Horizontal Precision* | Defines the current threshold value of the horizontal precision for the static post-processed GPS observation. If the horizontal precision for a static post-processed GPS observation is worse than the value in the settings, the GPS observation will be highlighted in red in the *GPS Obs* tab, Observation View and Report, when you tick the *RTK Precisions* checkbox at the *Automatic Test* of the Quality Control item. See "Automatic Tests tab" section on the next page for details. |
| *PP Static Vertical Precision* | Defines the current threshold value of the verticall precision for the static post-processed GPS observation. If the vertical precision for a static post-processed GPS observation is worse than the value in the settings, the GPS observation will be highlighted in red in the GPS Obs tab, Observation View and Report, when you tick the *RTK Precisions* checkbox at the *Automatic Test* of the Quality Control item. See "Automatic Tests tab" section on the next page for details. |

| Field | Description |
|---|---|
| *PP Kinematic Horizontal Precision* | Defines the current threshold value of the horizontal precision for the kinematic post-processed GPS observation. If the horizontal precision for a kinematic post-processed GPS observation is worse than the value in the settings, the GPS observation will be highlighted in red in the GPS Obs tab, Observation View and Report, when you tick the *RTK Precisions* checkbox at the *Automatic Test* of the Quality Control item. See "Automatic Tests tab" section below for details. |
| *PP Kinematic Vertical Precision* | Defines the current threshold value of the vertical precision for the kinematic post-processed GPS observation. If the vertical precision for a kinematic post-processed GPS observation is worse than the value in the settings, the GPS observation will be highlighted in red in the GPS Obs tab, Observation View and Report, when you tick the *RTK Precisions* checkbox at the *Automatic Test* of the Quality Control item. See "Automatic Tests tab" section below for details. |

## Automatic Tests tab

The *Automatic Tests* tab of the Quality Control item from the ***Job configuration*** dialog allows you to set which of the quality control tests will automatically run and will mark points and/or observations that fail the Quality Control test in red. Clearing any of these checkboxes will also clear red marks and descriptions on the Quality Control tabs of the Property dialog boxes. To perform the test, tick the appropriate checkbox.

**Fields of the *Automatic Tests* tab of the *Quality Control* item**

| Field | Description |
|---|---|
| *Warm Float solutions* | When ticked, the GPS observations which have the Float solution are highlighted in red in the GPS Observation tab, Observation View and Reports. |
| *RTK Precisions* | When ticked, the application will compare the current precision of the RTK GPS Observation with the values that are set in the *RTK Horizontal Precision* and *RTK Vertical Precision* editboxes at the *GPS Observation Precisions* tab correspondingly See "GPS Observation Precisions tab" section on the previous page for details. If the horizontal or vertical precision for an RTK vector is worse than the value in the settings, both RTK Topo and RTK Auto Topo GPS observation will be highlighted in red in the GPS Obs tab, Observation View and Report. |
| *PP Static Precisions* | When ticked, the application will compare the current precision of the static GPS Observation with the values that are set in the *PP Static Horizontal Precision* and *PP Static Vertical Precision* editboxes at the *GPS Observation Precisions* tab correspondingly See "GPS Observation Precisions tab" section on the previous page for details. If the horizontal or vertical precision for a static GPS observation is worse than the value in the settings,the GPS observation will be highlighted in red in the GPS Obs tab, Observation View and Report. |

| Field | Description |
|---|---|
| *PP Kinematic Precisions* | When ticked, the application will compare the current precision of the kinematic GPS Observation with the values that are set in the *PP Kinematic Horizontal Precision* and *PP Kinematic Vertical Precision* editboxes at the *GPS Observation Precisions* tab correspondingly See "GPS Observation Precisions tab" section on page 115 for details. If the horizontal or vertical precision for a kinematic GPS observation is worse than the value in the settings,the GPS observation will be highlighted in red in the GPS Obs tab, Observation View and Report. |
| *Point Standard Deviations* | When ticked, during adjustment the application will compare a point precision with the values that are set in the *Static Horizontal Precision* and *Static Vertical Precision* editboxes of the *Point Precisions* tab. See "Point Precisions tab" section on the next page for details. If the horizontal or vertical precision for a point after adjustment is worse than the value in the settings, the point will be highlighted in red in the Points tab, Observation View and Reports. |
| *Identical Points* | When checked, the application will compare the distance between two points with the values that are set in the *Static Horizontal Precision* and *Static Vertical Precision* editboxes of the *Point Precisions* tab. See "Point Precisions tab" section on the next page for details. If the distance is less than the value, both points will be highlighted in red in the Points tab, Observation View and Report. |
| *Misnamed GPS Occupations* | When ticked, the application will compare the coordinates of the GPS static occupation with the coordinates of the corresponding point (for this occupation). If the difference is more than 30 meters, the point and GPS occupation are highlighted in red on the tables, Observation View and Report. |
| *Misnamed Autotopo Rovers* | When ticked, the application will compare the coordinates of the GPS kinematic occupation with the coordinates of the corresponding point (for this occupation). If the difference is more than 30 meters, the point and GPS occupation are highlighted in red on the tables, Observation View and Report. |
| *Invalid Antenna Parameters* | When ticked, the application will search for an empty *Antenna Type* or/and *Antenna Height* or/and *Antenna Height Method* fields for the all GPS occupations of the job. If one of the fields is empty, the occupation is highlighted in red on the GPS Occupations tab and Report.<br>Refer to "GPS Occupations tab" section on page 133 and "Antenna tab" section on page 230 for more information. |
| *DL Test* | When ticked, the application will compare the precision for digital level measurements with the values that are set at the *DL Observation Precisions* tab of the *Quality Control* item. See "DL Observation Precisions tab" section on page 120 for details. If the precision for a digital level measurement is worse than the value in the settings, the DL observation will be highlighted in red in the DL Obs tab and Report after clicking the Compute Coordinates or the Adjustment icons. |

## Loop Closure Precisions tab

The *Loop Closure Precisions* tab of the Quality Control item from the ***Job configuration*** dialog allows you to set a threshold value of precision for the Loop Closures test. You can run the Loop Closures test for post-processed GPS observations that form a loop, by clicking **Loop Closures** icon from the *Adjustment* group of the *Process* tab. The threshold value (horizontal and vertical) for the test is computed by a formula:

$$\text{Tolerance} = \text{Absolute Tolerance} + \text{Relative Tolerance} * \text{Length} * 10^{-6}$$

where *Length* is the length of the loop in kilometers.

If the residual (in the corresponding plane) after performing the Loop Closures test for the closed figure is worse than the computed tolerance, the residual will be highlighted in red in the Loop Closures Report.

**Fields of the *Loop Closure Precision* tab of the *Quality Control* item**

| Field | Description |
|---|---|
| *Horz Tolerance abs* | Defines the current value of the absolute tolerance in the horizontal plane. You can edit the value. This value is used in the formula for computing the threshold value. See the formula above. |
| *Vert Tolerance abs* | Defines the current value of the absolute tolerance in the vertical plane. You can edit the value. This value is used in the formula for computing the threshold value. See the formula above. |
| *Horz Tolerance rel* | Defines the current value of the relative tolerance in the horizontal plane. You can edit the value. This value is used in the formula for computing the threshold value. See the formula above. |
| *Vert Tolerance rel* | Defines the current value of the relative tolerance in the vertical plane. You can edit the value. This value is used in the formula for computing the threshold value. See the formula above. |

## Point Precisions tab

The *Point Precisions* tab of the Quality Control item from the ***Job configuration*** dialog allows you to set the threshold value of horizontal and vertical precisions for the coordinates of points of the processed GPS observations in static and kinematic modes, and localization points. All values are in the current linear units.

**Fields of the *Point Precisions* tab of the *Quality Control* item**

| Field | Description |
|---|---|
| *Static Horizontal Precision* | Defines the current threshold value of the horizontal precision for the processed or adjusted or RTK coordinates of the static points. If the horizontal precision for a point is worse than the value in the settings, the point will be highlighted in red in the Points tab, Observation View and Reports.<br>• When you tick the *PP Static Precisions* checkbox at the *Automatic Test* tab, the application will highlight only worse point(s) after post - processing the network.<br>• When you tick the *Point Standard Deviations* checkbox at the *Automatic Test* tab and select the *By Quality Control* radiobutton in the *Rejection Criterion* group box at the General tab of the *Adjustment* item, the application will highlight only worse point(s) after adjusting the post-processed network and worse Topo point(s) of RTK survey. |
| *Static Vertical Precision* | Defines the current threshold value of the vertical precision for the processed or adjusted or RTK coordinates of the static points. If the vertical precision for a point is worse than the value in the settings, the point will be highlighted in red in the Points tab, Observation View and Reports.<br>• When you tick the *PP Static Precisions* checkbox at the *Automatic Test* tab, the application will highlight only worse point(s) after post - processing the network.<br>• When you tick the *Point Standard Deviations* checkbox at the *Automatic Test* tab and select the *By Quality Control* radiobutton in the *Rejection Criterion* group box at the General tab of the *Adjustment* item, the application will highlight only worse point(s) after adjusting the post-processed network and worse Topo point(s) of RTK survey. |
| *Kinematic Horizontal Precision* | Defines the current threshold value of the horizontal precision for the processed or adjusted or RTK coordinates of the kinematic points. If the horizontal precision for a point is worse than the value in the settings, the point will be highlighted in red in the Points tab, Observation View and Reports.<br>• When you tick the *PP Kinematic Precisions* checkbox at the *Automatic Test* tab, the application will highlight only worse point(s) after post - processing the network.<br>• When you tick the *Point Standard Deviations* checkbox at the *Automatic Test* tab and select the *By Quality Control* radiobutton in the *Rejection Criterion* group box at the General tab of the *Adjustment* item, the application will highlight only worse point(s) after adjusting the post-processed network and worse Topo point(s) of RTK survey. |

| Field | Description |
|---|---|
| *Kinematic Vertical Precision* | Defines the current threshold value of the vertical precision for the processed or adjusted or RTK coordinates of the kinematic points. If the vertical precision for a point is worse than the value in the settings, the point will be highlighted in red in the Points tab, Observation View and Reports.<br>• When you tick the *PP Kinematic Precisions* checkbox at the *Automatic Test* tab, the application will highlight only worse point(s) after post - processing the network.<br>• When you tick the *Point Standard Deviations* checkbox at the *Automatic Test* tab and select the *By Quality Control* radiobutton in the *Rejection Criterion* group box at the General tab of the *Adjustment* item, the application will highlight only worse point(s) after adjusting the post-processed network and worse Topo point(s) of RTK survey. |
| *Localization Horizontal Precision* | Defines the current threshold value of the horizontal precision for the localization point(s). If the horizontal precision for a localization point is worse than the value in the settings, the localization point will be highlighted in red in the Localization window, Map View and Reports after clicking **Compute Parameters** in the ***Localization*** dialog. |
| *Localization Vertical Precision* | Defines the current threshold value of the vertical precision for the localization point(s). If the vertical precision for a localization point is worse than the value in the settings, the localization point will be highlighted in red in the Localization window, Map View and Reports after clicking **Compute Parameters** in the ***Localization*** dialog. |

## DL Observation Precisions tab

The *DL Observation Precisions* tab of the Quality Control item from the ***Job configuration*** dialog allows you to set the threshold value of precision for digital level measurements. For selection of the desired precisions you select the corresponding precision order from the *Precision Order / Class* drop-down list. Each precision order (except Custom) has a predefined set of the not editable precision values of the DL observations. All values are in the current linear units.

**Fields of the *DL Observation Precisions* tab of the *Quality Control* item**

| Field | Description |
|---|---|
| *Precision Order / Class* | Defines the current precision order for digital level measurements. You can select the desired order from the list. Each precision order (except Custom) has a predefined set of the not editable precision values of the DL observations in the current linear units.<br>To create your own set of DL precisions, select *Custom* from the list and specify any values. |
| *Sighting Distance Tolerance* | Defines the maximum length of the DL sight.<br>If the maximum length of a DL observation is greater than the value in the settings and you have ticked the *DL Test* checkbox at the *Automatic Test* tab, the DL observation will be highlighted in red at the DL Obs tab, Observation View and Report after clicking the **Compute Coordinates** or the **Adjustment** icons. |

| Field | Description |
|---|---|
| *Sighting Balance Tolerance* | Defines the maximum difference between the foresight and backsight distances per setup (balance of sighting).<br>If a balance of sighting is greater than the value in the settingsand you have ticked the *DL Test* checkbox at the *Automatic Test* tab, the DL observation will be highlighted in red in the DL Obs tab, Observation View and Report after clicking the **Compute Coordinates** or the **Adjustment** icons. |
| *Sighting misclosure Tolerance* | Defines the current threshold value of the level measurement precision.<br>If a level measurement has the precision worse than the Sighting Misclosure Tolerance values and you have ticked the *DL Test* checkbox at the *Automatic Test* tab, a BS or FS observation will be highlighted in red at the *DL Obs* tab, Observation View and Report and rejected after adjusting the DL occupation(s). |
| *Section / Loop Distance Tolerance* | Defines the current threshold value of the section/loop distance.<br>If a distance of the section/loop is greater than the specified value and you have ticked the *DL Test* checkbox at the *Automatic Test* tab, a DL run (DL occupation) will be highlighted in red at the *DL Obs* tab after clicking the **Compute Coordinates** or the **Adjustment** icons. |
| *Section / Loop Balance Tolerance* | Defines the current threshold value of the balance of the section/loop.<br>If a balance of the section/loop is greater than the specified value and you have ticked the *DL Test* checkbox at the *Automatic Test* tab, the DL run (DL occupation) will be highlighted in red at the *DL Obs* tab after clicking the **Compute Coordinates** or the **Adjustment** icons. |
| *Section misclosure factor* | Defines the current value of the factor in meters, which is used in the calculation of the Section Misclosure Tolerance:<br>$Section\ Misclosure\ Tolerance = Section\ misclosure\ factor * \sqrt{Section\ Length}$,<br>where *Section Length* is the distance in kilometers.<br>If a section misclosure has the precision worse than the specified value and you have ticked the *DL Test* checkbox at the *Automatic Test* tab, the DL run (DL occupation) will be highlighted in red at the *DL Obs* tab after clicking the **Compute Coordinates** or the **Adjustment** icons. |
| *Loop or line misclosure factor* | Defines the current value of the factor in meters, which is used in the calculation of the Loop Misclosure Tolerance:<br>$Loop\ Misclosure\ Tolerance = Loop\ misclosure\ factor * \sqrt{Loop\ Length}$,<br>where *Loop Length* is the distance in kilometers.<br>If a loop misclosure has the precision worse than the Loop Misclosure Tolerance value and you have ticked the *DL Test* checkbox at the *Automatic Test* tab, the DL run (DL occupation) will be highlighted in red at the *DL Obs* tab after clicking the **Compute Coordinates** or the **Adjustment** icons. |

# Data Views

MAGNET Tools provides several data views for showing, editing and processing data.

- The Tabular view contains tabs representing the different types of information. The data in the job defines which tabs will be displayed. See "Tabular View" section below for details.
- The Observation View displays a graphic representation of the GPS, RTK, TS and DL survey data in the horizontal plane of the current coordinate datum or projection. See "Observations View" section on page 205 for details.
- The Map View displays graphic representation of the points, lineworks, surfaces and roads in the horizontal plane of the current coordinate datum or projection. See "Map View" section on page 205 for details.
- The 3 D View displays points, lines, surfaces, roads and lineworks using a three-dimensional representation of the data. See "3D View" section on page 206 for details.
- The *Antenna List* window displays parameters of all GPS antennas which were calibrated either by NGS, or TPS. See "Antenna List" section on page 207 for details.
- The *TS Instrument* window displays Total Station parameters. See "TS Instruments" section on page 209 for details.
- The Classes displays the list of the classes for Total Station measurements. See "Classes View" section on page 210 for details.
- The Occupation View displays a time-scale graph of the GPS occupations used in the job. See "Occupation View icon" section on page 44 for details.
- The Ephemeris View displays the list of the ephemeris which were imported to the current project. See "Ephemeris View icon" section on page 44 for details.
- The Codes view displays the list of codes and their attributes. See "Codes" section on page 214 for details.
- The Layers view displays the list of layers and their plotting styles. See "Layers" section on page 216 for details.

## Tabular View

The Tabular view contains tabs representing the different types of information. The data in the job determines the tabs that will be displayed. By default these tabs are displayed at the bottom of the MAGNET Tools window.

See the description of each tab in the appropriate section, listed below:

- "Points tab" section on the facing page — this tab always displays.
- "GPS Occupations tab" section on page 133
- "GPS Obs tab" section on page 140
- "TS Obs tab" section on page 148
- "DL Obs tab" section on page 156
- "Lines tab" section on page 159
- "Surfaces tab" section on page 163
- "Roads tab" section on page 165
- "X-Section Templates tab" section on page 196
- "Text tab" section on page 197
- "Inverse tab" section on page 198
- "Field Report tab" section on page 202
- "Compare Surfaces tab" section on page 200

# Points tab


This tab is always presented in the Tabular View. The tab displays the coordinates in the current coordinate system and the currents unit, set in the Status Bar. By using the Status Bar you can perform coordinate transformation to any predefined datum/projection and unit transformation.

You may manually add points right from the tab. To do so:

1. In the bottom row of the table, click .

   The row for the new point is displayed.
2. Specify the required parameters and press *Enter*.

**Fields of the *Points* tab**

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a point. See "Symbols for the Points tab" section on page 390 for details. |
| *Name* | Displays the point's name. To edit the name, click on the highlighted field and enter a new name. The point name is unique and the field cannot be empty. |
| *WGS-84 Latitude* | Displays the point's latitude coordinate in WGS84 coordinate system. To edit the value, click on the highlighted field and type a new value.<br>The coordinates in WGS-84 coordinate system are available when *WGS84 Lat, Lon, Ell.H* is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *WGS-84 Longitude* | Displays the point's longitude coordinate in WGS84 coordinate system. To edit the value, click on the highlighted field and type a new value.<br>The coordinates in WGS-84 coordinate system are available when *WGS84 Lat, Lon, Ell.H* is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *WGS-84 Ell.Height* | Displays the point's ellipsoidal (geodetic) height in WGS84 coordinate system. To edit the value, click on the highlighted field and type a new value.<br>The coordinates in WGS-84 coordinate system are available when "**WGS84 Lat, Lon, Ell.H**" is selected in the Status bar or in the Job Configuration window. |
| *X* | Displays X coordinate in Cartesian geocentric (WGS-84) coordinate system in the current units. To edit the value, click on the highlighted field and enter a new value.<br>The Cartesian coordinates are available when *WGS84 X, Y, Z* is selected in the Status bar or in the ***Job Configuration*** dialog . |
| *Y* | Displays Y coordinate in Cartesian geocentric (WGS-84) coordinate system in the current units. To edit the value, click on the highlighted field and enter a new value.<br>The Cartesian coordinates are available when *WGS84 X, Y, Z* is selected in the Status bar or in the ***Job Configuration*** dialog . |

| Field | Description |
|---|---|
| *Z* | Displays Z coordinate in Cartesian geocentric (WGS-84) coordinate system in the current units. To edit the value, click on the highlighted field and enter a new value.<br>The Cartesian coordinates are available when *WGS84 X, Y, Z* is selected in the Status bar or in the ***Job Configuration*** dialog . |
| *Latitude* | Displays the point's latitude coordinate in the selected Datum coordinate system. To edit the value, click on the highlighted column and type a new value.<br>The Datum coordinates are available when *Datum Lat, Lon, Ell.H* or *Datum Lat, Lon, Elevation* is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Longitude* | Displays the point's longitude coordinate in the selected Datum coordinate system. To edit the value, click on the highlighted column and type a new value.<br>The Datum coordinates are available when *Datum Lat, Lon, Ell.H* or *Datum Lat, Lon, Elevation* is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Ell.Height* | Displays the point's ellipsoidal height in the selected Datum coordinate system. To edit the value, click on the highlighted column and type a new value.<br>The Datum coordinates are available when *Datum Lat, Lon, Ell.H* is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Elevation* | Displays the point's orthometric height in the selected Datum coordinate system, if the corresponding geoid file is added to the job and the geoid covers the area where the job’s points are located. If the corresponding geoid file is not added to the job, or it does not cover the desired area, the column will display ellipsoidal height for all points of the job.<br>To edit the value, click on the highlighted column and type a new value.<br>This column will be displayed if you have selected either *Ground \| None* or *Ground \| Localization* or *Grid* or *Datum Lat, Lon, Elevation* coordinate systems in the ***Job Configuration*** dialog or in the Status Bar. |
| *Ground Northing* | Displays the point's northing coordinate in Ground coordinates. To edit the value, click on the highlighted column and enter a new value.<br>The Ground coordinates are available when *Ground \| None* or *Ground \| Localization* coordinate systems are selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Ground Easting* | Displays the point's easting coordinate in Ground coordinates. To edit the value, click on the highlighted column and enter a new value.<br>The Ground coordinates are available when *Ground \| None* or *Ground \| Localization* coordinate systems are selected in the Status bar or in the ***Job Configuration*** dialog. |

| Field | Description |
|---|---|
| *Grid Northing* | Displays the point's northing coordinate in Grid coordinates. To edit the value, click on the highlighted column and enter a new value.<br><br>The Grid coordinates are available when a projection is defined for the job and *Grid* coordinate system is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Grid Easting* | Displays the point's easting coordinate in Grid coordinates. To edit the value, click on the highlighted column and enter a new value.<br><br>The Grid coordinates are available when a projection is defined for the job and *Grid* coordinate system is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Code* | Displays codes of the point. If a point has multiple codes, all codes of the point will be displayed using a comma as separator, for example "1,AA,BB".<br><br>To edit a code, click on the highlighted field and either select a new one from the drop-down list of existing codes; or type a new code(s); or set the Code to empty. |
| *Control* | Displays the status of the point's coordinates. You can select one of the following statuses from the drop-down list:<br>• None — all coordinates can be changed after adjustment or coordinate calculation.<br>• Vertical — the elevation/ellipsoidal height is left unchangeable after adjustment or coordinate calculation. The / symbol is set in the *Icon* column for this status.<br>• Horizontal — the horizontal coordinates are left unchangeable after adjustment or coordinate calculation.The / symbol is set in the *Icon* column for this status.<br>• Both — the horizontal and vertical coordinates are left unchangeable after adjustment or coordinate calculation.The / symbol is set in the *Icon* column for this status. |
| *Note* | Displays any additional notes for the point. To edit the value, click on the highlighted field and type any necessary information. |
| *Photo Notes* | Displays the number of photo notes per point. This quantity is read-only and sortable.<br><br>You can add/remove/view a picture for the point at the *Photo Notes tab* of the ***Properties*** window for a point. See "Photo Notes tab" section on page 223 for details. |
| *Layer* | Displays the Layer where the point resides. The Layer sets the plotting style for the point. Every point has a non-empty Layer. In this field, you can select any Layer from the list of user-created layers. |
| *Source* | Displays the path of the raw data on the computer disk drive, local area network, or storage media. |

| Field | Description |
|---|---|
| *Std Dev n* | Displays the standard deviation of the northing coordinate for the point after adjustment in Grid coordinate system. |
| *Std Dev e* | Displays the standard deviation of the easting coordinate for the point after adjustment in Grid coordinate system. |
| *Std Dev u* | Displays the standard deviation of the height coordinate for the point after adjustment in Grid coordinate system. |
| *Std Dev Hz* | Displays the standard deviation of the coordinate in the horizontal plane for the point after adjustment in Grid coordinate system. |
| *String* | Displays the string for the point. A complex of strings and codes allows you to create a line in the job automatically. The software will automatically create a line between points with the same Code and String value. |
| *Control Code* | Displays the control code for the point. See "Control Code field" section on the facing page for details. |
| *Control Code 2* | Displays the control code 2 for the point. See "Control Code 2 field" section on page 129 for details. |
| *Combined Grid to Ground Scale Factor* | Displays Combined Grid to Ground Scale Factor for the point. The scale factor applied to convert grid distances to ground distances. Its formula is following: $$K_{COMB} = \frac{\frac{Ell.Height + R}{R}}{Mapping\ Scale}$$ Where *R* is the mean Earth radius. |
| *Convergence* | Displays Convergence for the given point.The convergence is a angle between geodetic north and grid north. |
| *Color* | Displays point color for Map View. The color can be chosen from the list. If you set BYCODE or BYLAYER, the color of the point automatically will be set in the color that was selected for the point's code or point's layer. |
| *Point Symbol* | Displays a point symbol for Map View. The symbol can be chosen from the list. If you set BYCODE or BYLAYER, the symbol of the point will be automatically set to the symbol that was selected for the point's code or the point's layer. |
| *Geoid Separation* | Displays some constant, which is the characteristic of the current geoid model and is calculated for the given point. To get the orthometric height of the point, subtract the value of this constant from the value of ellipsoidal height. This Geoid Separation value is displayed when the corresponding geoid is selected for this job in the *Coordinate System* item of the ***Job Configuration*** dialog. |

Right-click on a highlighted line to display a pop-up menu. This menu contains a set of commands and they can be divided into two groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific commands for the *Points* tab. See "Pop-up menu for the Point tab" section on page 129 for details.

If the corresponding geoid file is added to the job and the geoid covers the area where the job's points are located, orthometric heights will be displayed in the *Elevation* column, when you select *Ground* or/and *Grid* or/and *Datum with Elevation* coordinate systems in the ***Job Configuration*** dialog or in the Status Bar.

If the corresponding geoid file is not added to the job, or it does not cover the desired area, the *Elevation* column will display ellipsoidal height for all points of the job.

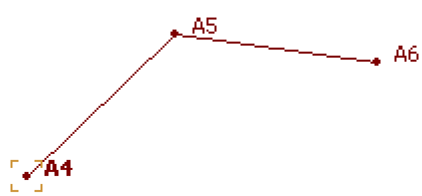
## Control Code field

Displays the control code used for the point. The Control Code list can contain the following codes:

- Codes, created by Topcon programmers (default codes). Using these codes will modify the existing line-work or add a line to the existing linework. You can apply the control codes only to the points which have the same Code and String value. You select the following default control code from the list:
  - Arc Start
  - Arc End
  - Close
  - Rectangle
- Codes, created by a user. Using these codes do not modify the existing linework.

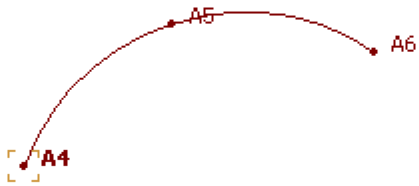
Let's see how the default code can modify an existing line.

None — does not change an existing linework



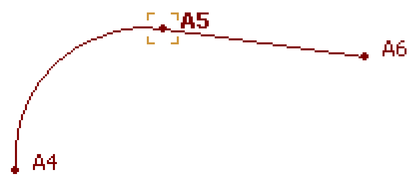

| Name | Code | String | Control Code |
|---|---|---|---|
| A4 | DD | 1 | |
| A5 | DD | 1 | |
| A6 | DD | 1 | |

Arc Start — defines the start point of an arc:



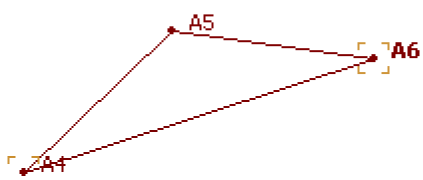

| Name | Code | String | Control Code |
|---|---|---|---|
| A4 | DD | 1 | Arc Start |
| A5 | DD | 1 | |
| A6 | DD | 1 | |

Arc End — defines an end point of the arc:



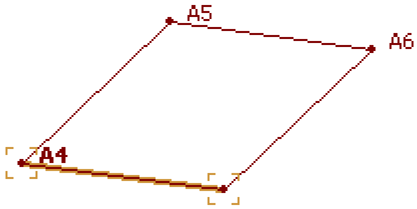

| Name | Code | String | Control Code |
|---|---|---|---|
| A4 | DD | 1 | Arc Start |
| A5 | DD | 1 | Arc End |
| A6 | DD | 1 | |

Close — automatically add a line to close the figure. This option will work only for a figure that contains more than two points:




| Name | Code | String | Control Code |
|---|---|---|---|
| A4 | DD | 1 | |
| A5 | DD | 1 | |
| A6 | DD | 1 | Close |

Rectangle — automatically adds point to close the figure. This option will work only for a figure that contains three points:

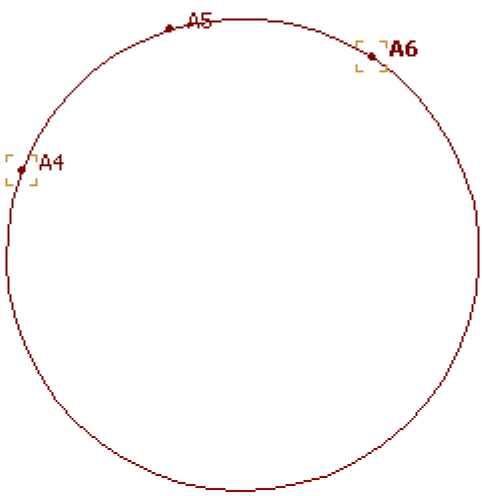



| Name | Code | String | Control Code |
|---|---|---|---|
| A4 | DD | 1 | Rectangle |
| A5 | DD | 1 | |
| A6 | DD | 1 | |

The field appears at the Points tab of the tabular view and the Codes and Style tab of the ***Properties*** window for a point.

### Control Code 2 field

Control Code 2 displays the control code used for the point. It has the same properties as Control Code. See "Control Code field" section on page 127 for details. MAGNET Tools allows you to simultaneously use two different values of Control Code and Control Code 2:




| Name | Code | String | Control Code | Control Code 2 |
|---|---|---|---|---|
| A4 | DD | 1 | Arc Start | |
| A5 | DD | 1 | | |
| A6 | DD | 1 | | Close |

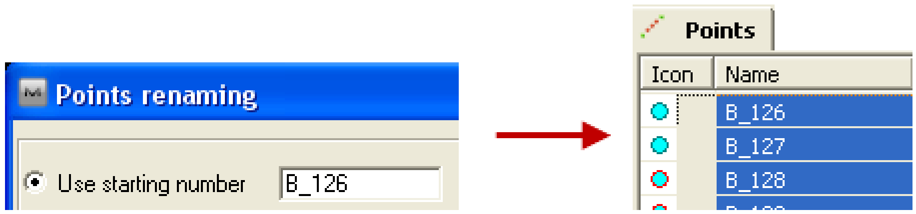
The field appears at the Points tab of the tabular view and the Codes and Style tab of the ***Properties*** window for a point.

### Pop-up menu for the Point tab

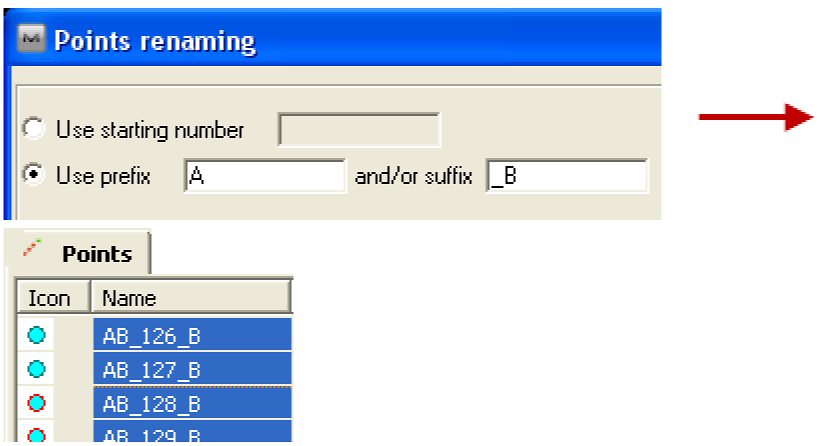
In the *Point* tab of the Tabular view you can highlight a line, right click it and perform the following point-specific commands:

- **Rename Points** — changes the names for the highlighted points. To do so:
  1. Select **Rename Points**.

     The ***Points renaming*** window is displayed.
  2. Change point names by using two following methods:
     - Changing the point name. To do so, select the *Use starting number* radiobutton, and specify the starting number in the editbox and click **OK**. The software will automatically:
       - alphanumerically sort the selected points
       - set this name for the first point of the sorted points
       - add the increment 1 to the name of the next point



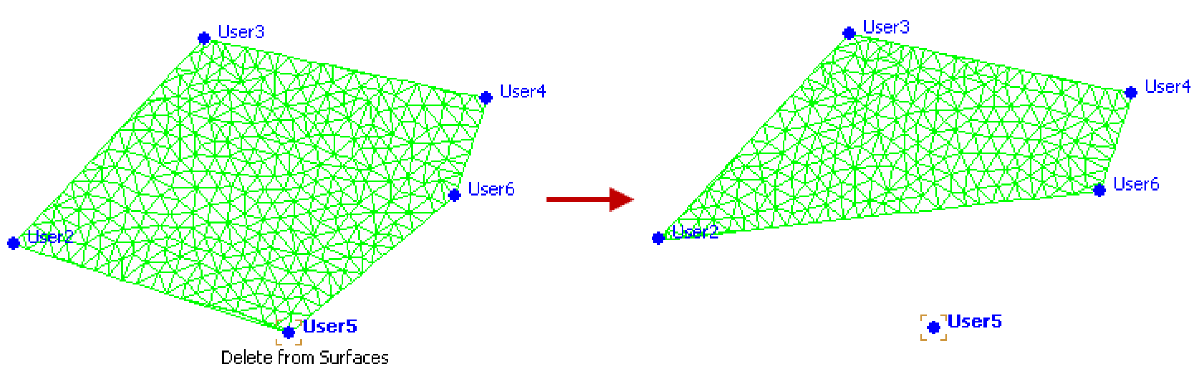

     - Adding a prefix and/or suffix to the existing point's name. To do so, select the *Use prefix and/or suffix* radiobutton, and specify the prefix/suffix in the appropriate editbox and click **OK**. The software will automatically add the prefix and/or suffix to the existing point names.



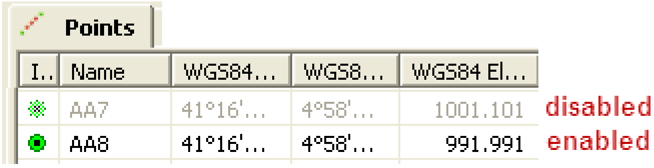

*IMPORTANT*

*The points will not be renamed, if the current job already has points with the same names.*

- **Delete from Surface** — deletes the highlighted points from the existing surface. The points will be removed from the Surface, but still be displayed in the CAD View window:




- **Disable/Enable** — disables/enables the highlighted points and all related objects from the adjustment, calculating coordinates and export. Disabled points are grayed-out in all views:




- **Add point** — adds a new point. See "Point icon" section on page 50 for details
- **Add to Surface** — this command is available when the job contains a surface. It adds points to an existing surface.
- **Insert Points to Line** — this command is available when the job contains a line. It inserts points to an existing line. See "Insert Point(s) to Line command" section below for details.
- **Append Points to Line** — this command is available when the job contains a line. It adds points to and existing line. See "Append Point(s) to Line command" section on the next page for details.
- **Zoom the selection** — automatically zooms in the highlighted points in the Map View.
- **Select Points** — opens the ***Select Point*** window. In this window you can set different criterions to select points at this tab. If you apply default set, all points of the job will be selected.
- **Report** — automatically creates a report for the highlighted points. You can edit this report in ***Report Configuration*** window By default this report contains the following information:
  - Name
  - Coordinates in the current coordinates system
  - Code

### *Insert Point(s) to Line command*

This command is available when the job contains a line. To use it, select **Insert Point(s) to Line** command in the pop-up menu for the "Points tab" section on page 123 and the "Lines tab" section on page 159.

The function inserts points to a line segment. When inserting a point to a segment, the software deletes the selected segment between the start point and end point, and creates two new segments: from the start point to the existing /or a new point and from the existing /or a new point to the end point.

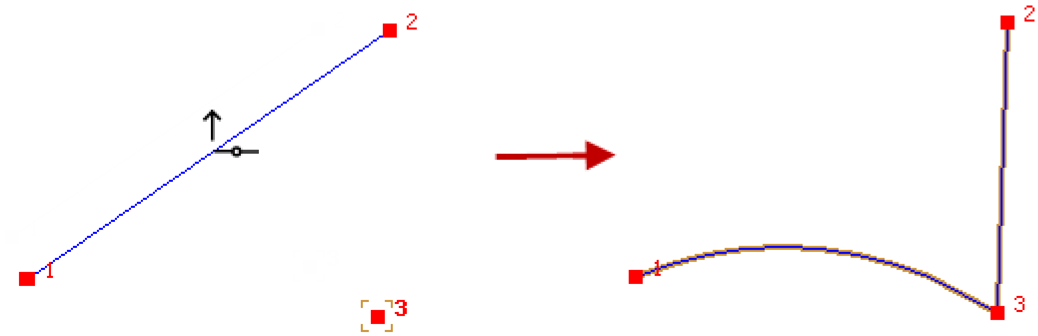
Two options are available for inserting points to the line — either to select the line first and then the point; or to select the point first, and then the line.

To insert a point to a line, selecting point first:

1. At the *Points* tab of the Tabular view, highlight the required point.
2. Right click and select the **Insert Point(s) to Line** command.

   The pointer is changed to . The *Insert Point(s) to Line* panel is displayed above the CAD view.
3. At the *Insert Point(s) to Line* panel, from the *Segment type* drop-down list, select the segment type for the new line.
4. In the CAD view, select a line to which the point should be inserted; or any place to create a line nod here.

   The previous segment is deleted and two new segments are created.



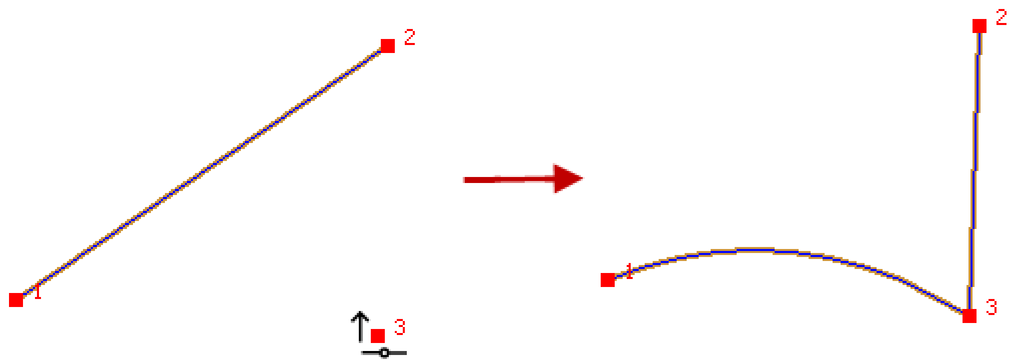

5. Close the *Insert Point(s) to Line* panel.

To insert a point to a line, selecting line first:

1. At the *Lines* tab of the Tabular view, highlight the required line.
2. Right click and select the **Insert Point(s) to Line** command.

   The pointer is changed to ⭡. The *Insert Point(s) to Line* panel is displayed above the CAD view.
3. At the *Insert Point(s) to Line* panel, from the *Segment type* drop-down list, select the segment type for the new line.
4. In the CAD view, select a point which should be inserted to the line,

   The previous segment is deleted and two new segments are created.




5. Close the *Insert Point(s) to Line* panel.

### *Append Point(s) to Line command*

This command is available when the job contains a line. To use it, select **Append(s) Point to Line** command in the pop-up menu for the "Points tab" section on page 123 and the "Lines tab" section on page 159.

The function adds points to a line segment. Two options are available — either to select the line first and then the point; or to select the point first, and then the line.

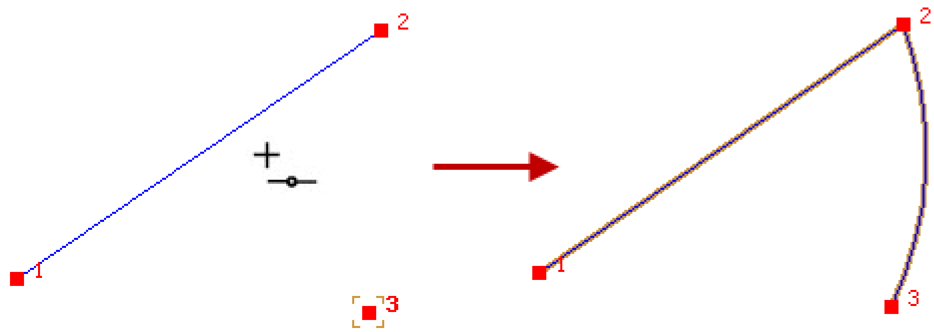
To append a point to a line, selecting point first:

1. At the *Points* tab of the Tabular view, highlight the required point.
2. Right click and select the **Append Point(s) to Line** command.

   The pointer is changed to ⭡. The *Append Point(s) to Line* panel is displayed above the CAD view.

3. At the *Append Point(s) to Line* panel, from the *Segment type* drop-down list, select the segment type for the new line.
4. In the CAD view, select a line to which the point should be added; or any place to create a line nod here.

   The new segment is created.



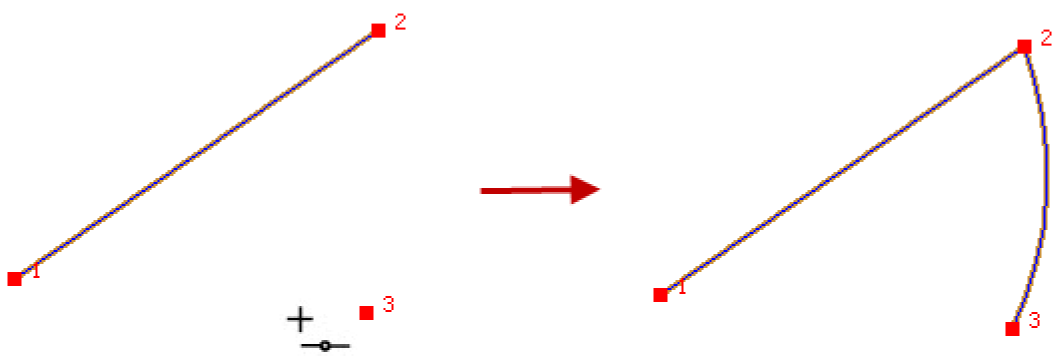
5. Close the *Append Point(s) to Line* panel.

To insert a point to a line, selecting line first:

1. At the *Lines* tab of the Tabular view, highlight the required line.
2. Right click and select the **Append Point(s) to Line** command.

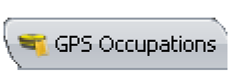
   The pointer is changed to . The *Append Point(s) to Line* panel is displayed above the CAD view.
3. At the *Append Point(s) to Line* panel, from the *Segment type* drop-down list, select the segment type for the new line.
4. In the CAD view, select a point which should be added to the line.

   The new segment is created.



5. Close the *Append Point(s) to Line* panel.

## GPS Occupations tab



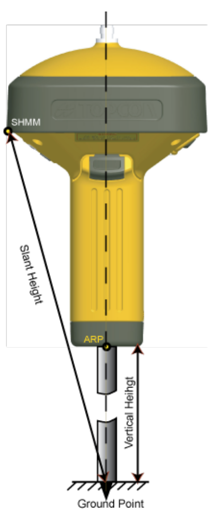

The *GPS Occupations* tab is displayed in the Tabular View only when the job contains GPS data. It displays the GPS occupation information. See also "GPS Obs tab" section on page 140.

**Fields of the *GPS Occupations* tab**

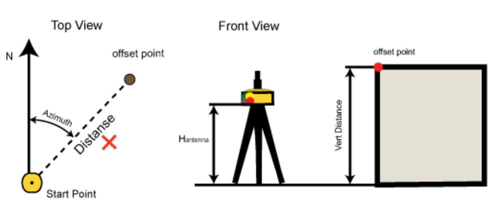
| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a GPS Occupation. See "Symbols for the GPS Occupations tab" section on page 392 for details. |
| *Point Name* | Displays the name of the occupied point. For all types of the RTK occupation and for static GPS occupation, this column cannot be empty. To edit the name, click on the highlighted column and type a new value. |
| *Original Name* | Displays the initial name of the occupation as indicated in the source file. The column cannot be empty for all types of occupation. To edit the name, click on the highlighted column and type a new value. |
| *Antenna Type* | Displays the model of the GPS antenna used for the occupation. To change the antenna type, click and select other antenna type from the drop-down list. Also you can create a custom antenna by clicking the Custom button. See "Adding Custom Antenna Type" section on page 328 for details.<br>NOTE<br>If the *None* antenna type is selected, the software will use zero values for A1/A2 parameters and in this case, the antenna phase center for L1 and L2 frequencies coincides with the Antenna Reference Point. |
| *Antenna Height* | Displays the GPS antenna's height for the occupation, in the current units. To edit the value, click on the highlighted column and type a new value. |
| *Antenna Height Method* | Displays the method used to measure the antenna height. Select the requiered method from the drop-down list. The following methods are available:<br>• Vertical — measured from the ground point to the antenna reference point (ARP) located on the bottom of the receiver.<br>• Slant — measured from the ground point to the antenna slant height measure mark (SHMM).<br>See *Antenna Height* picture below. |
| *Antenna Centering Error* | Displays the centering error of Antenna Reference Point (ARP) position over the mark, in the horizontal plane. This error will be taken into account when estimating adjustment results. To edit the value, click on the highlighted column and type a new value. |
| *Start Time* | Displays the first epoch time of the GPS occupation. The column cannot be empty. |
| *Stop Time* | Displays the end epoch time of the GPS occupation. The column cannot be empty. |
| *Duration* | Displays the duration of time in which the observational data was logged for the given GPS occupation (Duration = Stop Time - Start Time). |

| Field | Description |
|---|---|
| *Method* | Displays the surveying method for the occupation. The following methods are presented for the GPS occupations:<br>• Base — data collected on the base station during RTK measurements.<br>• Topo — data collected during static RTK measurements. (The rover antenna remains motionless during data collection for the point.) The point name is the name of a ground point. This name is entered manually.<br>• AutoTopo — data collected during kinematic RTK measurements. (The rover antenna is movable during collection data.) The point name is the name of a current epoch. This name is created by the field software automatically.<br>• Autonomous — the rover receiver does not receive the correction data from a base during RTK measurements.<br>• Static — data collected on the base or rover receiver during static GPS measurements. (The GPS antenna of the base / rover receiver remains motionless during data collection for the point.) The point name is the name of a ground point.<br>• Stop — data collected on the rover receiver during static part of the Stop and Go measurements. (The GPS antenna of the rover receiver remains motionless during data collection for the point.) The point name is the name of a ground point.<br>• Go — data collected on the rover receiver during kinematic part of the Stop and Go measurements. (The rover antenna is movable during collection data.) The point name is empty.<br>• Kinematic — data collected on the rover receiver during kinematic measurements. (The rover antenna is movable during collection data.) The point name is empty. |
| *Note* | Displays any additional notes for the selected GPS occupation. To edit the value, click on the highlighted field and enter your comments, if necessary. |
| *Source* | Displays the path of the raw data to the computer disk drive, local area network, or storage media. |
| *NEpoch* | Displays the number of epochs for the given occupation. |
| *Interval* | Displays the occupation logging interval, in milliseconds. |
| *GPS week, day* | Displays GPS week and day of occupation start time (the time from January, 6 1980: the day of GPS launch). The column cannot be empty. |
| *Receiver* | Displays the receiver's serial number. |
| *Receiver's Vendor* | Displays the name of the vendor which developed this GPS receiver. You can select a desired company from the list. This selects a vendor of the receiver to accommodate differences in post - processing of the GLONASS measurements by different companies. |
| *H RMS* | Displays the horizontal precision estimate of the GPS occupation in the current linear units. |

| Field | Description |
|---|---|
| *V RMS* | Displays the vertical precision estimate of the GPS occupation in the current linear units. |
| *Azimuth* | Displays the horizontal angle to the offset point, in current angular units. The field displays non-zero values when the imported MAGNET Field job contains Azimuth & Offsets data and this offset was performed from the measured point. See "Editing and viewing MAGNET Field Offsets in the Job" section on page 345 and *Azimuth and Offset* picture below for details. To edit the parameter, click on the highlighted column and type a new value. |
| *Offset Dist* | Displays the distance from the Start Point to the offset point, in current linear units. The field displays non-zero values when the imported MAGNET Field job contains Azimuth & Offsets data and this offset was performed from the measured point. See "Editing and viewing MAGNET Field Offsets in the Job" section on page 345 and *Azimuth and Offset* picture below for details. To edit the parameter, click on the highlighted column and type a new value. |
| *Offset Ht* | Displays the height difference between the ground point and the offset point, in curreknt linear units.<br>The field displays non-zero values when the imported MAGNET Field job contains Azimuth & Offsets data and this offset was performed from the measured point. See "Editing and viewing MAGNET Field Offsets in the Job" section on page 345 and *Azimuth and Offset* picture below for details. To edit the parameter, click on the highlighted column and type a new value. |




**Antenna Height**




**Azimuth and Offset**

Right-click on a highlighted line to display a pop-up menu. This menu contains a set of commands. They can be divided into two groups:

- Common commands for all tabs of the Tabular View. See Common pop-up menu of the Tabular View for details.
- Specific commands for the *GPS Occupations* tab. See "Pop-up menu for the GPS Occupations tab" section below for details.

## Pop-up menu for the GPS Occupations tab

In the *GPS Occupations* tab you can perform the special (only for GPS occupation) commands:

- **Decimation** — changes the record interval of a selected non-RTK GPS occupation for a greater fixed value, such as 5, 10, 15, 30 and 60 sec. In the process of decimation the first epoch in the created file has to be a multiple of the selected interval.

  For example, it is needed to change the record interval of the file with 1 sec interval to 10 sec interval. The start time of the original file is 12:22:11 and final 12:22: 59. The first epoch in the created file will be recor-ded at 12:22:20 and the final epoch - at 12:22:50. To decimate an occupation:

  1. Right click the required occupation
  2. Select **Decimation** from the pop-up menu.

     The ***Decimation of Occupation*** dialog is displayed.
  3. From the *Interval* drop-down list, select the required interval.
  4. Click **OK**.

     The original occupation are replaced with the created one.
- **Merge** — merges two and more selected non-RTK GPS occupations. This operation will be done when the following rules for selected occupations are met:
    - one type occupation (either kinematic or static)
    - static occupations correspond to the same point
    - kinematic occupations belong to the same Stop and Go file
    - occupations have the same record interval
    - occupations have the same antenna type
    - occupations have the same receiver ID
    - occupations have the same antenna height type
    - occupations have the same offsets in the horizontal and vertical planes

  To merge GPS occupations:

  1. Select the required occupations.
  2. Right click and select **Merge** from the pop-up menu.

     The ***Merge GPS Occupations*** dialog is displayed.
  3. In the *Merged GPS Occupations name* editbox, type the name for merged occupation.
  4. Click **OK**.

     Occupations are merged.
- **Split** — splits a selected non-RTK GPS occupation. Depends on the occupation duration and the number of epochs, the following ways for dividing can be used — by time, by duration, by hour and by day.
    - by time — if the occupation has more than one epoch, you can divide the selected occupation by time. By default, this time is equal to half of the time of the occupation. To split an occupation by time:

1. Select the required occupations.
2. Right click and select **Split** from the pop-up menu.

   The ***Split GPS Occupations*** dialog is displayed.
3. From the *Split by:* drop-down list, select *Time*.
4. In the *Split Time* filed specify the start time of the new GPS occupation.
5. Click **OK**.

   Occupation is split. Two occupations are created. The *Occupation* tab displays two occupations instead of the original occupation. The original occupation names for the created occupations are “<original occupation name>(Head)” and “<original occupation name>(Tail)”. All created occupation will have the same occupation name.

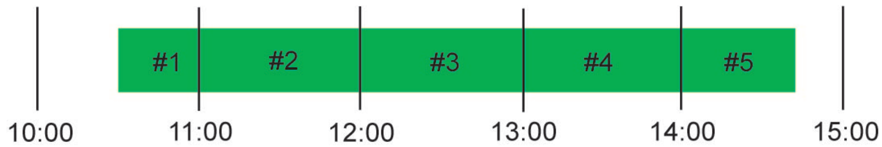
- by duration — if the occupation duration is more than 1 minute, you can divide the selected occupation by duration. You can edit the split duration in the corresponding field. After clicking OK in the Split GPS Occupation window, N +1 occupations will be created, where N is integer part of the formula "Occupation duration (in minutes) / split duration value (in minutes)". The duration of the created occupation is equal to the split duration value (except the last occupation). The Occupation tab displays N+1 occupations instead of the original occupation. The **original**occupation names for the created occupations are “<original occupation name>(Head)” , and from “<original occupation name>(Tail_1)” to “<original occupation name>(Tail_N)”
  1. Select the required occupations.
  2. Right click and select **Split** from the pop-up menu.

     The ***Split GPS Occupations*** dialog is displayed.
  3. From the *Split by:* drop-down list, select *Duration*.
  4. In the *Split Duration* filed specify the duration of the new GPS occupation.
  5. Click **OK**.

     Occupation is split. In the Split GPS Occupation window, N +1 occupations will be created, where N is integer part of the formula "Occupation duration (in minutes) / split duration value (in minutes)". The duration of the created occupation is equal to the split duration value (except the last occupation). The Occupation tab displays N+1 occupations instead of the original occupation. The original occupation names for the created occupations are “<original occupation name>(Head)” , and from “<original occupation name>(Tail_1)” to “<original occupation name>(Tail_N)”
- by hour — if the occupation duration is more than 1 hour or occupation time includes the moment HH:00:00 for the occupation with duration less than one hour, you can divide the selected occupation by hour. To do so:
  1. Select the required occupations.
  2. Right click and select **Split** from the pop-up menu.

     The ***Split GPS Occupations*** dialog is displayed.
  3. From the *Split by:* drop-down list, select *Hour*.
  4. Click **OK**.

     The occupation is splited. In the Split GPS Occupation window, either N, or N+1 or N+2 occupations will be created, where N is integer part of the formula "Start Time of the selected occupation (in hour) / Stop Time of the selected occupation (in hour)". The duration of the created occupation is equal to one hour (except the first and last occupation). The start / stop time of these occupations (except the first and last occupations) will be equal to the full hour. The Occupation tab displays these occupations instead of the original occupation. The originaloccupation names for the created occupations are “<original occupation name>(Head)” , and from “<original occupation name>(Tail_1)” to “<original occupation name>(Tail_N)”.




- by day — if the occupation duration is more than 1 day or occupation time includes the moment 00:00:00 for the occupation with duration less than one day, you can divide the selected occupation by day. To do so:
  1. Select the required occupations.
  2. Right click and select **Split** from the pop-up menu.

     The ***Split GPS Occupations*** dialog is displayed.
  3. From the *Split by:* drop-down list, select *Hour*.
  4. Click **OK**.

     The occupation is split. In the Split GPS Occupation window, either N, or N+1 or N+2 occupations will be created, where N is integer part of the formula "Start Time of the selected occupation (in day) / Stop Time of the selected occupation (in day)". The duration of the created occupation is equal to one day (except the first and last occupation). The start / stop time of these occupations (except the first and last occupations) will be equal to 00:00:00. The Occupation tab displays these occupations instead of the original occupation. The originaloccupation names for the created occupations are “<original occupation name>(Head)” , and from “<original occupation name>(Tail_1)” to “<original occupation name>(Tail_N)” .


- **Disable** — disables the highlighted GPS occupation and the corresponding GPS observation where the given GPS occupation is used; from the adjustment, calculating coordinates and export. Disabled GPS occupation and GPS observation are grayed-out in all views.
- **Enable** — enables the highlighted GPS occupation and the corresponding GPS observation where the given GPS occupation is used; for the adjustment, calculating coordinates and export.
- **Show related objects** — shows the list of tabs (Points tab and GPS Observations tab), where the objects (in the given case - points and GPS observations) can be displayed. After selecting the desired tab, the object is selected in the given tab.
- **RawData Plot** — opens a graphic raw data view. You may configure various combinations of displaying. To view raw data:
  1. Select the required occupation.
  2. Right click and select **RawData Plot**.

     The ***Select Plot: Functions*** dialog is displayed.
  3. Select the information for X- and Y-axis from the appropriate drop-down lists.
  4. Click **Next**.

     The *RawData Plot* view is opened.

- **Epoch View** — opens the Epoch View window for non-RTK GPS occupation. This window contains all raw data available for the given occupation in the text format. There are two panels in the window. The left panel displays all collected epochs for the occupation. For each epoch you can see: date and time, coordinates in the cartesian system (WGS84), the receiver clock offsets (in seconds), the components of velocity for each axis (in m/sec), the position dilution of precision, the common number of the obtained satellites (GPS, Glonass, Galileo, SBAS, QZSS, BDS), and solution type. Solution type for an occupation can be:
  - Hardware, Standalone
  - Hardware, Code Differential
  - Hardware, Phase differential float
  - Hardware, Phase differential fixed

  For the selected epoch in the left panel, the right panel displays satellite number, type of slot (for L1 receiver displays only CA, for L1&L2 receiver – CA, L1P, L2P), elevation angle, the channel signal to noise ratios relating to the delay lock loops (in dB*Hz's), the pseudorange (in meter) and carrier phase for each slot, the doppler shifts for L1 and L2, the smoothing correction (in meters) to the pseudo range measured.

  NOTE
  The coordinate values recorded in the header of the RINEX file will display for every epoch in the left panel of the window.
- **Select GPS Occupation** — opens the Select GPS Occupations window. In this window you can set different criterions to select GPS occupation in this tab. If you apply default set, all GPS occupations of the job will be selected.
- **Convert to static** — converts a kinematic occupation to static occupation. This command will be available only for kinematic GPS (not RTK) occupation.
- **Convert to kinematic** — converts a static occupation to kinematic occupation. This command will be available only for static GPS (not RTK) occupation.

## GPS Obs tab


The *GPS Obs* tab is shown only if the job contains GPS data. The tab displays the values in the current unit, set in the Status Bar. The tab displays the GPS observation (vector) information. See also "GPS Occupations tab" section on page 133.

**Fields of the GPS Obs tab**

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a GPS Observation. See "Symbols for the GPS Obs tab" section on page 393 for details. |
| *Point From* | Displays the name of the base station point for GPS observation (vector). The column cannot be empty. You can edit the name only at the *GPS Occupation* tab. |
| *Point To* | Displays the name of the rover station point for GPS observation (vector). The column cannot be empty. You can edit the name only in the *GPS Occupation* tab. |

| Field | Description |
|---|---|
| *Start Time* | Displays the first epoch time of common interval for the GPS observation (vector). The column cannot be empty. |
| *End Time* | Displays the end epoch time of common interval for the GPS observation (vector). The column cannot be empty. |
| *Duration* | Displays duration of common time interval for base and rover occupations for the given GPS observation (Duration = Stop Time - Start Time). |
| *Note* | Displays any additional notes for the selected GPS observation. To edit the value, click on the highlighted field and enter comments, if necessary. |
| *GPS Week, Day* | Displays GPS week and day of observation start time (the time from January, 6 1980: the day of GPS launch). The column cannot be empty. |
| *Method* | Displays the observation method. The following methods are presented:<br>• RTK Topo — an RTK observation is created from a Base and aTopo occupations<br>• RTK Auto Topo — an RTK observation is created from a Base and a AutoTopo occupations<br>• PP — an observation is created from two Static occupations<br>• PP Stop — an observation is created from one Static and one Stop occupations<br>• PP Go — an observation is created from one Static and one Go occupations<br>• PP Kinematic — an observation is created from one Static and one Kinematic occupations. |
| *Horizontal Precision* | Displays the horizontal precision estimate of the GPS observation, in current linear units. |
| *Vertical Precision* | Displays the vertical precision estimate of the GPS observation, in current linear units. |

| Field | Description |
|---|---|
| *Solution Type* | Displays the type of solution for RTK and GPS observations.<br>For RTK vectors or trajectory:<br>• *Fixed, Phase Diff* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover. All ambiguities have been fixed to integers.<br>• *Fixed, Phase Diff, mmGPS+* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS), a rover and mmGPS aided rover receiver. All ambiguities have been fixed to integers.<br>• *Fixed, Phase Diff, Degraded* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover with the specified level of vertical/horizontal positional accuracy in the rover receiver's option. All ambiguities have been fixed to integers.<br>• *Fixed, Phase Diff, Degraded, mmGPS+* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover with the specified level (in the rover receiver's option) of vertical/horizontal positional accuracy, and the mmGPS aided. All ambiguities have been fixed to integers.<br>• *Float, Phase Diff* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover. All ambiguities are float numbers.<br>• *Float, Phase Diff, mmGPS+* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS), a rover and mmGPS aided rover receiver. All ambiguities are float numbers<br>• *Float, Phase Diff, Degraded* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover with the specified level (in the rover receiver's option) of vertical/horizontal positional accuracy. All ambiguities are float numbers.<br>• *Float, Phase Diff, Degraded, mmGPS+* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover with the specified level (in the rover receiver's option) of vertical/horizontal positional accuracy. The mmGPS aided rover receiver. All ambiguities are float numbers.<br>• *Code Diff* — the solution is computed by using L1/L2 GPS/GLONASS code measurements when positioning.<br>For GPS observation:<br>• *Fixed, L1* — the solution is computed by using L1 frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). |

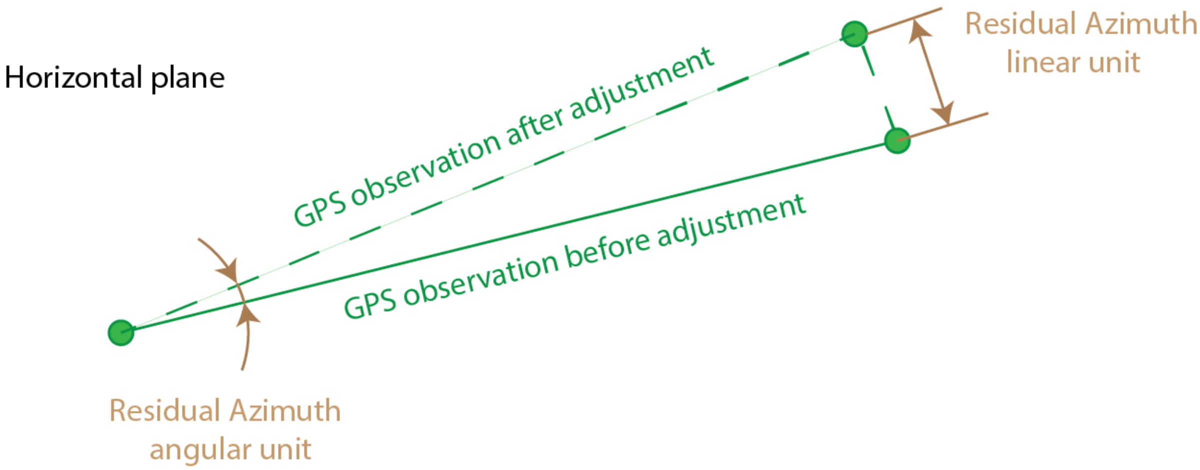
| Field | Description |
|---|---|
| | All ambiguities have been fixed to integers.<br>• *Fixed,L2* — the solution is computed by using L2 frequency measurements (L2 GPS/GLONASS code and carrier phase measurements). All ambiguities have been fixed to integers.<br>• *Fixed* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length is shorter than 10 km. L1 and L2 observables will be treated by the engine as independent data sets. All ambiguities have been fixed to integers.<br>• *Fixed, IonoFree* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 10 km to 30 km interval. After integer ambiguity resolution for a GPS observation with dual frequency measurements, ionofree combinations will be created and ionospheric error is eliminated. All ambiguities have been fixed to integers.<br>• *Fixed, Wide Lane* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 30 km to 1500 km interval. At early stages of processing of dual frequency measurements integer ambiguity resolution for L1 and L2 observables is performed with assistance of L1-L2 (Wide Lane) combination. All ambiguities have been fixed to integers.<br>• *VLBL* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for very long baselines using triple differences (No ambiguity resolution).<br>• *Float, L1* — the solution is computed by using L1 frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). All ambiguities are float numbers.<br>• *Float, L2* — the solution is computed by using L2 frequency measurements (L2 GPS/GLONASS code and carrier phase measurements). All ambiguities are float numbers.<br>• *Float* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length is shorter than 10 km. L1 and L2 observables will be treated by the engine as independent data sets. All ambiguities are float numbers.<br>• *Float, IonoFree* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 10 km to 30 km interval. After integer ambiguity resolution for a GPS observation with dual frequency measurements, ionofree combinations will be created and ionospheric error is eliminated. All ambiguities are float numbers.<br>• *Float, Wide Lane* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase meas- |

| Field | Description |
|---|---|
| | urements) for GPS observation length falling into the 30 km to 1500 km interval. At early stages of processing of dual frequency measurements integer ambiguity resolution for L1 and L2 observables is performed with assistance of L1-L2 (Wide Lane) combination. All ambiguities are float numbers.<br>• *Code Diff* — the solution is computed by using L1/L2 GPS/GLONASS code measurements only.<br>• *Failed, No Ephemeris* — the GPS observation is not processed; the corresponding navigation file is absent,<br>• *Failed, No Satellites* — the GPS observation is not processed; the data from satellites are absent. |
| *Epochs* | Displays number of epochs in the common data time interval. |
| *Orbit* | Displays the ephemerides are used for processing the given GPS observation:<br>• Broadcast — for RTK and GPS observations, when only broadcast ephemerides were used.<br>• Precise — for GPS observations only, when only precise ephemerides were used.<br>• Absent — for GPS observations only.<br>If the ephemerides are absent for the GPS observation time interval, the given GPS observation are not post-processed. |
| *GPS Satellites* | Displays the number of GPS satellites. It is the maximum number of common GPS satellites observed by the base and rover in the common interval. |
| *GLONASS Satellites* | Displays the number of GLONASS satellites. It is the maximum number of common GLONASS satellites observed by the base and rover in the common interval. |
| *PDOP* | Displays the average value of total position dilution of precision (PDOP) for common epochs interval. PDOP is equal to square root of sum-of-squares of the HDOP and VDOP values. |
| *HDOP* | Displays the average value of position dilution of precision in the horizontal plane (HDOP), for common epochs interval. |
| *VDOP* | Displays the average value of position dilution of precision in the vertical plane (VDOP), for common epochs interval. |
| *dX* | Displays the GPS observation's dX component (in Cartesian geocentric coordinate system), in current units. |
| *dY* | Displays the GPS observation's dY component (in Cartesian geocentric coordinate system), in current units. |
| *dZ* | Displays the GPS observation's dZ component (in Cartesian geocentric coordinate system), in current units. |
| *dN* | Displays the GPS observation's dN component (in topocentric coordinates), in current units. |

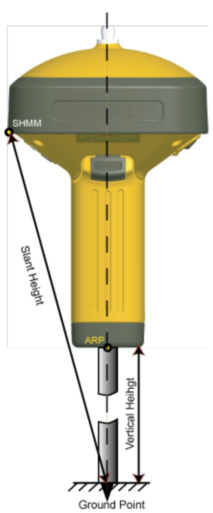
| Field | Description |
|---|---|
| *dE* | Displays the GPS observation's dE component (in topocentric coordinates), in current units. |
| *dHt* | Displays the GPS observation's vertical component (in topocentric coordinates), in current units. |
| *Azimuth* | Displays the GPS observation azimuth. |
| *Elevation Angle* | Displays the GPS observation's elevation angle. |
| *Distance* | Displays the GPS observation's distance, in current units. |
| *Res X* | Displays the residual of the X component (in Cartesian geocentric coordinate system) of the GPS observation after adjustment. |
| *Res Y* | Displays the residual of the Y component (in Cartesian geocentric coordinate system) of the GPS observation after adjustment. |
| *Res Z* | Displays the residual of the Z component (in Cartesian geocentric coordinate system) of the GPS observation after adjustment. |
| *Res n* | Displays the residual of the n component (in topocentric coordinates) of the GPS observation after adjustment. |
| *Res e* | Displays the residual of the e component (in topocentric coordinates) of the GPS observation after adjustment. |
| *Res u* | Displays the residual of the u component (in topocentric coordinates) of the GPS observation after adjustment. |
| *Res D* | Displays the residual of the GPS observation's distance after adjustment. |
| *Res A* | Displays the linear residual of the GPS observation's azimuth after adjustment. See *Azimuth residual* picture below. |
| *Res El* | Displays the residual of the GPS observation's elevation after adjustment. |
| *Base Antenna Type* | Displays the model of the GPS antenna used at the base. To change the antenna type, click and select other antenna type from the drop-down list. Also you can create a custom antenna by clicking the Custom button. See "Adding Custom Antenna Type" section on page 328 for more details.<br>NOTE<br>If the None antenna type is selected, the software will use zero values for A1/A2 parameters, and in this case, the antenna phase center for L1 and L2 frequencies coincides with the Antenna Reference Point. |
| *Base Antenna Height* | Displays the GPS antenna's height at the base station, in current units. To edit the value, click on the highlighted column and enter a new value. |
| *Base Antenna Height Method* | Displays the method used to measure the antenna height. You can change the type of the method (slant or vertical) with the help of the drop-down list. See picture *Base Antenna Height Method* below for details.<br>• *Vertical* — measured from the ground point to the antenna reference point (ARP) located on the bottom of the receiver.<br>• *Slant* — measured from the ground point to the antenna slant height measure mark (SHMM). |

| Field | Description |
|---|---|
| *Rover Antenna Type* | Displays the model of the GPS antenna used for the rover. To change the antenna type, click and select other antenna type from the drop-down list. Also you can create a custom antenna by clicking the Custom button. See "Adding Custom Antenna Type" section on page 328 for more details.**NOTE:** If the None antenna type is selected, the software will use zero values for A1/A2 parameters and in this case the antenna phase center for L1 and L2 frequencies coincides with the Antenna Reference Point. |
| *Rover Antenna Height* | Displays the GPS antenna's height for the rover in the current units. To edit the value, click on the highlighted column and enter a new value. |
| *AutoReject* | In this field you can select the status of the given GPS observation for adjustment:<br>• *Allowed* — the GPS observation will be used in adjustment.<br>• *Not Allowed* — the GPS observation will not be used in adjustment. |
| *Adjustment Status* | Displays the status of the given GPS observation after adjustment:<br>• *Not Adjusted* — the GPS observation is not adjusted.<br>• *Adjusted* — the GPS observation is adjusted.<br>• *AutoRejected* — the GPS observation is not adjusted, because the vector had the status Not Allowed before the adjustment procedure.<br>• *Disable* — the GPS observation is not adjusted, because the vector was disabled before the adjustment procedure. |
| *Engine/Mode* | Display the Engine Type and Engine Mode that were selected in the GPS+ PostProcess (the Engine tab) Process sub-menu option for last post-processing of the GPS observation.<br>This field relates to the post-processed GPS observation only. For RTK GPS observation, the field is empty |
| *Elevation Mask* | Displays an elevation cut-off angle (in degrees) for satellites used in data processing. This parameter was entered in the GPS+ PostProcess (the General tab) Process sub-menu option for the last post-processing of the GPS observation.<br>This field relates to the post-processed GPS observation only. For RTK GPS observation, the field is empty |
| *Satellite System* | Displays the navigation system (either GPS and GLONASS or only GPS satellites) that is used for postprocessing the GPS observation. This selection was entered in the GPS+ PostProcess (the General tab) Process sub-menu option for the last post-processing of the GPS observation.<br>This field relates to the post-processed GPS observation only. For RTK GPS observation, the field is empty |
| *Troposphere Model* | Displays the current Troposphere model. This model was entered in the GPS+ PostProcess (the Troposphere tab) Process sub-menu option for the last post-processing of the GPS observation.<br>This field relates to the post-processed GPS observation only. For RTK GPS observation, the field is empty |

| Field | Description |
|---|---|
| *Meteo Model* | Displays the current Meteo model. This model was entered in the GPS+ PostProcess (the Troposphere tab) Process sub-menu option for the last post-processing of the GPS observation.<br>This field relates to the post-processed GPS observation only. For RTK GPS observation, the field is empty |
| *Constant Zenith delay (hours)* | Displays the period of time in hours (defined by the user in the Troposphere tab of the Process sub-menu) during which the zenith delay is applied as constant.<br>This field relates to the post-processed GPS observation only. For RTK GPS observation, the field is empty |




**Azimuth residual**




**Base antenna height method**

> NOTE 2
> Zero value in the Res fields means that the GPS observation is included in the unclosed network, and does not contain repeated GPS observations.

Right-click on a highlighted line to display a pop-up menu. This menu contains a set of commands and they can be divided into two groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific commands for the *GPS Obs* tab. See "Pop-up menu for the GPS Obs tab" section below for details.

### Pop-up menu for the GPS Obs tab

In GPS Obs tab you can perform the special (only for GPS observation) commands:

- **Disable/ Enable** — allows disable/enable the highlighted GPS observations from the adjustment, calculating coordinates and export. Disabled GPS observation is grayed-out in all views.
- **Select GPS Obs** — opens the ***Select GPS Obs*** dialog. In this dialog you can set different criterions to select GPS observations in this tab. If you apply default set, all GPS observations of the job will be selected.
- **Compute Coordinate** — this command activates function of calculating coordinate the rover points from the corresponding base of the highlighted GPS observations.
- **Report** — automatically creates a report for the highlighted GPS observations. You can edit this report in Report Configuration window. By default it contains the following information:
  - Base station name
  - Rover station name
  - components of the GPS observations in topocentric coordinates
  - Horizontal and vertical precessions in the current units.

## TS Obs tab


The *TS Obs* tab is displayed only if the job contains TS raw data. The TS Obs tab displays a table containing two panels. The left panel contains all TS occupations, and the right panel displays all TS observations from the selected occupation.

You may manually add TS observations right from the tab. To do so:

1. In the left panel of the tab, select the required TS occupation.
2. In the bottom row of the right panel's table, click .

   The row for the new observation is displayed.
3. Specify the required parameters and press *Enter*.

#### Fields of the left panel

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a TS Occupation. See "Symbols for the left panel of the TS Obs tab" section on page 394 for details. |
| *#* | Displays the number of a TS occupation contained in the raw file. You can set any number from the list. |
| *Point Name* | Displays the name of the point where the Total Station was set. You can set any point's name from the list. |

| Field | Description |
|---|---|
| *Instrument Height* | Displays the instrument height — the vertical distance from the Instrument Center Mark to the ground, in current linear units. To edit the value, click on the highlighted field and enter a new value. |
| *Instrument Type* | Displays the Instrument Type for the given TS occupation. To change the instrument type, click and select other instrument type from the drop-down list. Also you can create a custom instrument type by clicking the Custom button. See "Adding TS Instrument Type" section on page 331 for details. |
| *Instrument Centering Error* | Displays the error of centering the Total Station position over the mark. This error will be taken into account during adjustment of the network with the given TS occupation. To edit the value, click on the highlighted field and enter a new value. |
| *Instrument Height Error* | Displays the measurement error of the Total Station height over the mark. This error will be taken into account during adjustment of the network with the given TS occupation. To edit the value, click on the highlighted field and enter a new value. |
| *Reflector Centering Error* | Displays the error of centering the reflector position over the mark. This error will be taken into account during adjustment of the network with the given TS occupation. To edit the value, click on the highlighted field and enter a new value. |
| *Reflector Height Error* | Displays the measurement error of the reflector height over the mark. This error will be taken into account during adjustment of the network with the given TS occupation. To edit the value, click on the highlighted field and enter a new value. |

**Fields of the right panel**

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a TS Observation. See "Symbols for the right panel of the TS Obs tab" section on page 394 for details. |
| # | Displays the number of the TS observation contained in the raw file. |
| *Point From* | Displays the date and time of the total station measurement. You cannot edit this field. |
| *Code* | Displays code of the TS observation. A TS observation can have only one code. To edit the code, click on the highlighted field and select a new one from the drop-down list of existing codes or enter a new codes, or remove the Code and leave the field empty. |
| *String* | Displays the string for the TS observation. The string entered for a TS occupation is automatically displayed as string for the corresponding point in the *Points* tab. Using a complex of string and codes allows you to automatically create a line in the job. The software will automatically create a line between points with the same Code and String values. |
| *Control Code* | Displays the control code for the TS observation. See "Control Code field" section on page 152 for details. |

| Field | Description |
| --- | --- |
| *Control Code2* | Displays the second control code for the TS observation. See "Control Code2 field" section on page 154 for details. |
| *Source* | Displays the path of the raw data on the computer disk drive, local area network, or storage media. |
| *Point To* | Displays the name of the point at which the reflector was set. You can set any point's name from the list. |
| *Type* | Displays the current type of the Total Station occupation. See "Type field" section on page 154 for details. |
| *Reflector Height* | Displays the vertical distance from the center of the prism to a ground point, in current linear units. To edit the value, click on the highlighted field and enter a new value. |
| *Azimuth* | Displays the azimuth value that defines orientation of TS measurements by backsight from the station in the horizontal plane. The field displays non-zero values only for BKB type. If you set a point as backsight in the field, the azimuth value is calculated using the coordinates of the station point and the backsight point. In this case, you cannot edit the azimuth value. If you set an azimuth as backsight, in the field, then you directly enter the azimuth value. In this case, you can edit the azimuth value in the software.<br>The software allows editing the azimuth value for BKB observation type only if the *Point To* field is empty. |
| *Horizontal Circle* | For the SS, FS, Horizontal Resection/Vertical Resection/Resection types of Total Station observation, the field displays the measured horizontal angle from the previous to the next observation. For BKB type, the field displays the horizontal circle reading when pointing to the backsight point. You cannot edit this parameter. |
| *Zenith Angle* | Displays the vertical angle to the reflector measured from zenith. You cannot edit this parameter. |
| *Slope Distance* | Displays the slope distance between the TS station (Point From) and the TS occupation (Point To). You cannot edit this parameter. |
| *Vertical Angle* | Displays the vertical angle to the reflector measured from horizon. You cannot edit this parameter. |
| *Horizontal Distance* | Displays the distance between the TS station (Point From) and the TS occupation (Point To) in the horizontal plane. You cannot edit this parameter. |
| *Vertical Distance* | Displays the distance between the TS station (Point From) and the TS occupation (Point To) in the vertical plane. You cannot edit this parameter. |
| *Note* | Displays any additional TS occupation's note. To edit the note, click on the highlighted field and enter comments, if needed. |

| Field | Description |
|---|---|
| *Offset Along* | Displays the distance from the "To Point" to the projection of the offset point along the line "From Point-To Point", in current linear units. The field displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset. See "Editing and viewing MAGNET Field Offsets in the Job" section on page 345 for details. To edit the value, click on the highlighted filed and enter a new value. |
| *Offset Across* | Displays the distance from the offset point to the line "From Point-To Point", in current linear units. The field displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset. See "Editing and viewing MAGNET Field Offsets in the Job" section on page 345 for details. To edit the value, click on the highlighted filed and enter a new value. |
| *Offset Ht* | Displays the height difference between the ground point or the top of "To Point"and the offset point, in current linear units. The field displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset. See "Editing and viewing MAGNET Field Offsets in the Job" section on page 345 for details. To edit the value, click on the highlighted filed and enter a new value. |
| *Offset Type* | Displays the current type of the given offset. For the Distance Offset and the Line Offset created in MAGNET Field, you see "From Observation Line" type. |
| *AutoReject* | In this field you can select the status of the given TS observation for Adjustment:<br>• Allowed - the TS observation will be used in Adjustment.<br>• Not Allowed - the TS observation will not be used in Adjustment. |
| *Adjustment Status* | Displays the status of the given TS observation after Adjustment:<br>• Not Adjusted - the TS observation is not adjusted.<br>• Adjusted - the TS observation is adjusted.<br>• AutoRejected - the TS observation is not adjusted, because the vector had the status Not Allowed before the adjustment procedure.<br>• Disable - the TS observation is not adjusted, because the vector was disabled before the adjustment procedure. |
| *SDist Residual* | Displays the residual of the slope distance after adjustment for both enabled and disabled TS observations. |
| *HAngle Residual* | Displays the residual of the horizontal angle after adjustment for both enabled and disabled TS observations. |
| *Azimuth Residual* | Displays the residual of azimuth after adjustment for both enabled and disabled TS observations. |
| *VAngle Residual* | Displays the residual of the vertical angle after adjustment for both enabled and disabled TS observations. |
| *ZAngle Residual* | Displays the residual of the zenith angle after adjustment for both enabled and disabled TS observations. |

| Field | Description |
|---|---|
| *HDist Residual* | Displays the residual of the horizontal distance after adjustment for both enabled and disabled TS observations. |
| *VDist Residual* | Displays the residual of the vertical distance after adjustment for both enabled and disabled TS observations. |
| *Cross Residual* | Displays the residual of the horizontal angle represented in the linear measure after adjustment for both enabled and disabled TS observations. |

Right-click on a highlighted line to display a pop-up menu. This menu contains a set of commands and they can be divided into three groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific commands for the left panel of the *TS Obs* tab. See "Pop-up menu for the left panel of the TS Obs tab" section on page 155,
- Specific commands for the right panel of the *TS Obs* tab. See "Pop-up menu for the right panel of the TS Obs tab" section on page 156 for details.

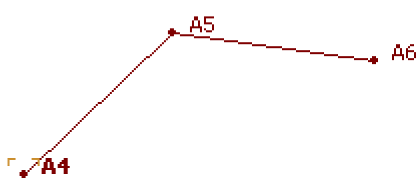
## Control Code field

The Control Code list can contain the following codes:

- Codes, created by Topcon programmers (default codes). Using these codes will modify the existing line-work or add a line to the existing linework. You can apply the control codes only to the points which have the same Code and String value. You select the following default control code from the list:
  - Arc Start
  - Arc End
  - Close
  - Rectangle
- Codes, created by a user. Using these codes do not modify the existing linework.

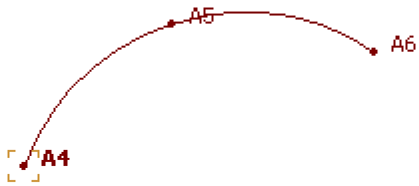
Let's see how the default code can modify an existing line.

None — does not change an existing linework



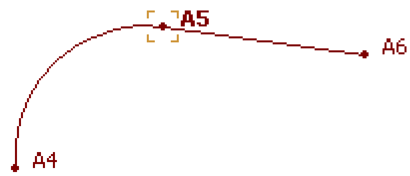

| Name | Code | String | Control Code |
|---|---|---|---|
| A4 | DD | 1 | |
| A5 | DD | 1 | |
| A6 | DD | 1 | |

Arc Start — defines the start point of an arc:



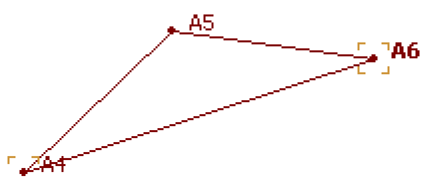

| Name | Code | String | Control Code |
|---|---|---|---|
| A4 | DD | 1 | Arc Start |
| A5 | DD | 1 | |
| A6 | DD | 1 | |

Arc End — defines an end point of the arc:



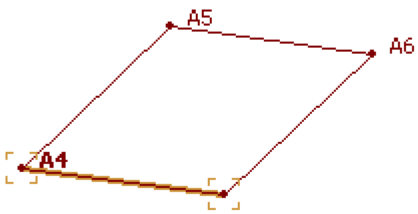

| Name | Code | String | Control Code |
|---|---|---|---|
| A4 | DD | 1 | Arc Start |
| A5 | DD | 1 | Arc End |
| A6 | DD | 1 | |

Close — automatically add a line to close the figure. This option will work only for a figure that contains more than two points:




| Name | Code | String | Control Code |
|---|---|---|---|
| A4 | DD | 1 | |
| A5 | DD | 1 | |
| A6 | DD | 1 | Close |

Rectangle — automatically adds point to close the figure. This option will work only for a figure that contains three points:

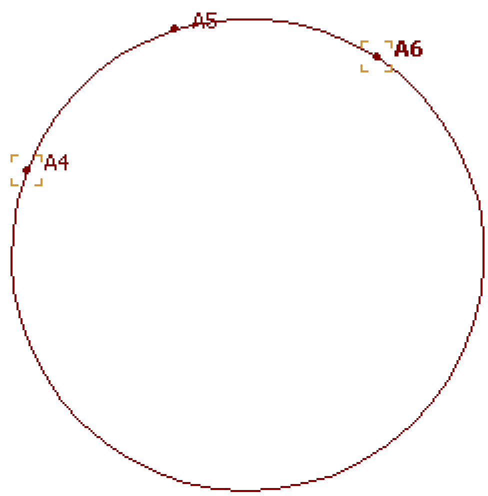



| Name | Code | String | Control Code |
|---|---|---|---|
| A4 | DD | 1 | Rectangle |
| A5 | DD | 1 | |
| A6 | DD | 1 | |

The field appears it the right panel of the TS Obs tab and the General tab of the ***Properties*** dialog for the right panel of the TS Obs tab.

## Control Code2 field

Control Code 2 displays the control code used for the TS observation. It has the same properties as Control Code. See "Control Code field" section on page 152 for details. MAGNET Tools allows you to simultaneously use two different values of Control Code and Control Code 2:




| Name | Code | String | Control Code | Control Code 2 |
|---|---|---|---|---|
| A4 | DD | 1 | Arc Start | |
| A5 | DD | 1 | | |
| A6 | DD | 1 | | Close |

The field appears it the right panel of the TS Obs tab and the General tab of the ***Properties*** dialog for the right panel of the TS Obs tab.

## Type field

Displays the current type of the Total Station occupation. The types can be divided into two groups:

The types which can be replaced by the other type from the list in the MAGNET Tools:

- SS (side shot) — the measurement from the station to the reflector. This measurement contains the horizontal and vertical angles and slope distance data.
- BS (backsight) — can be used in two cases:
  - The start measurement which used as a reference line for orientation of the further measurements from the station together with BKB. This measurements can contain the vertical angle and slope distance data.
  - The measurement to the previous occupation point in traverse survey. This measurements can contain the horizontal and vertical angles and slope distance data.
- FS (foresight) — the measurement to the next occupation point in traverse survey. This measurements can contain the horizontal and vertical angle and slope distance data.
- Resection — the measurement from an unknown point at which the total station is set to the known point. This measurements can contain the horizontal and vertical angle and slope distance data.
- Horizontal Resection — the measurement from an unknown point at which the total station is set to the known point. This measurements can contain the horizontal angle data.
- Vertical Resection — the measurement from an unknown point which the total station is set to the known point. This measurements can contain the vertical angle data.

The types which cannot edited in the MAGNET Tools. See "Editing and viewing MAGNET Field Offsets in the Job" section on page 345 for details.

- BKB ( backsight bearing point) — the start measurement used as a reference line for orientation of next measurements from the station. This measurements contain the horizontal angle data.
- Side — the measurement from the station to the reflector in process of performing Horizontal Angle Offset. This measurements contain the horizontal angle and slope distance data.
- Center —the measurement from the station to a center of pipe in process of performing Horizontal Angle Offset. This measurements contain the horizontal angle data.
- Vertical — the measurement from the station to the reflector in process of performing Horizontal/Vertical Angle Offset. This measurements contain the horizontal and vertical angle and slope distance data.
- Horz.Vertical — the measurement from the station to an offset point in process of performing Horizontal/Vertical Angle Offset. This measurements contain the horizontal and vertical angle.
- Missing Pt. — the measurement from the station to an one prism from two prisms in process of performing Hidden Point offset. This measurements contain the horizontal and vertical angle and slope distance data.
- Line — the measurement from the station to a point of the line in process of performing Two Lines Intersection and/or Lines and Corner offset. This measurements contain the horizontal and vertical angle and slope distance data.
- Corner — the measurement from the station to an offset point in process of performing Lines and Corner and/or Plane and Corner offset. This measurements contain the horizontal and vertical angle data.
- Plane — the measurement from the station to one point from three points of a plane in process of performing Plane and Corner offset. This measurements contain the horizontal and vertical angle and slope distance data.

The field appears it the right panel of the TS Obs tab and the Observation tab of the ***Properties*** dialog for the right panel of the TS Obs tab.

## Pop-up menu for the left panel of the TS Obs tab

In the left panel of the *TS Obs* tab you can perform the special (only for TS occupation) commands:

- **Disable/ Enable** — allows disable/enable the highlighted TS occupations from the adjustment, calculating coordinates and export.
- **Add Manual TS Occupation** — allows you to manually add a new TS Occupation.

- **Select TS Obs** — opens the ***Select TS Obs*** dialog. In this window you can set different criterions to select TS observations in this tab (in the right panel). If you apply default set, all TS observations of the job will be selected.
- **Select TS Occupation** — opens the ***Select TS Occupations*** dialog. In this window you can set different criterions to select TS occupations in this tab (in the left panel). If you apply default set, all TS occupations of the job will be selected.
- **Compute Coordinate** — this command activates function of calculating coordinate the reflector points from the highlighted stations.

### Pop-up menu for the right panel of the TS Obs tab

In the right panel of the *TS Obs* tab you can perform the special (only for TS observation) commands:

- **Disable/Enable** — disables/enables the highlighted TS observations from the adjustment, calculating coordinates and export.
- **Zoom to Selection —** automatically zooms in the highlighted TS observations on Map View
- **Select TS Obs** — opens the ***Select TS Obs*** window. In this window you can set different criterions to select TS observations in this tab (in the right panel). If you apply default set, all TS observations of the job will be selected.
- **Compute Coordinate** — this command activates function of calculating coordinate the reflector points from the highlighted stations.
- **Report —** automatically creates a report for the highlighted TS observations. By default this report contains the following information: the numbers of the TS observation, Point From, Point To, Instrument and Reflector Height, Horizontal Circle, Zenith Angle and Slope Distance.

## DL Obs tab


The *DL Obs* tab is shown only if the job contains DL (digital level) raw data. The DL Obs tab displays a table containing two panels. The left panel displays all DL Run (or DL occupations), and the right panel displays all DL observations.

You may manually add DL observations right from the tab. To do so:

1. In the left panel of the tab, select the required DL occupation.
2. In the bottom row of the right panel's table, click .

   The row for the new observation is displayed.
3. Specify the required parameters and press *Enter*.

#### Fields of the left panel

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a DL Occupation. See "Symbols for the left panel of the DL Obs tab" section on page 394 for details. |
| # | Displays the number of the DL run (DL occupation) contained in the current job. You can set any number from the list. |

| Field | Description |
|---|---|
| *From* | Displays the start leveling point of the job. You cannot select other point as start point. |
| *To* | Displays the finish leveling point of the job. You cannot select other point as finish point. |
| *Level Run* | Display the name of the leveling job created in a digital level. |
| *Date* | Displays the start date (day/month/year) and time of the job creation. You cannot edit the value. |
| *Note* | Displays any additional DL run's note. To edit the note, click on the highlighted field and enter your comments. |
| *Distance* | Displays the sum of all backsight and foresight distances. You cannot edit the parameter. |
| *Balance* | Display the sum of differences between DL to BS point and DL to FS point of the job. You cannot edit the value. |

**Fields of the right panel**

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a DL Obsersvation. See "Symbols for the right panel of the DL Obs tab" section on page 395 for details. |
| *#* | Displays the number of the DL observation contained in the current job. You cannot set any number from the list. |
| *Point* | Displays the name of turning or side shot point. You can select a point from the list. |
| *Type* | Displays the current type of the Digital Level observation. This field contains the list of the DL observation types. You cannot select the other type from the list:<br>• SS (side shot) — the measurement to a point that is not a BS/FS point, or Changing Point/ Bench Mark point.<br>• BS (backsight) — the measurement to the previous occupation point in the DL run.<br>• FS (foresight) — the measurement to the next occupation point in the DL run.<br>• End of Changing Pt — the end measurement of the DL run to the point that is used to carry the measurements forward in the DL run.<br>• End of Bench Mark — the end measurement of the DL run to the point with known elevation. |
| *Ht. Measurements* | Displays the rod reading on the given point, in current linear units. You cannot edit the measurement. |
| *Vert Offset* | Displays the vertical offset from the horizontal plane for traverse and sideshot points. |
| *Distance* | Displays the measured distance from DL to the given point. You cannot edit the measurement. |

| Field | Description |
|---|---|
| *Instrument Elevation* | Displays the elevation of sight that includes the elevation of BS point and the rod reading on BS point. You cannot edit the measurement. |
| *Std Dev* | Displays the standard deviation for the level measurement. This value is created in the Digital Level. You cannot edit the parameter. |
| *Note* | Display any additional DL observation's note. To edit the note, click on the highlighted field and enter comments, if needed. |
| *Date* | Displays the start date (day/month/year) and time of creating the measurement. You cannot edit the value. |
| *Source* | Displays the path of the raw data to the computer disk drive, local area network, or storage media. |
| *Ht Residual* | Displays the adjustment residuals for the level measurements. You cannot edit the value. |
| *Elevation* | Displays the elevation on FS point that includes the elevation of sight and rod reading on FS point. You cannot edit the value. |
| *AutoReject* | In this field you can select the status of the given DL observation for Adjustment:<br>• Allowed — the DL observation will be used in Adjustment.<br>• Not Allowed — the DL observation will not be used in Adjustment. |
| *Adjustment Status* | Displays the status of the given DL observation after Adjustment:<br>• Not Adjusted — the DL observation is not adjusted.<br>• Adjusted — the DL observation is adjusted.<br>• AutoRejected — the DL observation is not adjusted because the vector had the status Not Allowed before the adjustment procedure.<br>• Disable — the DL observation is not adjusted because the vector was disabled before the adjustment procedure. |
| | |

Right-click on a highlighted line to display a pop-up menu. This menu contains a set of commands and they can be divided into three groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific commands for the left panel of the *DL Obs* tab. See "Pop-up menu for the left panel of the DL Obs tab" section below for details.
- Specific commands for the right panel of the *DL Obs* tab. See "Pop-up menu for the rignt panel of the DL Obs tab" section on the facing page for details.

## Pop-up menu for the left panel of the DL Obs tab

In the left panel of the DL Obs tab you can perform the special (only for DL run) commands:

- **Disable/Enable** — disables/enables the highlighted DL runs from the adjustment, calculating coordinates and export.

- **Add Manual DL run** — allows you to manually add a new DL run (DL occupation).
- **Compute Coordinate** — activates function of calculating elevation of the turning and sideshot points.

### Pop-up menu for the rignt panel of the DL Obs tab

In the right panel of the DL Obs tab you can perform the special (only for DL observation) commands:

- **Disable/Enable** — disables/enables the highlighted DL observations from the adjustment, calculating coordinates and export.
- **Zoom to Selection** — automatically zooms in the highlighted DL observations on Map View

## Lines tab


The Lines tab is shown only if the job contains polyline data. The Lines tab displays a table containing two panels. The left panel displays all polylines (type, layers, plotting styles, codes and string) in the job, and the right panel displays all segments for the selected polyline.

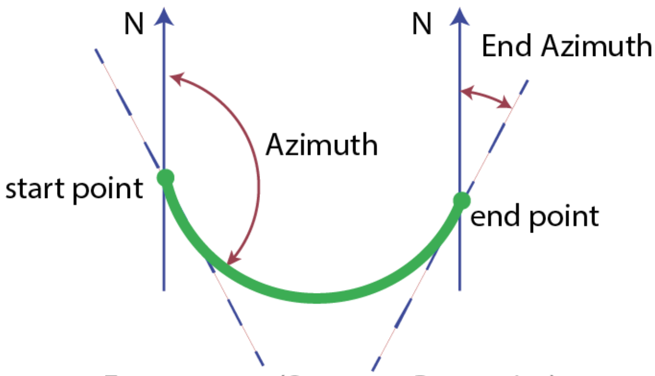
#### Fields of the left panel

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a polyline. See "Symbols for the left panel of the Lines tab" section on page 395 for details. |
| *Name* | Defines the name of the line. It can be empty. If specified, the name should be unique. |
| *Type* | In this field you can select the type of the polyline:<br>• Line — unclosed polyline.<br>• Area — closed polyline.<br>When you select Area for a polyline with the Line type, the application automatically adds a segment to close the existing polyline if the existing polyline has more than one segment. When you select Line for a polyline which has the Area type, the application automatically removes a segment to unclose the area. |
| *Layer* | Displays the Layer in which the polyline resides. The Layer sets the plotting style for the polyline (and all segments of the polyline). Every polyline has its non-empty Layer. In this field, you can select any Layer from the list of user-created layers. |
| *Line Style* | Displays the polyline style for Map View. The style can be chosen from the list. If you set BYCODE or BYLAYER, the style of the polyline will be set automatically to the style that was selected for the polyline's code, or polyline's layer. See Map View for more information. |
| *Line Width* | Displays the polyline width for Map View. The width can be chosen from the list. If you set BYCODE or BYLAYER, the width of the polyline will be set automatically to the width that was selected for the polyline's code, or polyline's layer. |

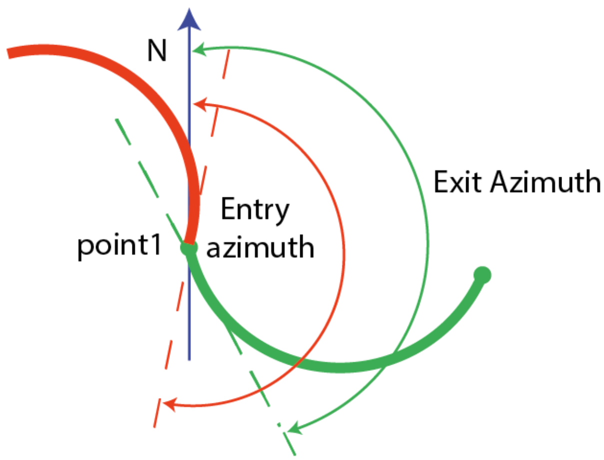
| Field | Description |
|---|---|
| *Line Color* | Displays the polyline color for Map View. The color can be chosen from the list. If you set BYCODE or BYLAYER, the color of the polyline will be set automatically to the color that was selected for the polyline's code, or polyline's layer. |
| *Area Fill Style* | Displays the fill stile for closed polyline (area) in Map View. The fill style can be chosen from the list. If you set BYCODE or BYLAYER, the fill style for the polyline will be set automatically to the fill style that was selected for the polyline's code, or polyline's layer. |
| *Point Type* | Displays the symbol for the point of the polyline in Map View. The symbol can be chosen from the list. If you set BYCODE or BYLAYER, the point symbol will be set automatically to the symbol that was selected for the polyline's code, or polyline's layer. |
| *Fill Transparency* | Displays the transparency value for closed polyline (area) in Map View. The value can be chosen from the list. If you set BYCODE or BYLAYER, the value will be set automatically to the symbol that was selected for the polyline's code, or polyline's layer. |
| *Area Color* | Displays the color for the closed polyline (area) in Map View. The color can be chosen from the list. If you set BYCODE or BYLAYER, the area color will be set automatically to the color that was selected for the polyline's code, or polyline's layer. |
| *Point Color* | Displays the color for the point of the polyline in Map View. The color can be chosen from the list. If you set BYCODE or BYLAYER, the point color will be set automatically to the color that was selected for the polyline's code, or polyline's layer. |

**Fields of the right panel**

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a polyline. See "Symbols for the left panel of the Lines tab" section on page 395 for details. |
| *Order* | Displays the order of the start point of the selected polyline / end point of the segment in the selected polyline. You can set any number from the list of the point's number. |
| *Point* | Displays the name of the start point of the selected polyline, or end point of a segment (vertex of a segment). You can select a point from the list of the job's points. |
| *Distance from start* | Displays the total distance from the start point of the selected polyline to this point (vertex), in current linear units. You cannot edit this value. |
| *Distance from prev* | Displays the distance of the segment (from the previous point to this point), in current linear units. You cannot edit this value. |
| *Entry Azimuth* | Displays the azimuth of the tangent to the given point (vertex) for the current segment. You cannot edit this value. See picture below for details. |
| *Exit Azimuth* | Displays the end azimuth of the tangent to the given point (vertex) of the segment. You cannot edit this value. |




For segment (Segment Properties)




For points in the left panel of the Lines tab

Right-click on a highlighted line to display a pop-up menu. This menu contains a set of commands and they can be divided into three groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific commands for the left panel of the *Lines* tab. See "Pop-up menu for the left panel of the Lines tab" section below for details.
- Specific commands for the right panel of the *Lines* tab. See "Pop-up menu for the right panel of the Line tab" section on the next page for details.

## Pop-up menu for the left panel of the Lines tab

In the left panel of the *Lines* tab you can perform the special (only for polyline) commands:

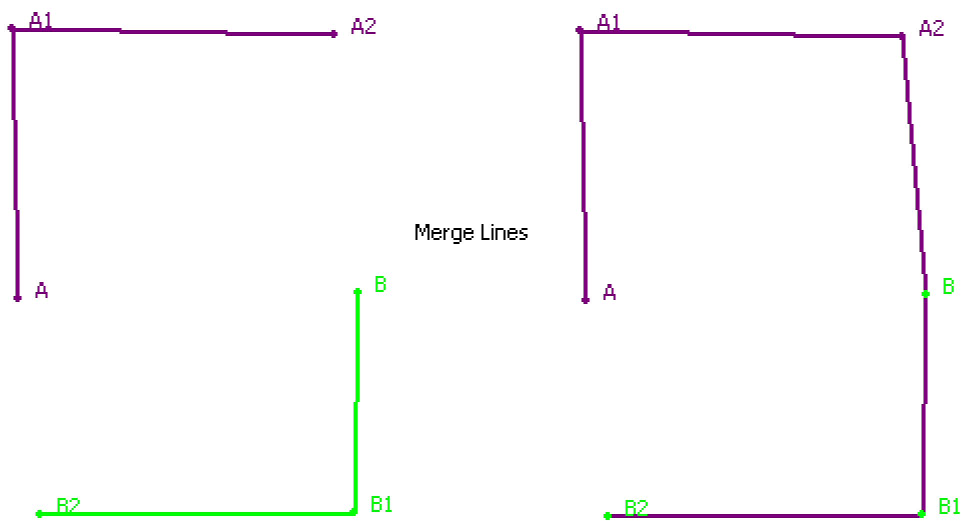
- **Delete** — deletes the selected polylines from the current job. The command does not delete the points of the polylines.
- **Convert to Road** — converts a polyline to a Road. In this case:
  - A start point of the line will be a start point of the road.
  - Horizontal projections of lines and curves will be used for creating the horizontal alignment of the road.
  - Height difference of the segment vertices forms up a vertical alignment. Only the grade will be used for creating the vertical alignment of the road.
  - The current layer of the line will be the current layer of the road.

  To convert a line to a road:

1. Right-click the required line and select **Convert**.
2. From the additional menu, select **To Road**.

   The ***Convert Line to Road*** dialog is displayed.
3. In the *Name* editbox, type the name of the new road.
4. In the *Start Sta/Chainage* editbox, specify the start chainage of the new road.
5. From the *Layer* drop-down box, select the layer to which the road will belong to.
6. Click **OK**.

- **Merge Lines** — this command will be available when you selects two separate polylines that do not have a common point. An additional line will be automatically created between the End point of the first selected line and the Start point of the second line. The created line has a plotting style of the first line:




- **Reverse Line** — flips the order of the segments in the polyline.
- **Add to Surface** — this command will be available when a surface is present in the current job. The highlighted polylines will be added to the surface if a polyline is within the surface boundaries. If the current job contains more than one surface, choose the desired Surface to add polylines.
- **Insert Point(s) to Line** — inserts a point to the selected segment. See "Insert Point(s) to Line command" section on page 131 for details.
- **Append Point(s) to Line** — adds a point to the selected segment. See "Append Point(s) to Line command" section on page 132 for details.
- **Zoom to Selection** — automatically zoom in the highlighted polylines in the Map View.

## Pop-up menu for the right panel of the Line tab

In the right panel of the Lines tab you can perform the special (only for segment) commands:

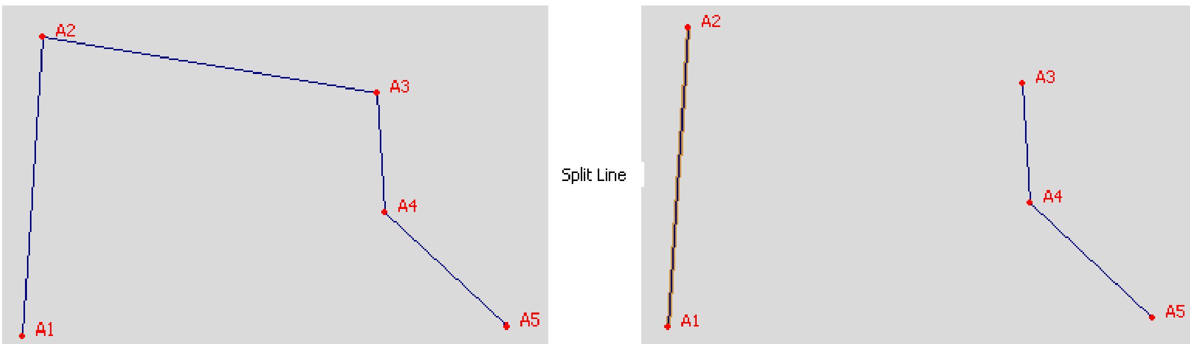
- **Delete** — deletes the selected polylines from the current job. The command does not delete the points of the polylines.
- **Convert to Road** — converts a polyline to a Road. In this case:
  - A start point of the line will be a start point of the road.
  - Horizontal projections of lines and curves will be used for creating the horizontal alignment of the road.
  - Height difference of the segment vertices forms up a vertical alignment. Only the grade will be used for creating the vertical alignment of the road.
  - The current layer of the line will be the current layer of the road.

To convert a line to a road:

1. Right-click the required line and select **Convert**.
2. From the additional menu, select **To Road**.

   The ***Convert Line to Road*** dialog is displayed.
3. In the *Name* editbox, type the name of the new road.
4. In the *Start Sta/Chainage* editbox, specify the start chainage of the new road.
5. From the *Layer* drop-down box, select the layer to which the road will belong to.
6. Click **OK**.

- **Split** — this command will be available for all segments except the first and last segment of the polyline. The highlighted segment(s) will be deleted from the polyline. Two separate polylines will be created:




- **Reverse Line** — flips the order of the segments in the polyline.
- **Add to Surface** — this command will be available when a surface is present in the current job. All segment(s) will be added to the surface if the segments are within the surface boundaries. If the current job contains more than one surface, choose the desired Surface to add polylines.
- **Insert Point(s) to Line** — inserts a point to the selected segment. See "Insert Point(s) to Line command" section on page 131 for details.
- **Append Point(s) to Line** — adds a point to the selected segment. See "Append Point(s) to Line command" section on page 132 for details.
- **Zoom to Selection** — automatically zooms in the highlighted segments in the Map View.

## Surfaces tab


The Surfaces tab is shown only if the job contains a digital terrain model.

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a surface. See "Symbols for the Surfaces tab" section on page 395 for details. |
| *Name* | Displays the name of the surface. To edit the name, click on the highlighted field and enter a new name. The surface name is unique and the field cannot be empty. |

| Field | Description |
|---|---|
| *Focus Point* | Displays the name of a focus point. If the column is empty, the triangulation is completed in relation to the ground plane. If set to some existing point, the triangulation will be done with respect to that point, that is as if the surface is viewed from that point. You can select a point from the list of the job's points. |
| *Layer* | Displays the name of the Layer in which the surface resides. The Layer sets the plotting style for the surface. Every surface has to have a Layer. In this field, you can select any Layer from the list of user-created layers. |
| *Number of Points* | Displays the quantity of points in the surface, including intersection points of lines forming this model. You cannot edit this parameter. |
| *Number of Triangles* | Displays the quantity of triangles created on the surface. You cannot edit this parameter. |
| *Area* | Displays the sum of areas of the triangle projections on the horizontal plane (if the triangulation is done with respect to the ground plane) and the vertical plane (if the triangulation is done with respect to a vertical plane from a focus point for the given surface). You cannot edit this parameter. |
| *Minimum Northing* | Displays the minimum value of northing coordinates of points included in the surface. You cannot edit this parameter. |
| *Maximum Northing* | Displays the maximum value of northing coordinates of points included in the surface. You cannot edit this parameter. |
| *Minimum Easting* | Displays the minimum value of easting coordinates of points included in the surface. You cannot edit this parameter. |
| *Maximum Easting* | Displays the maximum value of easting coordinates of points included in the surface. You cannot edit this parameter. |
| *Minimum Elevation* | Displays the minimum value of elevation coordinates of points included in the surface. You cannot edit this parameter. |
| *Maximum Elevation* | Displays the maximum value of elevation coordinates of points included in the surface. You cannot edit this parameter. |
| *Comment* | Displays any additional information about the surface. |
| *Need Update* | Displays the current status of the surface. If set to "No", the surface is not changed, or automatic update is done. If set to "Yes", the surface is changed, and automatic update of the changed surface is disabled. |
| *Auto Update* | When unticked (default setting), automatic update of the changed surface is disabled. If ticked, automatic update of the changed surface is enabled. |

Right-click on a highlighted line to display a pop-up menu. This menu contains a set of commands and they can be divided into two groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific commands for the *Surfaces* tab. See "Pop-up menu for Surfaces tab" section below for details.

## Pop-up menu for Surfaces tab

In Surfaces tab you can execute the special (only for surface) commands:

- **Add to this Surface** — adds the selected object (point, line) to this surface.
- **Contour Lines** — this command is available for a surface which does not have a focus point. This command opens ***Contour Lines*** window. This window allows contouring the surface with intervals and layers specified for the major and minor lines. See "Drawing Contour Lines for surface" section on page 343 for details.
- **3D View** — opens and displays the surface on 3D View.
- **Map View** — opens and displays the surface on Map View.
- **Zoom to Selection** — automatically zooms in the highlighted surface(s) on Map View.
- **Update Surface** — starts the automatic updating the changed surface. After updating the *Need Update* field displays "No".

## Roads tab


The *Roads* tab is shown only if the job contains road data. MAGNET Tolls allows you to create a road using one of  following two ways:

- Through horizontal and vertical projections of the center line (alignment) and lines representing the surface of the road and lying in the planes perpendicular to the center line — X-Section.
- Through a set of several strings — String Set. Every separate string in the set is defined by one or several pairs of the horizontal and vertical alignments.

The application allows you to edit/view any road created in MAGNET Field, and allows you to create a new road with X-Section.

The left panel of the Roads tab contains the list of roads in the job. Each road involves horizontal alignment, vertical alignment and either X-section or Road String Set :

| Road with X-Section | Road with String Set |
|---|---|
| Road_Name<br>A1 (Horizontal alignment)<br>V1 (Vertical alignment)<br>R-1 (X-Sections) | Road_Name-1<br>CENT_Line-1 (Horizontal alignment)<br>CENT_Line-1 (Vertical alignment)<br>Crossing-1 (Road String Set) |

For detailed description see the appropriate section:

- "Road content" section on the next page
- "Horizontal alignment content" section on the next page
- "Vertical alignment content" section on page 175
- "X-Section content" section on page 178
- "Road String Set content" section on page 179

The right panel displays the parameters of the object, selected in the left panel:

- Road — the right panel displays the horizontal and vertical alignment in the table and 2D graphic views.
- Horizontal or vertical alignment — the right panel displays the horizontal or vertical alignment in the table and 2D graphic views.
- Table or graphic view of the horizontal or vertical alignment — the right panel displays the corresponding view only.
- X-Sections — the right panel displays the X-Sections in the table and 2D graphic views.
- String Set — the right panel displays the list of road strings which form the given String Set.

- Single Road String — the right panel displays the list of the pairs of the horizontal/vertical alignments for that string.
- Single pair of the horizontal/vertical alignments — the right panel displays the horizontal and vertical alignment in the table and 2D graphic views.
- Horizontal alignment or vertical alignment of the road string — the right panel displays the horizontal or vertical alignment in the table and 2D graphic views.
- Table or graphic view of the horizontal or vertical alignment of the road string — the right panel displays the corresponding view only.

Right-click on a highlighted object in the left panel, to display a pop-up menu. This menu contains a set of commands and they can be divided into two groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific commands for a single road. See "Pop-up menu for a road" section on page 192 for details.
- Specific commands for the horizontal alignment. See "Horizontal alignment content" section below for details.
- Specific commands for the vertical alignment. See "Vertical alignment content" section on page 175 for details.
- Specific commands for the X-Section. See "X-Section content" section on page 178 for details.

## Road content

A road is the root item in the tree that displays a road name. You can edit the road name. The tree involves a horizontal alignment, a vertical alignment and either a X-section or a Road String Set:

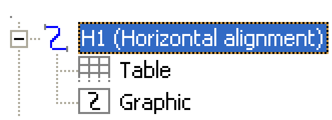
| Road with X-Section | Road with String Set |
|---|---|
| Road_Name<br>A1 (Horizontal alignment)<br>V1 (Vertical alignment)<br>R-1 (X-Sections) | Road_Name-1<br>CENT_Line-1 (Horizontal alignment)<br>CENT_Line-1 (Vertical alignment)<br>Crossing-1 (Road String Set) |

Right-click on a highlighted road object in the left panel, to display a pop-up menu. This menu contains a set of commands and they can be divided into two groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific commands for a single road. See "Pop-up menu for a road" section on page 192 for details.

## Horizontal alignment content

The root tree item displays a horizontal alignment name. You can edit its name. The tree of the horizontal alignment consists of table and graphic views:




See "Table view of the horizontal alignment" section on the facing page and "Graphic view of the horizontal alignment" section on page 175 for details.

When you select the horizontal alignment, the right panel of the *Road* tab from the Tabular view displays the horizontal alignment in the table and 2D graphic views. When you select a desired view, the right panel will display only this view.

Right-click on a highlighted object in the left panel, to display a pop-up menu. This menu contains a set of commands and they can be divided into two groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific command for the horizontal alignment. See below.

### *Add Horz element command of the pop-up menu*

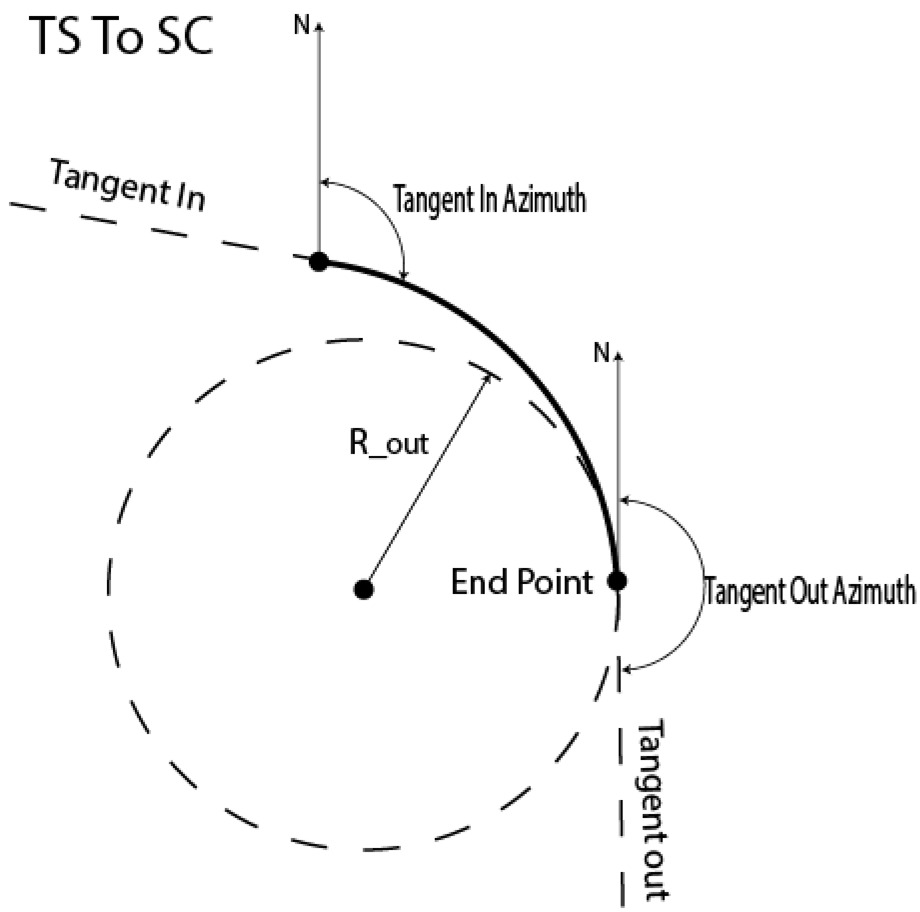
Adds the horizontal alignment to the road. Horizontal alignment is created through line, curve, spiral, intersection. Opens ***Add Horz Element*** dialog. In the *General* tab of the dialog select a desired horizontal alignment type from the *Type* drop-down list.

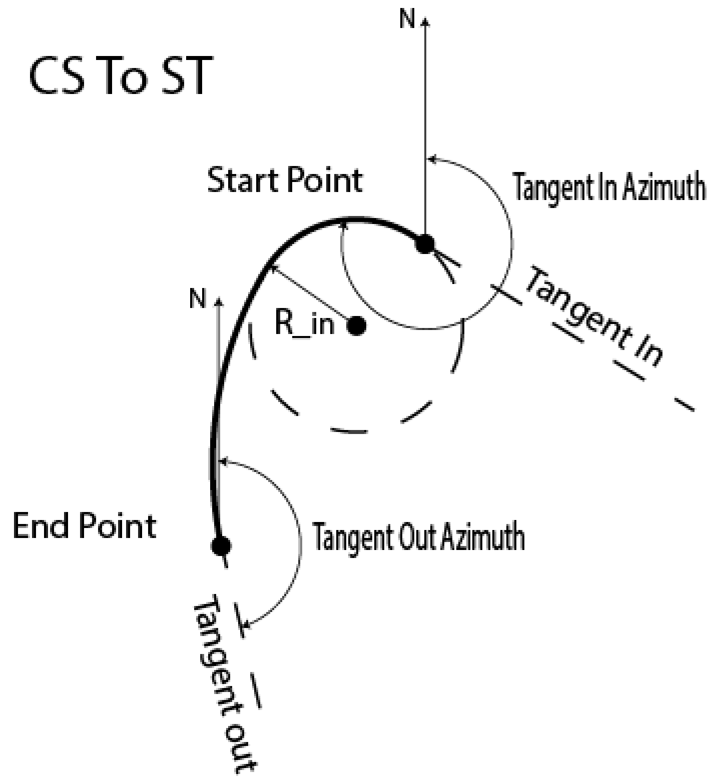
See "General tab" section on page 281 for details.

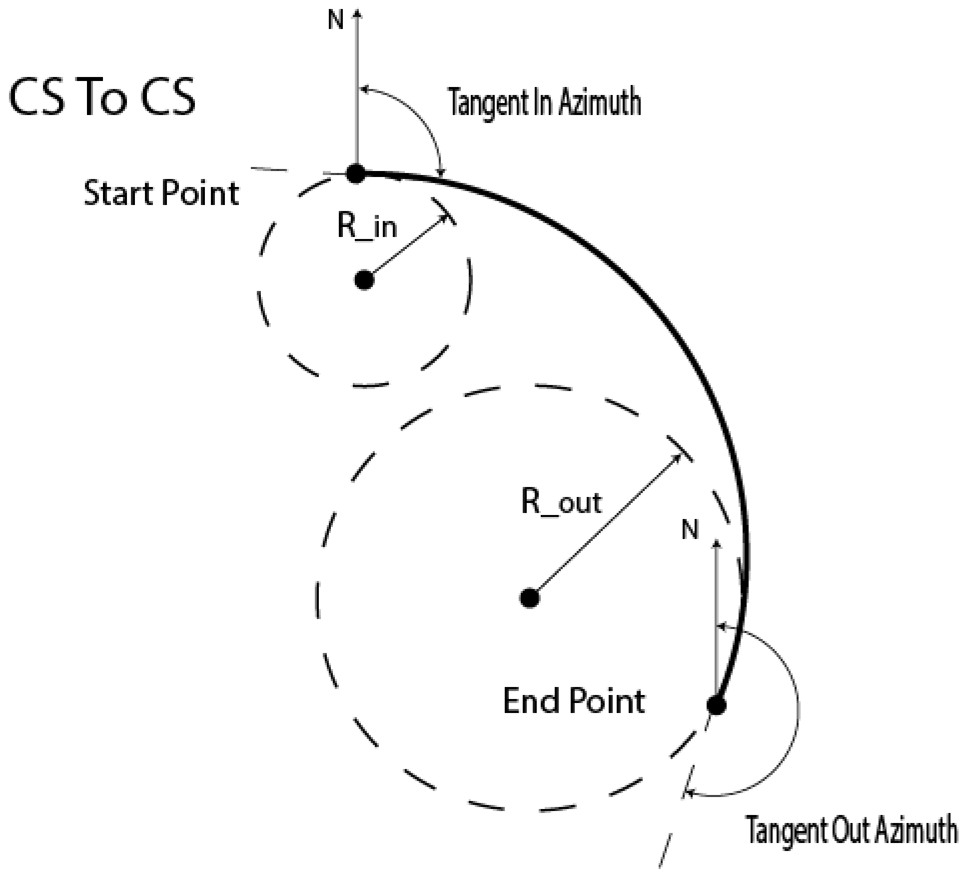
### *Table view of the horizontal alignment*

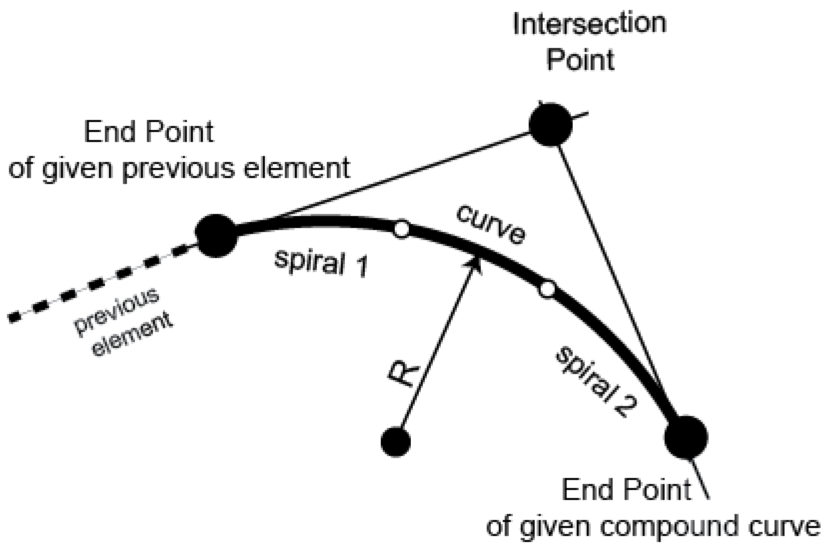
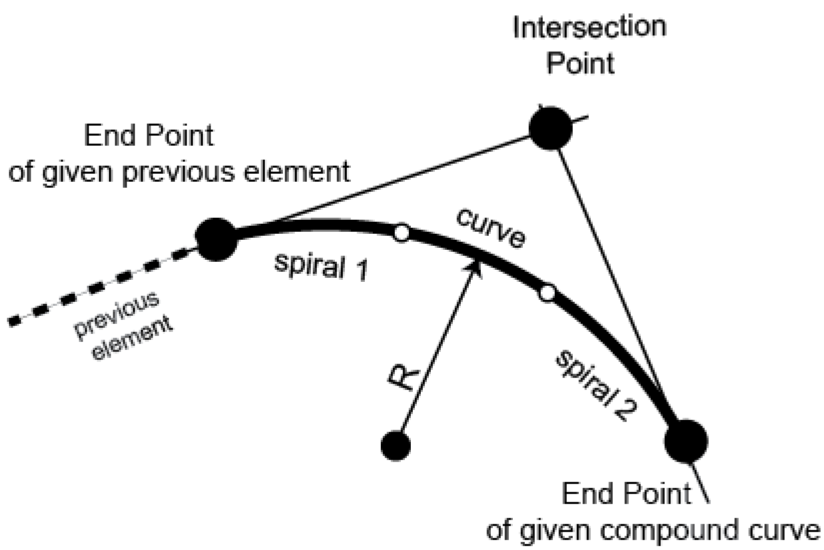
When you select the table view in the left panel, the right panel will display the parameters of the horizontal alignment in the table view only. Fields are described in the table below. All information are displayed in current units.

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a horizontal alignment. See Symbols in the table view of horizontal alignment for details. |
| *Order* | Defines the order of the element in the horizontal alignment. You can set any number from the list of element numbers. |

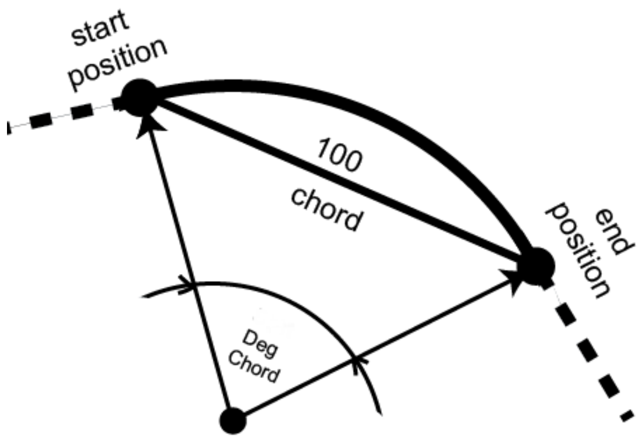
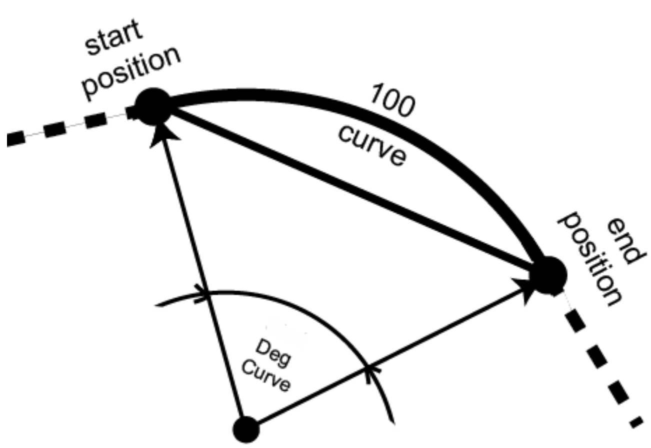
| Field | Description |
|---|---|
| *Type* | Defines the type of a road horizontal element. In this field you can select one of the following types:<br>• *Line*<br>• *Curve*<br>• *Spiral TS to SC* “Traverse-Spiral to Spiral-Curve“ direction means that the start station of the spiral is the end station of the line, and the end station of the spiral is the start station of the curve:<br><br><br>• *Spiral CS to ST* “Curve-Spiral to Spiral-Traverse“ direction means that the start station of the spiral is the end station of the curve, and the end station of the spiral is the start station of the line: |

| Field | Description |
|---|---|
| | <br><br>• *Spiral CS to SC* “Curve-Spiral to Spiral-Curve“ direction means that the start station of the spiral is the end station of one curve, and the end station of the spiral is the start station of the other curve. |

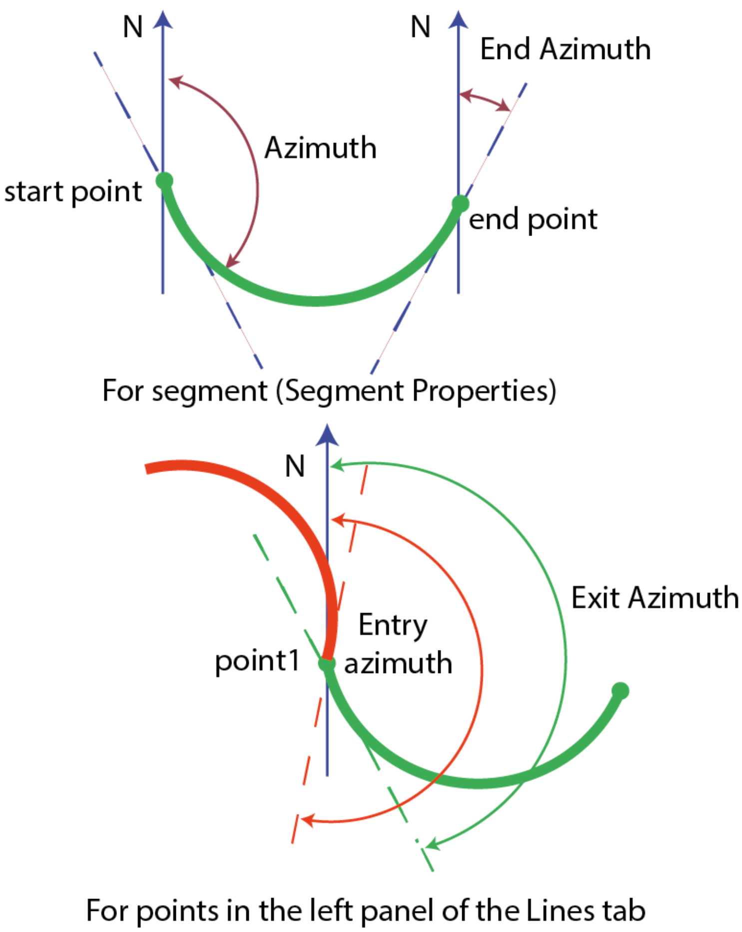
| Field | Description |
|---|---|
| | <br>• *Intersection* |
| *Azimuth* | Defines the azimuth of the tangent to the start point of the horizontal alignment. You can edit this value only for the starting element of the road (in this case the *Tangential to previous element* checkbox is disabled). To change the azimuth of all other elements, untick the *Tangential to previous element* checkbox and type the desired value in the filed. |
| *Length* | Defines the length of the horizontal element. |
| *Turn* | Defines the direction of turn of the curve/spiral. The Right value stands for clockwise direction and the Left value, for counter-clockwise direction. |
| *Start Radius* | Defines either the radius of the curve or the start radius of the spiral. See General tab for details. |
| *End Radius* | Defines the end radius of the spiral of *TS to SC* or *CS to SC* type. |
| *Northing* | Defines the intersection point's or compound curve end point's northing coordinate in the current coordinate system. You can edit the value, if a point is not selected in the *Intersection Pt* list. |
| *Easting* | Defines the intersection point's or compound curve end point's easting coordinate in the current coordinate system. You can edit the value, if a point is not selected in the *Intersection Pt* list. |

| Field | Description |
|---|---|
| *Spiral 1 Length* | Defines the length of the first spiral of the compound curve. You can edit the value.   |
| *Spiral 2 Length* | Defines the length of the second spiral of the compound curve.   |
| *End Station/Chainage* | Displays the number of the end station/ chainage for the horizontal element. You cannot edit this value. |
| *Intersection Point* | Defines the name of the intersection point or the end point of the compound curve. You can select the desired point from the list. After selecting the point, the *Northing* and the *Easting* fields displays the coordinates of the selected point. These coordinates cannot be changed for the selected point. |

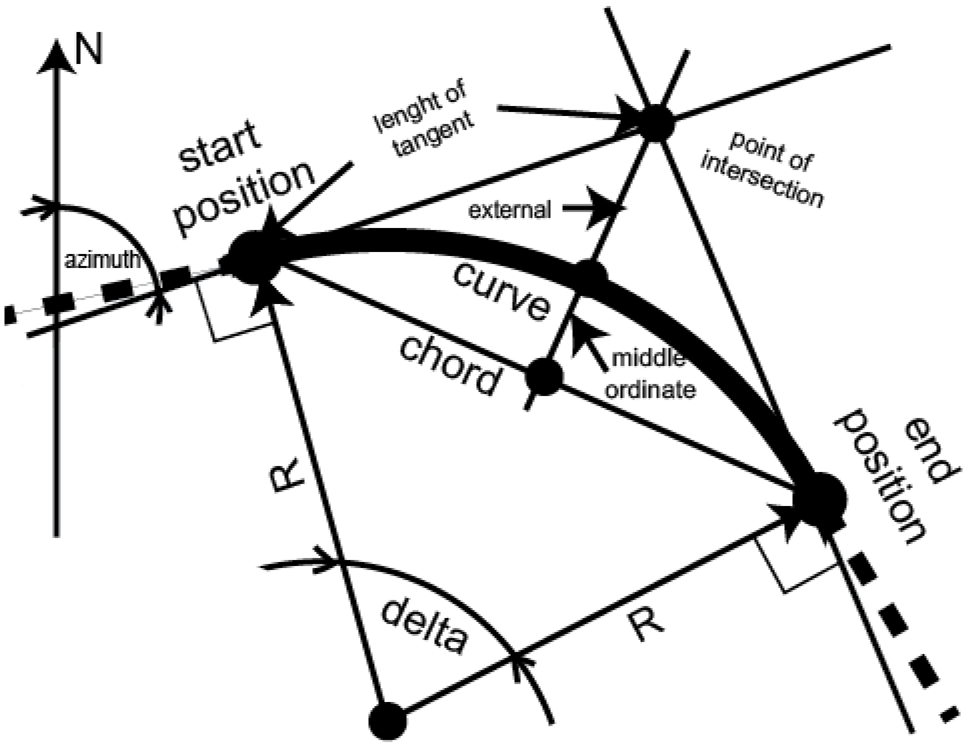
| Field | Description |
|---|---|
| *Tangential to previous* | If this parameter is ticked (default setting for all horizontal element types except the first road element), the defined value of the azimuth will be used for the next alignment as start azimuth, and you cannot edit the azimuth. Untick the checkbox to edit the azimuth. |
| *End Northing* | Displays the northing coordinate of the end point of the horizontal element in Ground / Grid coordinate system. |
| *End Easting* | Displays the eastigng coordinate of the end point of the horizontal element in Ground / Grid coordinate system. |
| *End Azimuth* | Displays the azimuth of the tangent to the given point for the horizontal element. |
| *End Azimuth* | Displays the azimuth of the tangent to the given point for the horizontal element. See picture below for details. |
| *Delta* | Displays the angle between the radii corresponding to the curve. See picture below for details. |
| *Chord* | Displays the length of the segment joining start and end points of a curve in the current linear units. See picture below for details. |
| *Tangent* | Defines the length of the segment which touches the given curve in the current linear units. See picture below for details. |
| *Mid Ord* | Defines the distance from the midpoint of a chord to the midpoint of the corresponding curve (Middle Ordinate) in the current linear units. See picture below for details. |
| *External* | Defines the distance from the midpoint of the curve to the intersection point of the tangents in the current linear units. See picture below for details. |
| *Spiral Const* | Defines the spiral constant value. The spiral constant is the square root of the length multiplied by the radius of the spiral. The value is used to define a compound curve. |
| *Spiral Const 1* | Displays the square root of the length multiplied by the radius of the first spiral for the compound curve. See picture from the *Spiral 1 Length* field. |
| *Spiral Const 2* | Displays the square root of the length multiplied by the radius of the second spiral for the compound curve. See picture from the *Spiral 1 Length* field. |

| Field | Description |
|---|---|
| *Start Deg Chord* | Defines the angle in degrees used to compute either the radius of the curve or the start radius of the spiral of the *CS to ST* or the *CS to SC* type, whose chord is 100 units long:   Using the degree of chord (DCH) parameter, the radius of the curve can be calculated as follows: $R = \frac{50}{\sin(\frac{DCH}{2} + \frac{\pi}{180})}$ |
| *Start Deg Curve* | Defines the angle in degrees used to compute either the radius of the curve or the start radius of the spiral of the *CS to TS* or *CS to SC* type whose curve is 100 units long:   Using the degree of curve (DCV) parameter, the radius of the curve can be calculated as follows: $R = \frac{100 \times 180}{\pi} \times \frac{1}{DCV}$ |

| Field | Description |
|---|---|
| *End Deg Chord* | Displays the angle in degrees used to compute either the radius of the curve or the end radius of the spiral of the *TS to SC* or the *CS to SC* type whose chord is 100 units long. See picture from the *Start Deg Chord* field.<br>Using the degree of chord (DCH) parameter, the radius of the curve can be calculated as follows:<br>$R = \frac{50}{\sin(\frac{DCH}{2} + \frac{\pi}{180})}$ |
| *End Deg Curve* | Defines the angle in degrees used to compute either the radius of the curve or the start radius of the spiral of the *TS to SC* or the *CS to SC* whose curve is 100 units long. See picture from the *Start Deg Curve* field.<br>Using the degree of curve (DCV) parameter, the radius of the curve can be calculated as follows:<br>$\mathrm{R} = \frac{100 \times 180}{\pi} \times \frac{1}{DCV}$ |




**Entry and exit azumuth**



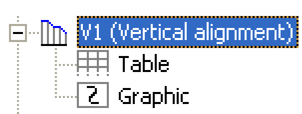

**Curve parameters**

*Graphic view of the horizontal alignment*

When you select the graphic view in the left panel, the right panel of the *Road* tab of the Tabular view will display all elements of the horizontal alignment in the graphic view in the Grid or Ground coordinate system. You can select any element of the alignment. The start and end stations of any element and intersection points are displayed. The alignment is displayed using the plotting style of the layer for the given road.

## Vertical alignment content

The root tree item displays a vertical alignment name. You can enter / edit the name of the alignment. The tree of the vertical alignment consists of table and graphic views:




See "Table view of the vertical alignment" section on the next page and "Graphic view of the vertical alignment" section on page 178 for details.

When you select the vertical alignment, the right panel of the *Road* tab from the Tabular view displays the vertical alignment in the table and 2D graphic views. When you select a desired view, the right panel will display only this view.

Right-click on a highlighted object in the left panel, to display a pop-up menu. This menu contains a set of commands and they can be divided into two groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific command for the vertical alignment. See below.

### Add Vert Element command of the pop-up menu

Adds the vertical alignment to the road. Vertical alignment is created through grade, circular arc and parabolas, or long sections. When adding the first element to a horizontal alignment, all vertical elements are available. Opens the ***Add Vert Element*** dialog. At the *General* tab of the window select a desired vertical alignment type from the *Type* drop-down list. If selecting a grade or parabola as the first element, only a grade or parabola or a circular arc can be the next element added to the vertical alignment. If selecting a long section as the first element, only a parabola long sections or arc long sections can be the next element of the vertical alignment.

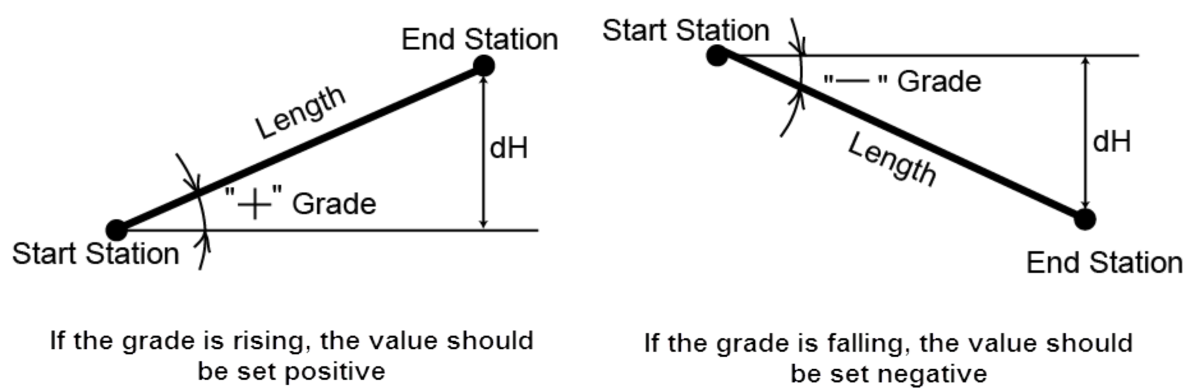
See "General tab" section on page 291 for details.

### Table view of the vertical alignment

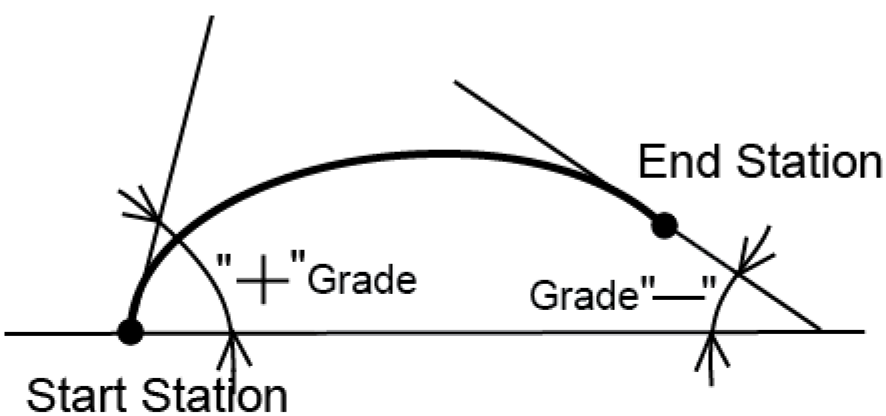
When you select the table view of the vertical alignment in the left panel, the right panel will display the parameters of the vertical alignment in the table view only. Fields are described in the table below.

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a vertical alignment. See "Symbols in the vertical alignment table view" section on page 396 for details. |
| *Order* | Defines the order of the element in the vertical alignment. You can set any number from the list. |
| *Type* | Defines the type of a road vertical alignment. You can select one of the following types:<br>• Grade,<br>• Parabola,<br>• Circular Arc,<br>• Parabola Long Section,<br>• Arc Long Section.<br>If selecting a grade or parabola as the first element, then either a grade, or parabola, or a circular arc can be the next element added to the vertical alignment.<br>If selecting a long section as the first element, the only either a parabola long sections, or arc long sections can be the next element of the vertical alignment.<br>See pictures below for details. |
| *Sta/Chainage* | Defines the number of the start station or chainage for a vertical element. You can edit this parameter for a parabola long section and an arc long section and cannot edit this parameter for grade, parabola, circular arc.<br>You can select chainage or station to use for the road center line position at the *Roads* tab of the *Display* item from the ***Job Configuration*** dialog. See "Roads tab" section on page 93 for details. |
| *Length* | Defines the length of the vertical element. You can edit this parameters for the grade, parabola and parabola long section. The length of the circular arc is automatically calculated taking into account entered values of the *Radius*, *Start Grade* and *End Grade* parameters. For the long section element, set 0 for the start and end elements of the long section. |

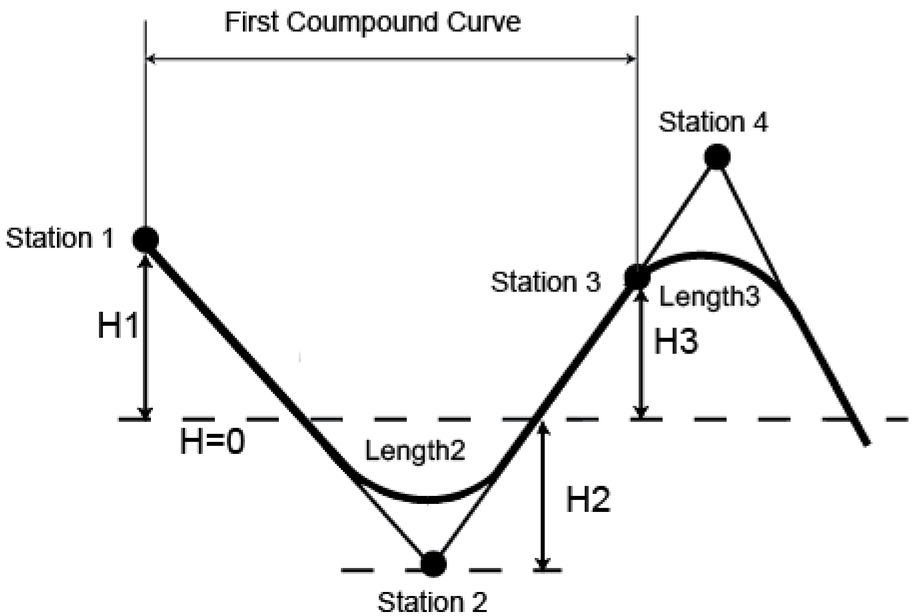
| Field | Description |
|---|---|
| *Start Grade* | or grade vertical alignment type, displays the ratio of the grade length and delta H (the difference between the elevations at the end station and the start station of the grade element) multiplied by 100% .<br>For parabola and circular arc displays the start grade of the element, in percents.<br>You can edit this parameter. If the grade is rising, the value should be set positive; if the grade is falling, the value should be set negative.<br>See pictures below for details. |
| *End Grade* | For parabola and circular arc displays the end grade of the element, in percents. You can edit this parameter. If the grade is rising, the value should be set positive; if the grade is falling, the value should be set negative.<br>See pictures below for details. |
| *Elevation* | Defines the elevation on the station used for creating the long section. |
| *Radius* | Defines the radius of the Circular Arc and Arc Long Section vertical element. For the arc long section element, set 0 for start and end element of the long section. |




**Rising and falling grades**




**Parabola**




**Compound curve in the vertical plane**

### *Graphic view of the vertical alignment*

When you select the graphic view in the left panel, the right panel of the *Roads* tab from the Tabular view displays all elements of the vertical alignment in the graphic view. You can select any element of the alignment. The start and end stations of any element are displayed. The alignment is displayed using the plotting style of the layer for the given road.

## X-Section content

The root tree item displays a X-Section name. You can enter / edit the name of the X-Section. The tree of the X-Section consists of table view:


When you select the X-Section, the right panel of the *Road* tab from the Tabular view displays the X-Section in the table and 2D graphic views. When you select a table view, the right panel will display only table. See Table view of the X-Section for details.

Right-click on a highlighted object in the left panel, to display a pop-up menu. This menu contains a set of commands and they can be divided into two groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific command for the vertical alignment. See below.

### *Add X-Section command of the pop-up menu*

Adds a cross-section to the center line. X- section are the lines representing the surface of the road and lying in the plane perpendicular to the center line. Opens the ***Add X-Section*** dialog.

See General tab for details.

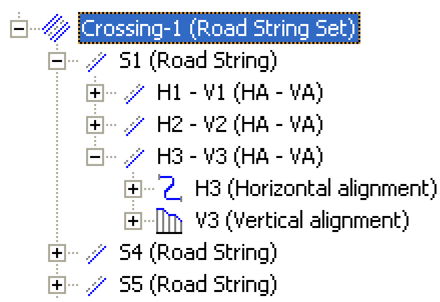
### *Table view of the X-Section*

When you select the table view in the left panel, the right panel will display the parameters of the X-Section in the table view only. Fields are described in the table below.

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a X-Section. See "Symbols for the X-Section table view" section on page 395 for details. |
| *Sta/Chainage* | Defines the station or chainage where the template is to be applied. If you set "0", the selected template is applied from the road start point to the road end point or to the point where a new template is applied. |
| *Side* | Defines the left or right side of the road relative to the center line where this template is to be used. |
| *Template* | Displays the name of the current template. You can select other template from the list of existing templates in the current job. |

## Road String Set content

The root tree item displays a Road String Set name. You can edit the name. The tree of the Road String Set involves a set of separate Road Strings , each Road string consists of the pair pairs of the horizontal and vertical alignments (HA-VA). The tree of the horizontal/vertical alignment consists of the table and graphic views:



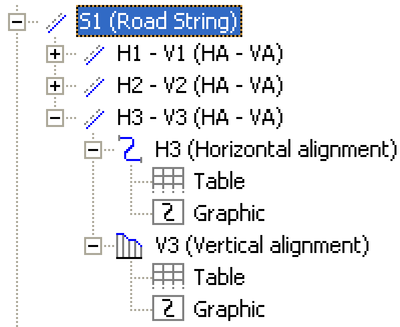

See "Road String content" section below and "Pairs of the horizontal and vertical alignments content" section on the next page for details.

When you select a Road String Set in the left panel, the right panel displays the list of separate Road strings which are included into the given string set. Fields are described in the table below.

| Field | Description |
|---|---|
| *Icon* | Displays a symbol associated with the Road String. For any Road String type the icon is used. |
| *Name* | Display a Road String name. To edit the name, click on the highlighted field and enter a new name. The Road String name is unique and the field cannot be empty. |
| *Order* | Displays the order of a separate Road String in the selected Road String Set. You can set any number from the list of Road String numbers. |

### *Road String content*

The root tree item displays a name of the separate Road String. You can edit the name. Each Road String consists of the pairs of the horizontal and vertical alignments (HA-VA). The tree of the horizontal/vertical alignment consists of the table and graphic views:

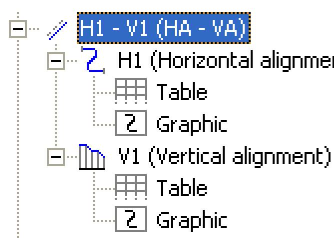



When you select a single Road String in the left panel, the right panel displays the list of horizontal and vertical alignments which are included into the given Road String. Fields are described in the table below.

| Field | Description |
|---|---|
| *Horizontal Alignment Name* | Defines the current horizontal alignment name for the Road String. You can select other horizontal alignment from the list for the given road. |
| *Vertical Alignment Name* | Defines the current vertical alignment name for the Road String. You can select other vertical alignment from the list for the given road. |

## Pairs of the horizontal and vertical alignments content

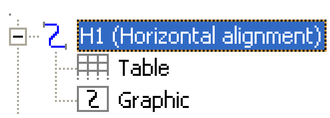
The root tree item displays a name of the pair horizontal and vertical alignments (HA-VA). The tree of the horizontal/vertical alignment consists of the table and graphic views:




When you select a single pair of the horizontal and vertical alignments of the road string in the left panel, the right panel displays the horizontal and vertical alignment in the table and 2D graphic views. See "Horizontal alignment from the road string content" section below and "Vertical alignment from the road string content" section on page 189 for details.

### *Horizontal alignment from the road string content*

The root tree item displays a horizontal alignment name. You can enter / edit the name of the alignment. The tree of the horizontal alignment consists of table and graphic views:




See Table view of the horizontal alignment from the road string and Graphic view of the horizontal alignment from the road string for details.

When you select the horizontal alignment, the right panel of the *Road* tab from the Tabular view displays the horizontal alignment in the table and 2D graphic views. When you select a desired view, the right panel will display only this view.

When you select the horizontal alignment, the right panel of the *Road* tab from the Tabular view displays the horizontal alignment in the table and 2D graphic views. When you select a desired view, the right panel will display only this view.

Right-click on a highlighted object in the left panel, to display a pop-up menu. This menu contains a set of commands and they can be divided into two groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific command for the horizontal alignment. See below.

#### *Add Horz element command of the pop-up menu*

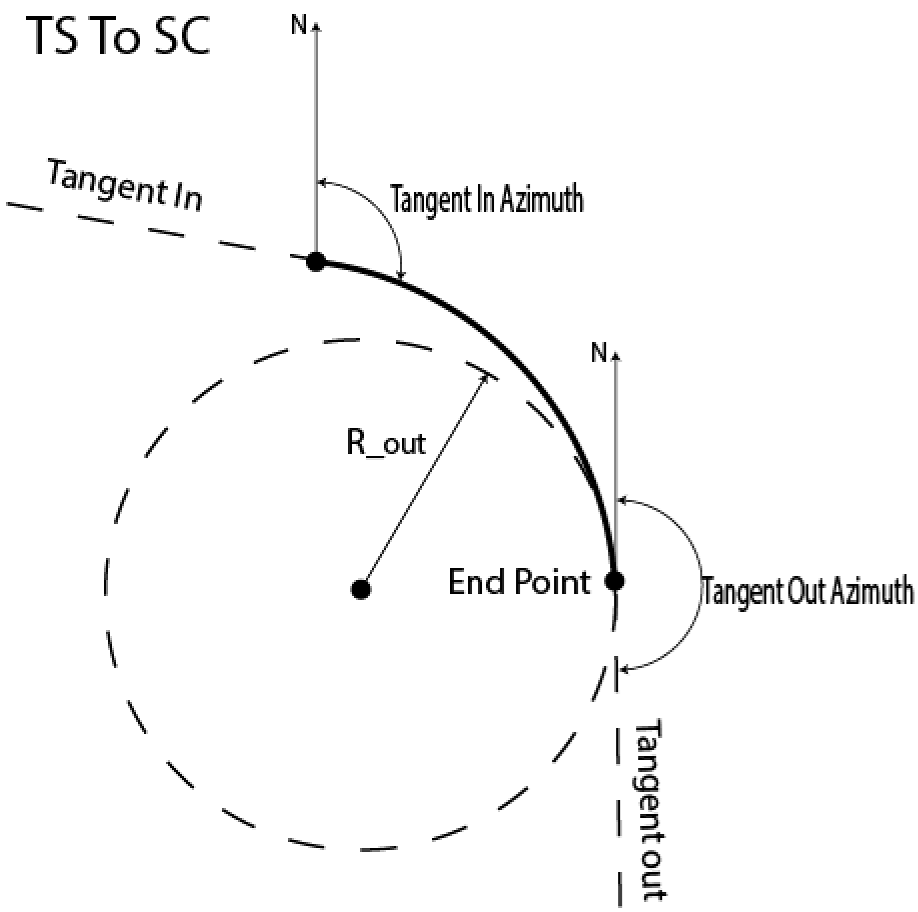
Adds the horizontal alignment to the road. Horizontal alignment is created through line, curve, spiral, intersection. Opens ***Add Horz Element*** dialog. In the *General* tab of the dialog select a desired horizontal alignment type from the *Type* drop-down list.

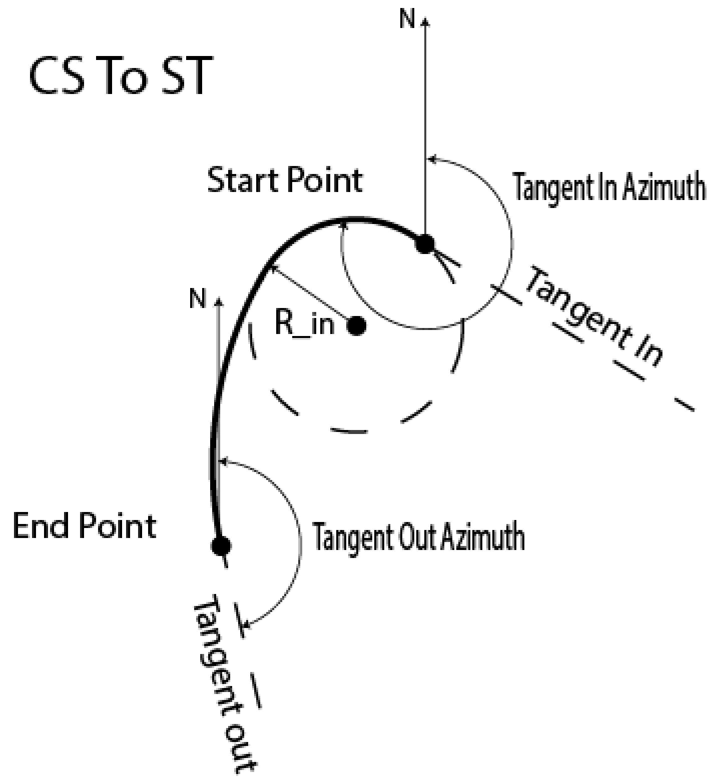
See "General tab" section on page 281 for details.

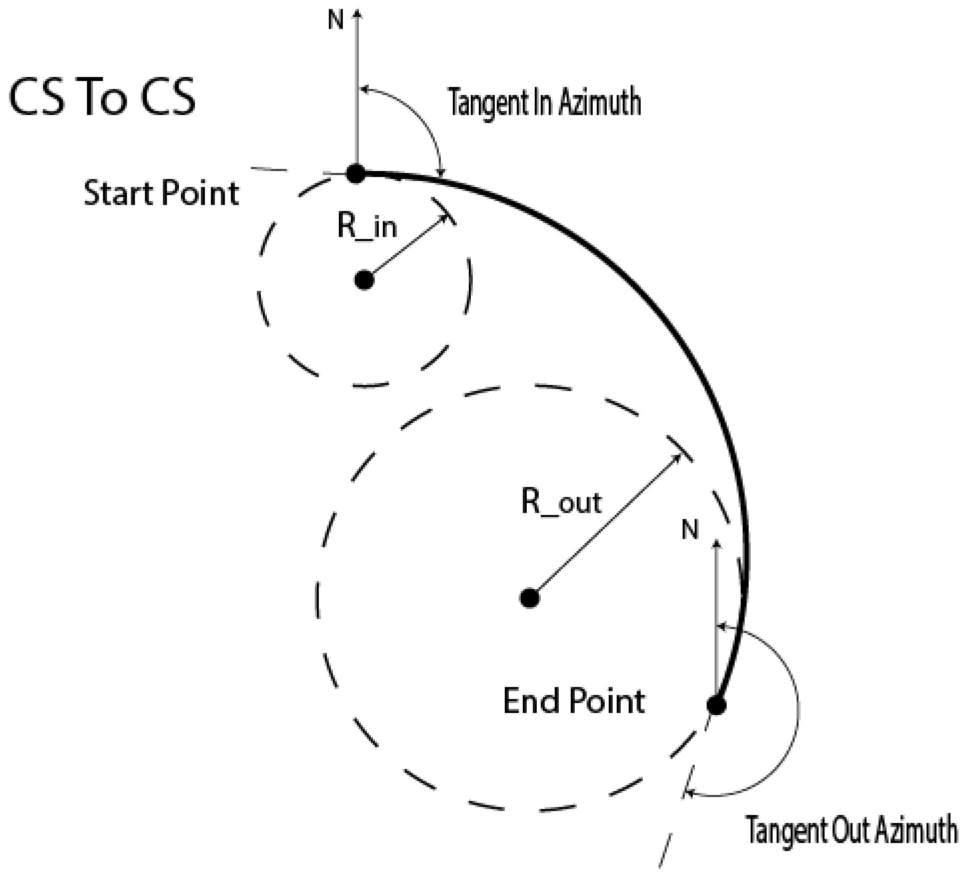
### *Table view of the horizontal alignment from the road string*

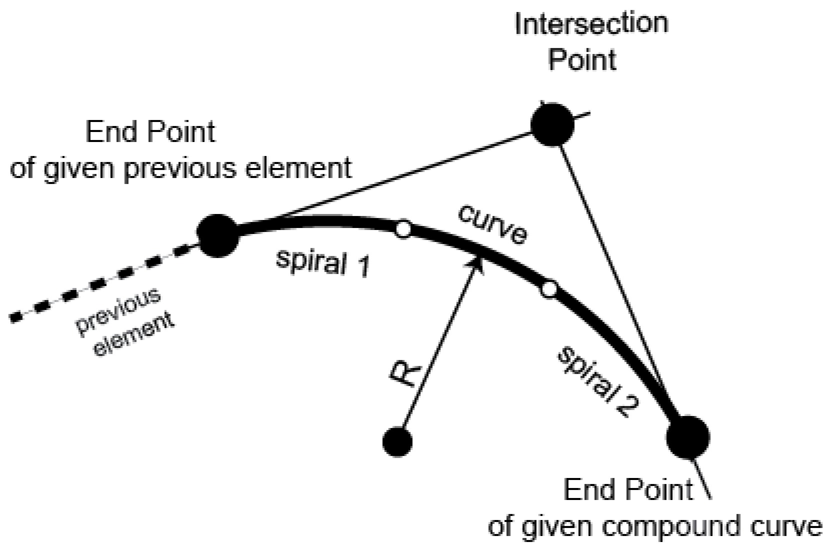
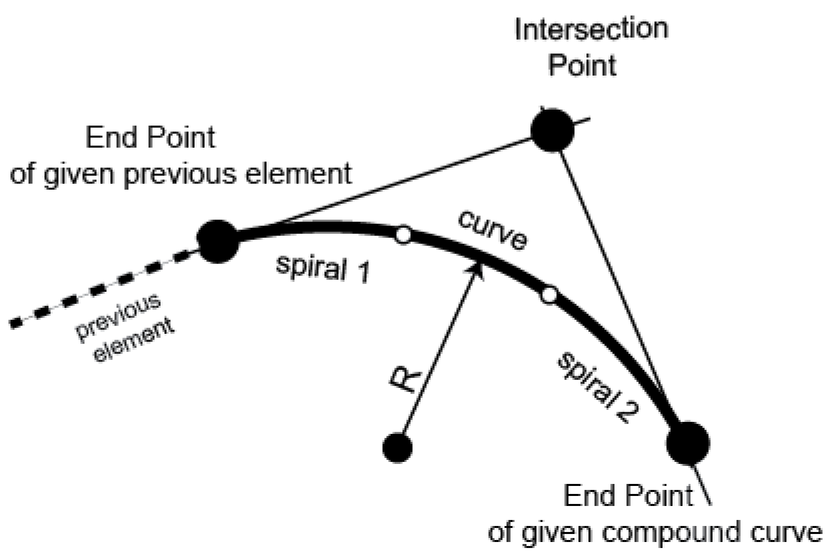
When you select the table view in the left panel, the right panel will display the parameters of the horizontal alignment in the table view only. Fields are described in the table below. All information are displayed in current units.

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a horizontal alignment. See Symbols in the table view of horizontal alignment for details. |
| *Order* | Defines the order of the element in the horizontal alignment. You can set any number from the list of element numbers. |

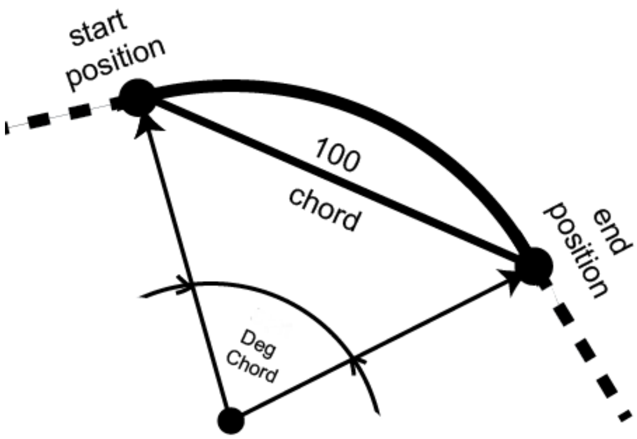
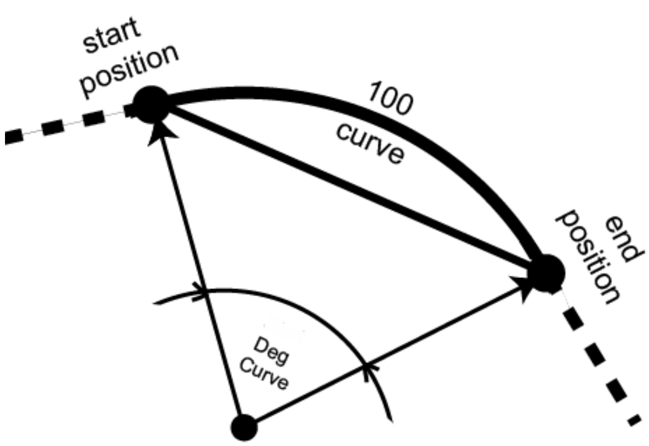
<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Type</td><td>Defines the type of a road horizontal element. In this field you can select one of the following types:
<ul>
<li>Line</li>
<li>Curve</li>
<li>Spiral TS to SC “Traverse-Spiral to Spiral-Curve“ direction means that the start station of the spiral is the end station of the line, and the end station of the spiral is the start station of the curve:<br>

</li>
<li>Spiral CS to ST “Curve-Spiral to Spiral-Traverse“ direction means that the start station of the spiral is the end station of the curve, and the end station of the spiral is the start station of the line:</li>
</ul></td></tr>
</table>

| Field | Description |
|---|---|
| | <br>• *Spiral CS to SC* “Curve-Spiral to Spiral-Curve“ direction means that the start station of the spiral is the end station of one curve, and the end station of the spiral is the start station of the other curve. |

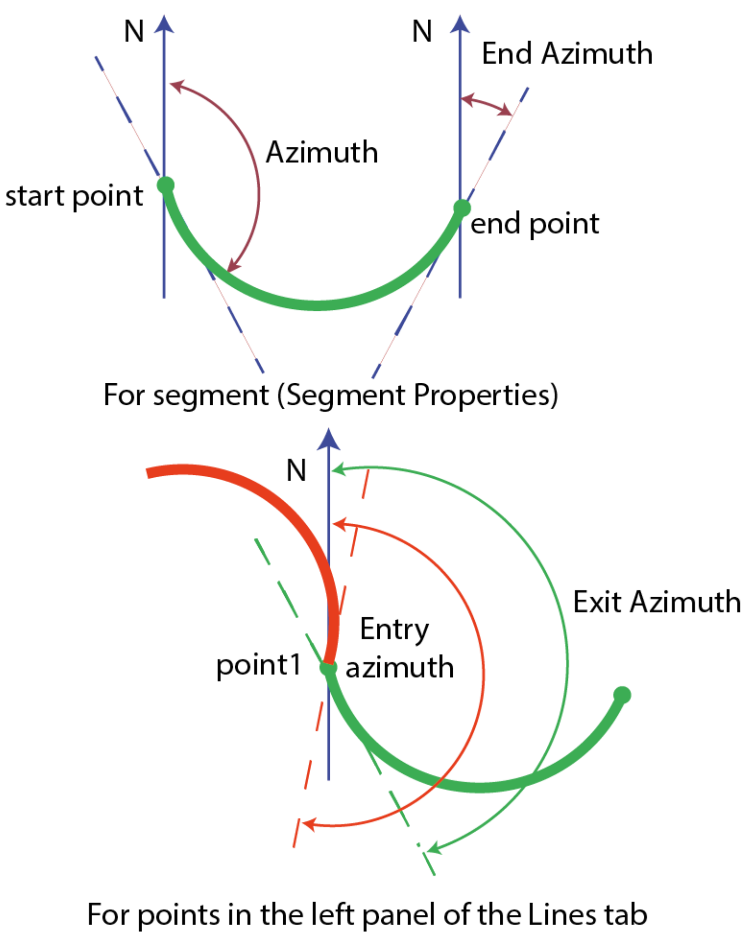
| Field | Description |
| --- | --- |
| | <br>• *Intersection* |
| *Azimuth* | Defines the azimuth of the tangent to the start point of the horizontal alignment. You can edit this value only for the starting element of the road (in this case the *Tangential to previous element* checkbox is disabled). To change the azimuth of all other elements, untick the *Tangential to previous element* checkbox and type the desired value in the filed. |
| *Length* | Defines the length of the horizontal element. |
| *Turn* | Defines the direction of turn of the curve/spiral. The Right value stands for clockwise direction and the Left value, for counter-clockwise direction. |
| *Start Radius* | Defines either the radius of the curve or the start radius of the spiral. See General tab for details. |
| *End Radius* | Defines the end radius of the spiral of *TS to SC* or *CS to SC* type. |
| *Northing* | Defines the intersection point's or compound curve end point's northing coordinate in the current coordinate system. You can edit the value, if a point is not selected in the *Intersection Pt* list. |
| *Easting* | Defines the intersection point's or compound curve end point's easting coordinate in the current coordinate system. You can edit the value, if a point is not selected in the *Intersection Pt* list. |

| Field | Description |
|---|---|
| *Spiral 1 Length* | Defines the length of the first spiral of the compound curve. You can edit the value.   |
| *Spiral 2 Length* | Defines the length of the second spiral of the compound curve.   |
| *End Station/Chainage* | Displays the number of the end station/ chainage for the horizontal element. You cannot edit this value. |
| *Intersection Point* | Defines the name of the intersection point or the end point of the compound curve. You can select the desired point from the list. After selecting the point, the *Northing* and the *Easting* fields displays the coordinates of the selected point. These coordinates cannot be changed for the selected point. |

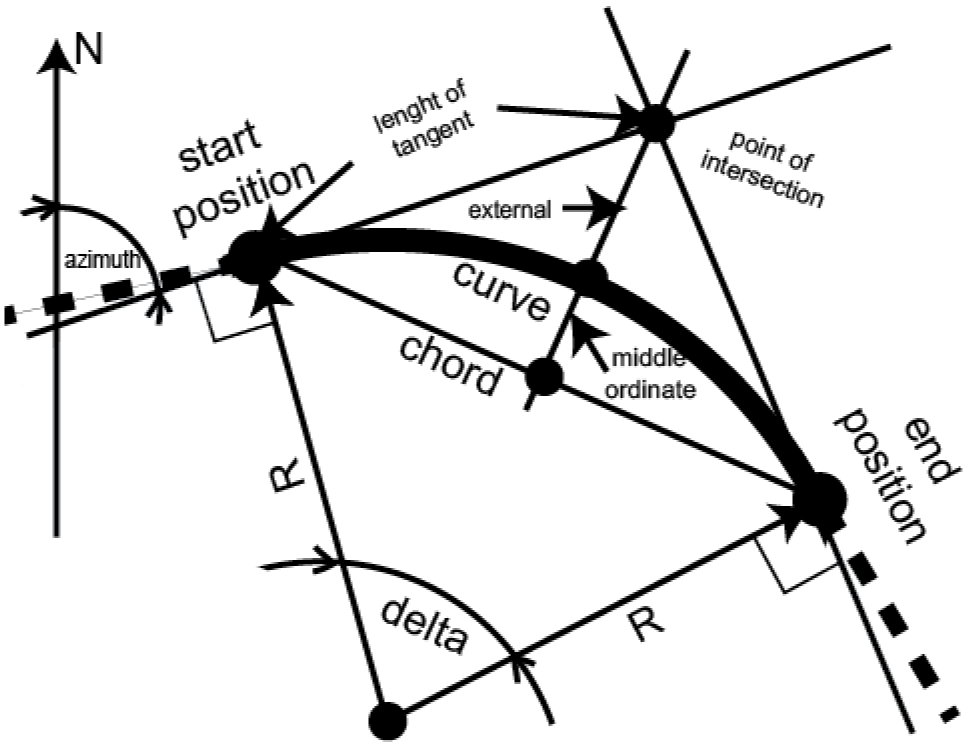
| Field | Description |
|---|---|
| *Tangential to previous* | If this parameter is ticked (default setting for all horizontal element types except the first road element), the defined value of the azimuth will be used for the next alignment as start azimuth, and you cannot edit the azimuth. Untick the checkbox to edit the azimuth. |
| *End Northing* | Displays the northing coordinate of the end point of the horizontal element in Ground / Grid coordinate system. |
| *End Easting* | Displays the eastigng coordinate of the end point of the horizontal element in Ground / Grid coordinate system. |
| *End Easting* | Displays the azimuth of the tangent to the given point for the horizontal element. |
| *End Azimuth* | Displays the azimuth of the tangent to the given point for the horizontal element. See picture below for details. |
| *Delta* | Displays the angle between the radii corresponding to the curve. See picture below for details. |
| *Chord* | Displays the length of the segment joining start and end points of a curve in the current linear units. See picture below for details. |
| *Tangent* | Defines the length of the segment which touches the given curve in the current linear units. See picture below for details. |
| *Mid Ord* | Defines the distance from the midpoint of a chord to the midpoint of the corresponding curve (Middle Ordinate) in the current linear units. See picture below for details. |
| *External* | Defines the distance from the midpoint of the curve to the intersection point of the tangents in the current linear units. See picture below for details. |
| *Spiral Const* | Defines the spiral constant value. The spiral constant is the square root of the length multiplied by the radius of the spiral. The value is used to define a compound curve. |
| *Spiral Const 1* | Displays the square root of the length multiplied by the radius of the first spiral for the compound curve. See picture from the *Spiral 1 Length* field. |
| *Spiral Const 2* | Displays the square root of the length multiplied by the radius of the second spiral for the compound curve. See picture from the *Spiral 1 Length* field. |

<table>
<tr><th>Field</th><th>Description</th></tr>
<tr><td>Start Deg Chord</td><td>Defines the angle in degrees used to compute either the radius of the curve or the start radius of the spiral of the CS to ST or the CS to SC type, whose chord is 100 units long:<br><br><br>Using the degree of chord (DCH) parameter, the radius of the curve can be calculated as follows:<br>$$R = \frac{50}{\sin(\frac{DCH}{2} + \frac{\pi}{180})}$$</td></tr>
<tr><td>Start Deg Curve</td><td>Defines the angle in degrees used to compute either the radius of the curve or the start radius of the spiral of the CS to TS or CS to SC type whose curve is 100 units long:<br><br><br>Using the degree of curve (DCV) parameter, the radius of the curve can be calculated as follows:<br>$$\mathrm{R} = \frac{100 \times 180}{\pi} \times \frac{1}{DCV}$$</td></tr>
</table>

| Field | Description |
|---|---|
| *End Deg Chord* | Displays the angle in degrees used to compute either the radius of the curve or the end radius of the spiral of the *TS to SC* or the *CS to SC* type whose chord is 100 units long. See picture from the *Start Deg Chord* field.<br>Using the degree of chord (DCH) parameter, the radius of the curve can be calculated as follows:<br>$$R = \frac{50}{\sin(\frac{DCH}{2} + \frac{\pi}{180})}$$ |
| *End Deg Curve* | Defines the angle in degrees used to compute either the radius of the curve or the start radius of the spiral of the *TS to SC* or the *CS to SC* whose curve is 100 units long. See picture from the *Start Deg Curve* field.<br>Using the degree of curve (DCV) parameter, the radius of the curve can be calculated as follows:<br>$$\mathrm{R} = \frac{100 \times 180}{\pi} \times \frac{1}{DCV}$$ |




**Entry and exit azumuth**



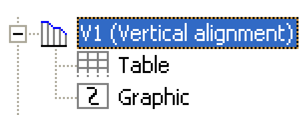

**Curve parameters**

### *Graphic view of the horizontal alignment from the road string*

When you select the graphic view in the left panel of the Roads tab, the right panel will display the horizontal alignment in the graphic view only.

### *Vertical alignment from the road string content*

The root tree item displays a vertical alignment name. You can enter / edit the name of the alignment. The tree of the vertical alignment consists of table and graphic views:




See Table view of the vertical alignment from the road string and Graphic view of the vertical alignment from the road string for details.

When you select the vertical alignment, the right panel of the *Road* tab from the Tabular view displays the vertical alignment in the table and 2D graphic views. When you select a desired view, the right panel will display only this view.

Right-click on a highlighted object in the left panel, to display a pop-up menu. This menu contains a set of commands and they can be divided into two groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific command for the vertical alignment. See below.

### *Add Vert Element command of the pop-up menu*

Adds the vertical alignment to the road. Vertical alignment is created through grade, circular arc and parabolas, or long sections. When adding the first element to a horizontal alignment, all vertical elements are available. Opens the ***Add Vert Element*** dialog. At the *General* tab of the window select a desired vertical alignment type from the *Type* drop-down list. If selecting a grade or parabola as the first element, only a grade or parabola or a circular arc can be the next element added to the vertical alignment. If selecting a long section as the first element, only a parabola long sections or arc long sections can be the next element of the vertical alignment.

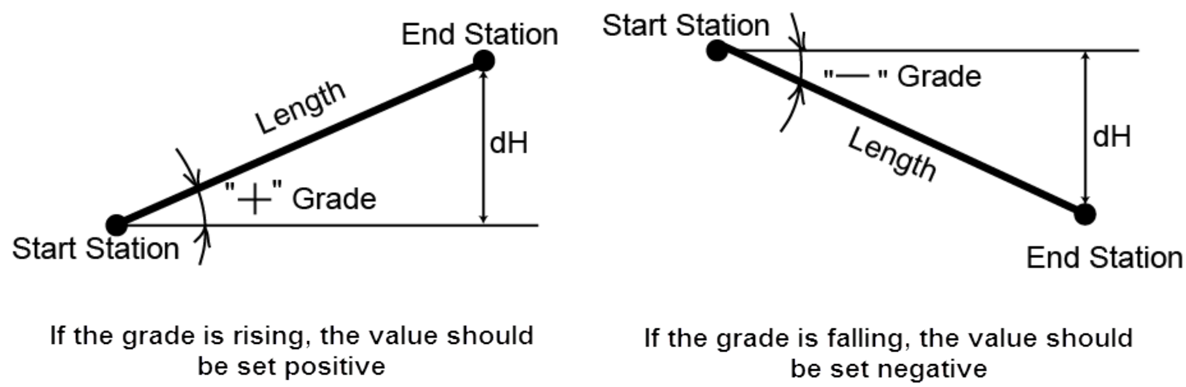
See "General tab" section on page 291 for details.

### *Table view of the vertical alignment from the road string*

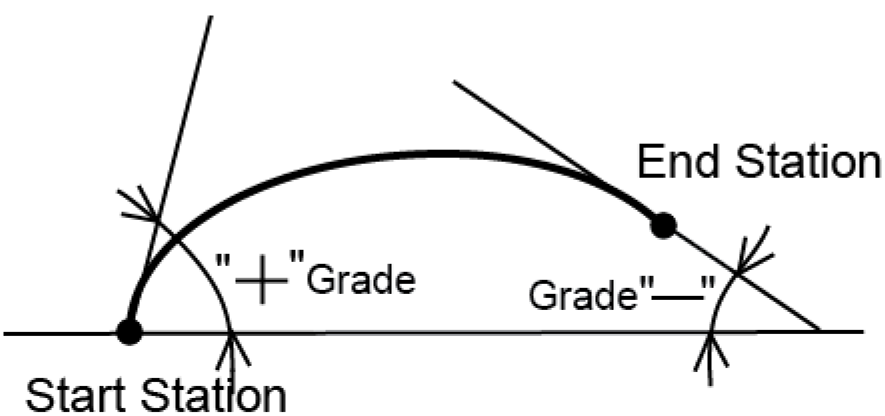
When you select the table view of the vertical alignment in the left panel, the right panel will display the parameters of the vertical alignment in the table view only. Fields are described in the table below.

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a vertical alignment. See "Symbols in the vertical alignment table view" section on page 396 for details. |
| *Order* | Defines the order of the element in the vertical alignment. You can set any number from the list. |
| *Type* | Defines the type of a road vertical alignment. You can select one of the following types:<br>• Grade,<br>• Parabola,<br>• Circular Arc,<br>• Parabola Long Section,<br>• Arc Long Section.<br>If selecting a grade or parabola as the first element, then either a grade, or parabola, or a circular arc can be the next element added to the vertical alignment.<br>If selecting a long section as the first element, the only either a parabola long sections, or arc long sections can be the next element of the vertical alignment.<br>See pictures below for details. |
| *Sta/Chainage* | Defines the number of the start station or chainage for a vertical element. You can edit this parameter for a parabola long section and an arc long section and cannot edit this parameter for grade, parabola, circular arc.<br>You can select chainage or station to use for the road center line position at the *Roads* tab of the *Display* item from the ***Job Configuration*** dialog. See "Roads tab" section on page 93 for details. |
| *Length* | Defines the length of the vertical element. You can edit this parameters for the grade, parabola and parabola long section. The length of the circular arc is automatically calculated taking into account entered values of the *Radius*, *Start Grade* and *End Grade* parameters. For the long section element, set 0 for the start and end elements of the long section. |

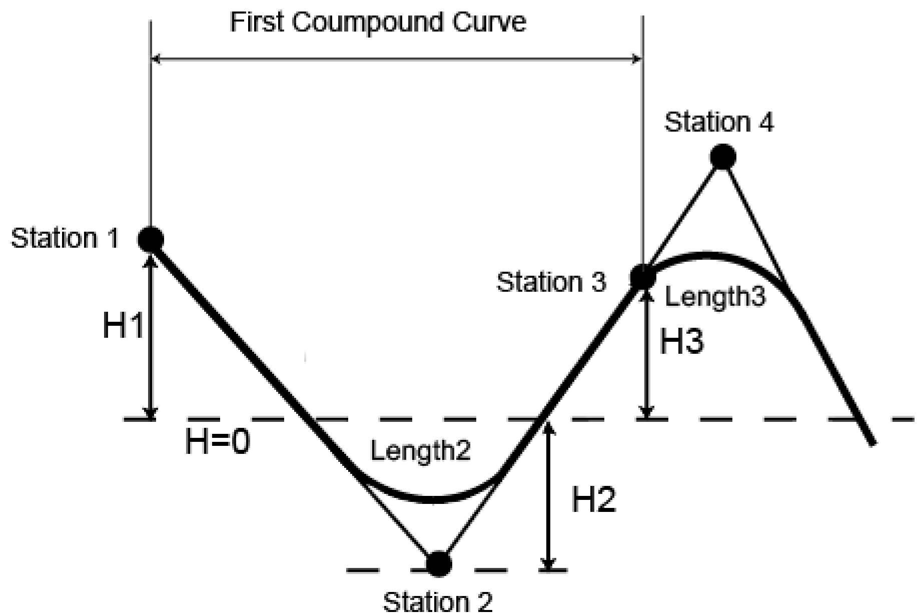
| Field | Description |
|---|---|
| *Start Grade* | or grade vertical alignment type, displays the ratio of the grade length and delta H (the difference between the elevations at the end station and the start station of the grade element) multiplied by 100% .<br>For parabola and circular arc displays the start grade of the element, in percents.<br>You can edit this parameter. If the grade is rising, the value should be set positive; if the grade is falling, the value should be set negative.<br>See pictures below for details. |
| *End Grade* | For parabola and circular arc displays the end grade of the element, in percents. You can edit this parameter. If the grade is rising, the value should be set positive; if the grade is falling, the value should be set negative.<br>See pictures below for details. |
| *Elevation* | Defines the elevation on the station used for creating the long section. |
| *Radius* | Defines the radius of the Circular Arc and Arc Long Section vertical element. For the arc long section element, set 0 for start and end element of the long section. |




**Rising and falling grades**




**Parabola**




**Compound curve in the vertical plane**

*Graphic view of the vertical alignment from the road string*

When you select the graphic view in the left panel, the right panel will display the vertical alignment in the graphic view only.

## Pop-up menu for a road

In Road tab you can perform the special commands:

- Convert
  - To Points
  - To Line
  - To Surface
- Add Vert element
- Add Herz element
- Add X-Section

See below for detailed descriptions.

### *Convert*

**to Points** — converts the selected road to points. See "Convert road to points dialog" section on the facing page for details.

- To create only points of the center line, do not tick checkboxes in the dialog.
- To create points of the center line and start/end points of the horizontal and vertical alignments, tick *Create Turn Points* checkbox.
- To create points of the center line and points lying on the right and left of the center line, tick the *Create Offset Points* checkbox.

**to Line** — converts the selected road to the lines. See "Convert road to lines dialog" section on page 194 for details.

- To create only the lines for the road's center line, do not check the boxes in the dilaog.
- To create the lines for the road's center line and for two offset lines which are set on the right and left from the center line at an offset specified in the X-Section Offset dialog box, tick the *Create Offset Lines* check-box.
- To create the lines for the road's center line and X-section lines for start/end points of the horizontal and vertical alignments, check the box *Create X-Section Lines*.

**to Surface** — converts the selected road to the surface with fixed interval between surface points. See "Convert road to surface dialog" section on page 195 for details.The series of surface points will be created along the center line and each offset line for the following places:

- a) for start/end points of horizontal and vertical alignments,
- b) for points where cross-sections are defined,
- c) for points of curve,
- d) for points with the given station interval.

### *Add Vert Element*

Adds the vertical alignment to the road. Vertical alignment is created through grade, circular arc and parabolas, or long sections. When adding the first element to a horizontal alignment, all vertical elements are available. Opens the ***Add Vert Element*** dialog. At the *General* tab of the window select a desired vertical alignment type from the *Type* drop-down list. If selecting a grade or parabola as the first element, only a grade or parabola or a circular arc can be the next element added to the vertical alignment. If selecting a long section as the first element, only a parabola long sections or arc long sections can be the next element of the vertical alignment.

See "General tab" section on page 291 for details.

### *Add Horz Element*

Adds the horizontal alignment to the road. Horizontal alignment is created through line, curve, spiral, intersection. Opens ***Add Horz Element*** dialog. In the *General* tab of the dialog select a desired horizontal alignment type from the *Type* drop-down list.

See "General tab" section on page 281 for details.

### *Add X-Section*

Adds a cross-section to the center line. X- section are the lines representing the surface of the road and lying in the plane perpendicular to the center line. Opens the ***Add X-Section*** dialog.

See General tab for details.

### *Convert road to points dialog*

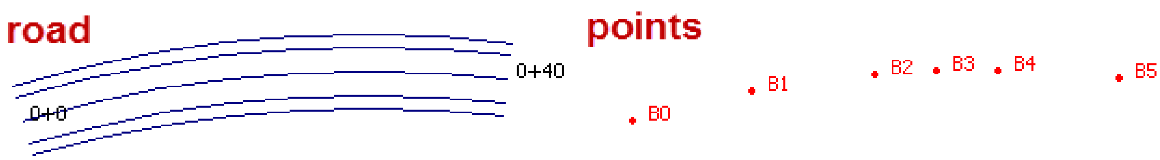
To open the dialog, select the **Convert** -> **To Points** command from the pop-up menu for the selected road at the *Roads* tab of the Tabular view. Fields of the dialog are described in the table below.

**Fields of the *Convert road to points* dialog**

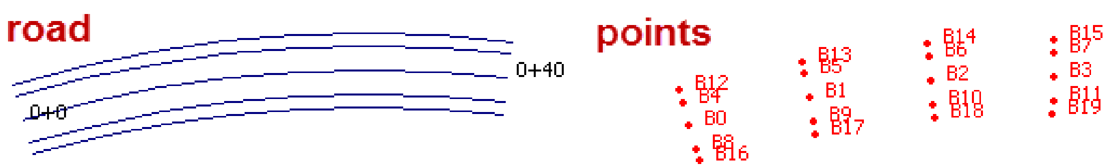
| Field | Description |
|---|---|
| *Create Turn Points* | When ticked, the application creates points of the center line and start/end points of the horizontal and vertical alignments. |
| *Create Offset Points* | When ticked, the application creates points of the center line and points lying on the right and left of the center line at a distance specified in the X-Section Offset window. |

| Field | Description |
|---|---|
| *Start Name* | Defines the name of the first point of the point set which will be created after converting the selected road to points. |
| *Station Interval* | Defines the maximum length in the current units between points to be created. |

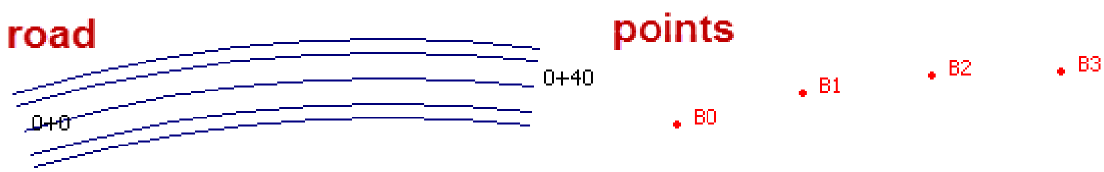
When the both *Create Turn Points* and *Create Offset Points* checkboxes unticked, the application creates only points of the center line.




**When Create Turn Points checkbox is ticked**




**When Create Offset Points checkbox is ticked**



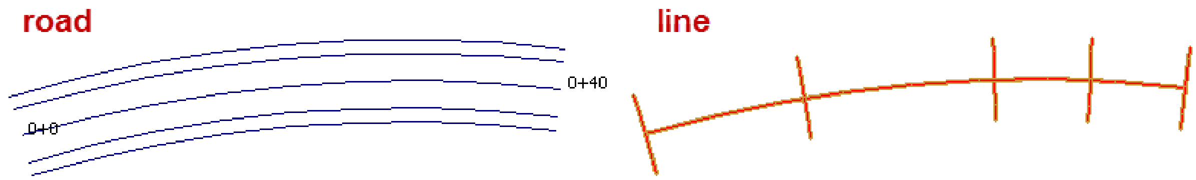

**When both checkbox unticked**

## *Convert road to lines dialog*

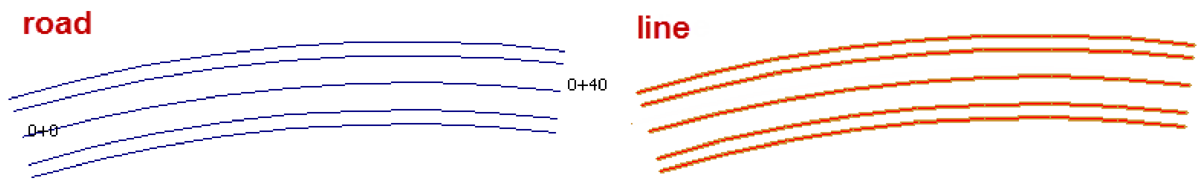
To open the dialog select the **Convert -> To Lines** command from the pop-up menu for the selected road at the *Roads* tab of the Tabular view. Fields of the tab are described in the table below.

| Field | Description |
|---|---|
| *Create Offset Lines* | When ticked, the application creates the lines for the road's center line and for two offset lines which are set on the right and left from the center line at an off-set specified in the X-Section Offset dialog box. |
| *Create X-Section Lines* | When ticked, the application creates the lines for the road's center line and X-section lines for start/end points of the horizontal and vertical alignments. |
| *Station Interval* | Defines the maximum length (in the current units) of the line being created. |

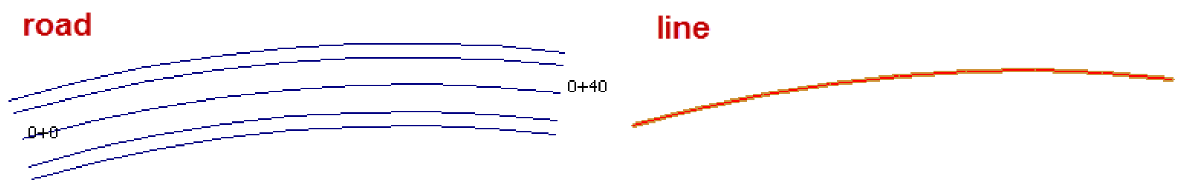
When the both boxes are unchecked, the application creates only the lines for the road's center line:




**When Create Offset Lines checkbox is ticked**




**When Create X-Section Lines checkbox is ticked**




**When both checkboxes are unticked**

## *Convert road to surface dialog*

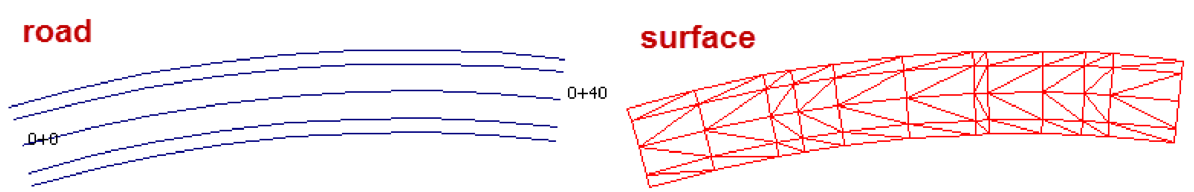
You can open this tab after selecting the **Convert** -> **To Surface** command from the pop-up menu for the selected road at the *Roads* tab of the Tabular view. Fields of the dialog are described in the table below.

**Fields of the *Convert road to surface* dialog**

| Field | Description |
|---|---|
| *Interval* | Defines the interval between the surface points. |
| *Extended slopes to the surface* | Defines the territory surface adjacent to the road. You can select any existing surface. |
| *Surface Name* | Defines the name of the surface. |

The series of surface points are created along the center line and each offset line for the following places:

- for start/end points of horizontal and vertical alignments,
- for points where cross-sections are defined,
- for points of curve,
- for points with the given station interval.



## X-Section Templates tab


The *X-Section Templates* tab is shown only if the job contains a road with X-Sections data. The tab has two panels. The left panel displays a list of available X-Section templates and values of their cut and fill slopes in percents. The right panel displays the offsets of the selected template in table and graphic mode. Fields of both panels are described in the tables below.

**Fields of the left panel of the *X-Section Templates* tab**

| Field | Description |
|---|---|
| *Icon* | Displays symbol assigned to the X-Section template. See "Symbols in the X-Section Template tab" section on page 396 for details. |
| *Name* | Defines the X-Section template name. To edit the name, click on the highlighted filed and enter a new name. The X-Section template name is unique and the field cannot be empty. |
| *Cut Slope (1:n)* | Defines the horizontal increment of the slope for a unit of the vertical increment. The cut slope is used when the road surface is below the terrain. By default, cut slope equals 0 (units in percent). You can edit the parameter. |
| *Fill Slope (1:n)* | Defines the horizontal increment of the slope for a unit of the vertical increment. The fill slope is used when the road surface is above the terrain. By default, fill slope equals 0 (units in percent). You can edit the parameter. |

**Fields of the right panel of the *X-Section Templates* tab**

| Field | Description |
|---|---|
| *Icon* | Displays symbol of the offset. For the offsets the icon is used. |
| *Name* | Defines the offset name of the X-Section offset. To edit the name, click on the highlighted filed and enter a new name. You can leave the field empty. |
| *Order* | Displays the order of the offset in the template. You can set any number from the list of offset number. |
| *Hz. Dist* | Defines the horizontal offset (in the current linear units) from the center line for the offset. You can edit the value. |
| *V Dist* | Defines the vertical offset from the horizontal plane for the offset. You can edit the value. When you enter this parameter, the Grade will be automatically calculated and displayed in the appropriate field. |
| *Grade* | Defines the ratio of horizontal offset and vertical offset multiplied by 100%. When you enter this parameter, the Vertical distance will be automatically calculated and displayed in the appropriate field. |
| *Hz. Offset from CL* | Defines the horizontal offset from the center line (in the current linear units) for the start point of the given offset. It is calculated using the corresponding values of the previous offsets and it is not editable. |
| *V. Offset from CL* | Defines the vertical offset from the horizontal plane for the start point of the offset. It is calculated using the corresponding values of the previous offsets and it is not editable. |

Right-click on a highlighted line to display a pop-up menu. This menu contains a set of commands and they can be divided into three groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.
- Specific commands for the left panel *X-Section Templates* tab. See "Pop-up menu for the left panel of the X-Section Template tab" section below for details.
- Specific commands for the right panel *X-Section Templates* tab. See "Pop-up menu for the right panel of the X-Section Template tab" section below for details.

### Pop-up menu for the left panel of the X-Section Template tab

In the left panel of the X-Section tab you can perform the special (only for template) commands:

- **Add X-Section Template** — allows you to create a new X-Section Template and to save it in the job. Opens the ***Add X-Section Template*** dialog. It is similar to the ***Properties*** dialog for the X-Section template. See "Properties dialog for X-Section template" section on page 296 for details.

  After clicking **OK** the new template is displayed in the left panel of the tab and automatically opens the ***Add Offset*** dailog. You can create an offset for the template in this dialog.
- **Add Offset** — allows you to create an offset (segment) for the selected X-Section Template. Opens the ***Add Offset*** dialog. It is similar to the ***Properties*** dialog for the offset. See "Properties dialog for X-Section Offset" section on page 296 for details.

### Pop-up menu for the right panel of the X-Section Template tab

In the right panel of the *X-Section Template* tab you can perform the special (only for offsets) command:

**Add Offset** — allows you to create an offset (segment) for the selected X-Section Template. Opens the ***Add Offset*** dialog. It is similar to the ***Properties*** dialog for the offset. See "Properties dialog for X-Section Offset" section on page 296 for details.

## Text tab


The *Text* tab from the Tabular view is shown only when the job contains text objects. The text object can be created in the job or it can be imported in the job. Fields of the tab are described in the table below.

| Field | Description |
|---|---|
| *Contents* | Defines the content of the text box. You can type any text here. |
| *Layer* | Defines the Layer in which the Text resides. The Layer sets the plotting style for the text. You can select any Layer from the list of layers available in the job. The field cannot be empty. |
| *Color* | Defines the text color for the Map view. If you set BYLAYER, the color of the text will be set automatically by layer settings. |
| *Angle* | Defines the angle rotation of the text box in degrees. By default, the values is zero, which means horizontal orientation of the text. |
| *Text Height* | Defines the height of the text in the current linear units. |
| *Font Name* | Defines the font for the text. You can select any font from the list of available fonts. |

| Field | Description |
|---|---|
| *Insertion Point* | Defines where the insertion point will be located on the text box. |
| *Draw Box* | Defines whether to draw the frame around the text. |
| *Start Point* | Defines the name of the start point of the text box. You can selected any existing point of the current job. |

## Inverse tab

The *Inverse* tab from the Tabular view displays a table that lists the results of the inverse calculations.

The table appears only when you click the **Inverse** icon from the *COGO* group at the *Report* tab of the ribbon.

The results will be displayed in the tab after clicking **Calculate** at the *Inverse* panel. This table stores the previous results of the inverse calculations. Fields of the tab are described in the table below.

**Fields of the *Inverse* tab**

| Field | Description |
|---|---|
| *From* | Displays the name of the start point (if the point has name) in the Inverse task. |
| *To* | Displays the name of the end point (if the point has name) in the Inverse task. |
| *Forward Azimuth* | The calculated value depends on the selected coordinate system. If the global coordinate system (*WGS Lat,Lon,Ell.H / Datum Lat,Lon,Ell.H / Datum Lat,Lon,Elevation*) is selected in the Status bar, the horizontal geodesic azimuth from the "From" point to the "To" point is displayed. For *Grid/Ground* coordinate system, selected in the Status Bar, grid/ground azimuth (bearing) from the "From" point to the "To" point is displayed. |
| *Backward Azimuth* | The calculated value depends on the selected coordinate system. If the global coordinate system (*WGS Lat,Lon,Ell.H / Datum Lat,Lon,Ell.H / Datum Lat,Lon,Elevation*) is selected in the Status bar, the horizontal geodesic azimuth from the "To" point to the "From" point is displayed. For *Grid/Ground* coordinate system, selected in the Status Bar, grid/ground azimuth (bearing) from the "To" point to the "From" point is displayed. |
| *Geodetic Distance* | Displays the length of the geodetic line (the shortest distance) between the two points on an ellipsoid in the current unit. |
| *Ground Distance* | The calculated value depends on whether the Grid-to-Ground transformation is activated or not. If Grid to Ground transformation is not activated, it will be the geodetic distance multiplied by the scale factor, which is automatically calculated taking into account the height of the first point. If Grid to Ground transformation is activated, the Ground Distance displays a grid distance multiplied by the scale factor calculated, taking into account the average job height. |
| *Grid Distance* | Displays the shortest distance between two points on a projection plane in the current unit. This value will be displayed when a "**Grid**" coordinate system is selected in the Status bar. |
| *Slop Distance* | Displays the 3D distance between the points, in current unit. |
| *Delev* | Displays the difference in orthometric heights, in current unit. This value will be displayed, if *Ground* or *Grid* or *Datum Lat, Lon, Elevation* is selected in the Status bar. |

| Field | Description |
| --- | --- |
| *Delta Ell. H* | Displays the difference in ellipsoidal heights, in current unit. This value will be displayed, if*WGS84 Lat, Lon, Ell.H* or *Datum Lat, Lon, Ell.H* is selected in the Status bar. |
| *dN* | Displays the difference in Norting coordinates, in current unit. This value will be displayed when a projection is defined in the Job Configuration. |
| *dE* | Displays the difference in Easting coordinates, in current unit. This value will be displayed when a projection is defined in the Job Configuration. |
| *Note* | Displays a user comment. To edit the note, click on the highlighted field and enter a user's comments. |

Right-click on a highlighted line to display a pop-up menu. This menu contains common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.

**Drawing Different Distances calculated in Inverse window**

## Compare Surfaces tab

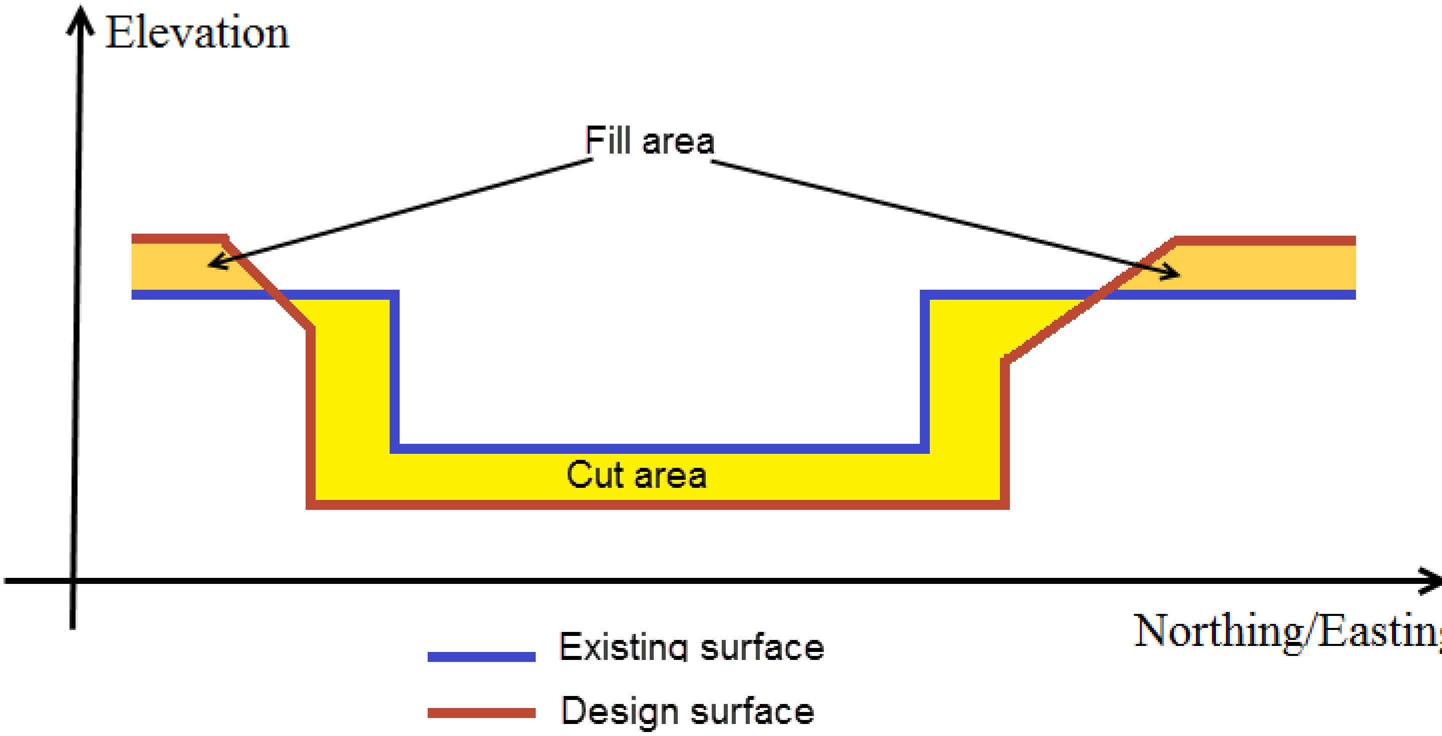
The *Compare Surfaces* tab from the Tabular view displays a table that lists the results of the surfaces comparison.

The tab appears only when the **Compare Surfaces** icon from the *COGO* group at the *Report* tab of the ribbon is pressed.

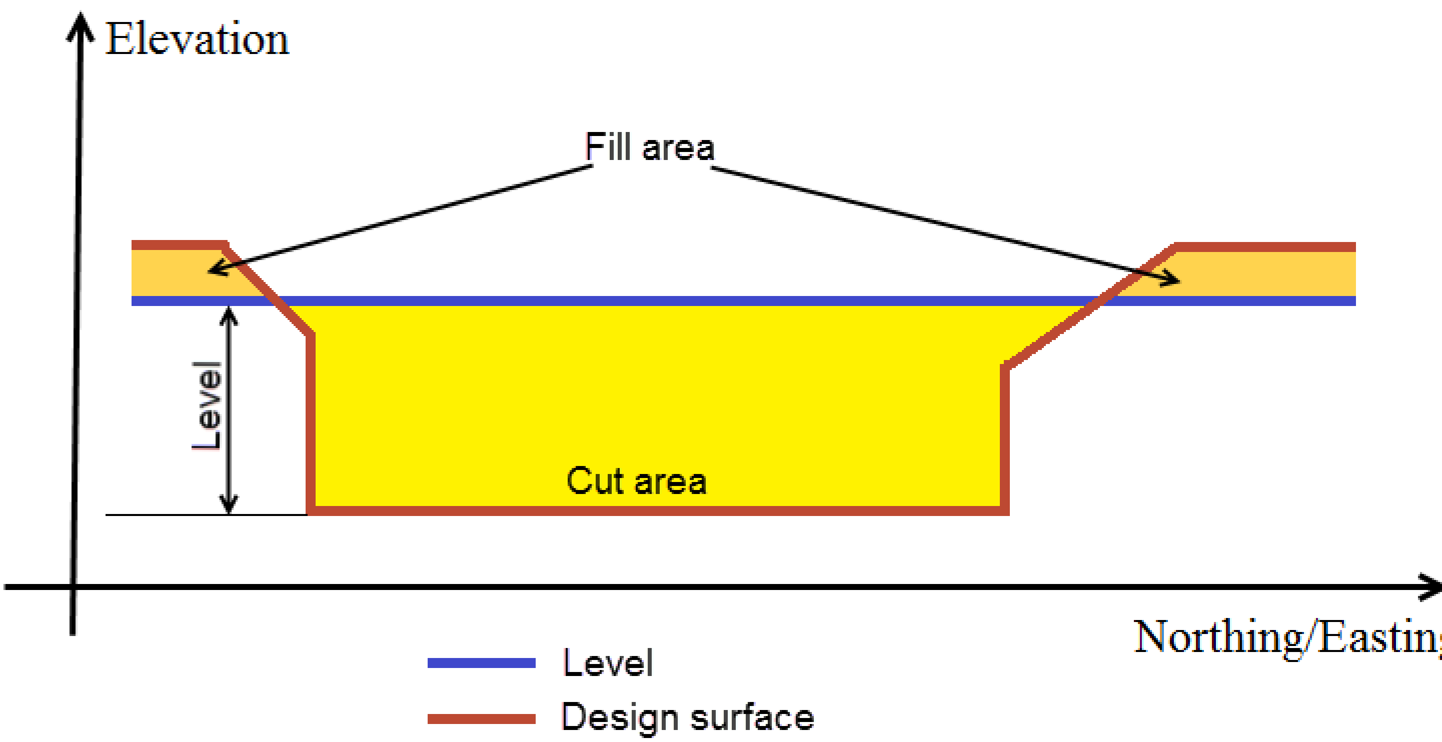
The results will be displayed in the tab after clicking **Calculate** at the *Compare Surfaces* panel. This table stores the previous results of the inverse calculations. Fields of the tab are described in the table below.

**Fields of the *Inverse* tab**

| Field | Description |
|---|---|
| *Design* | Displays the name of the first surface/road from comparison. |
| *Existing* | Displays the name of the second surface from comparison. |
| *Level* | Displays the level of the horizontal pane from comparison. |
| *Cut* | If two surfaces were compared — displays the cut volume to correct the existing surface to the design surface. See *Comparing two surfaces* picture below.<br>If a surface and a level were compared — displays the cut volume to correct the design surface to the specified level. See *Comparing surfaces and a level* picture below. |
| *Fill* | If two surfaces were compared — displays the fill volume to correct the existing surface to the design surface. See *Comparing two surfaces* picture below.<br>If a surface and a level were compared — displays the fill volume to correct the design surface to the specified level. See *Comparing a surface and a level* picture below. |
| *Area* | Displays the common area of two surfaces or a surface and a horizontal pane. |
| *Note* | Defines any additional notes about comparison. |
| *Save as Surface* | Tick to save the result of comparison as a new surface. |




**Comparing two surfaces**




**Comparing surfaces and a level**

Right-click on a highlighted line to display a pop-up menu. This menu contains common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section on page 204 for details.

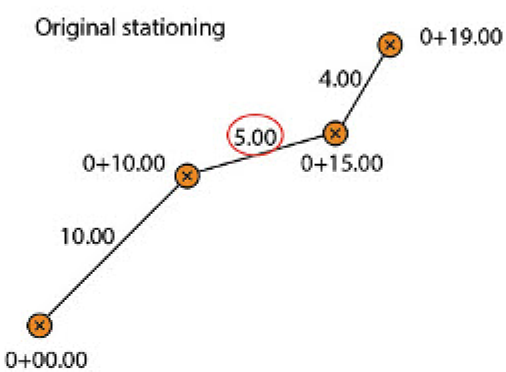
## Field Report tab

The *Field Report* tab from the Tabular view is shown only when the job contains reports imported from MAGNET Field job. Fields of the tab are described in the table below.

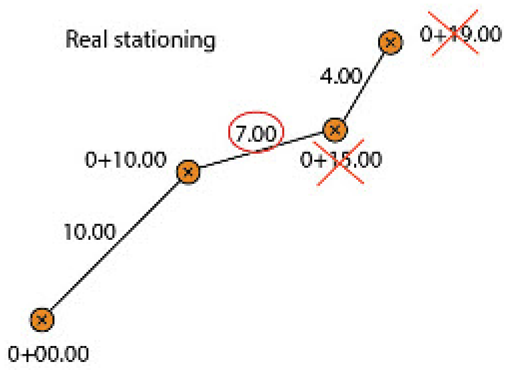
| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a field report. |
| *Name* | Defines the name of the field report. |
| *Author* | Defines the name of the field report's author. |
| *Job name* | Defines the name of the job from which the report was imported. |
| *Project name* | Defines the name of the Enterprise project to which the source job belongs to. |
| *Note* | Defines any additional information about imported report |
| *Time* | Displays the time of the report generation in MAGNET Field. |
| *Latitude* | Defines the latitude coordinate from the field report. |
| *Longitude* | Defines the longitude coordinate from the field report. |
| *Height* | Defines the height coordinate from the field report. |
| *Images* | Displays the quantity of the attached images. |

## Station Equations tab

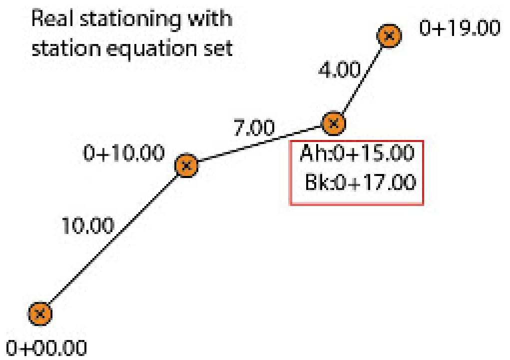
While designing a road there may be a situation when the original stationing does not fit to the actual alignment, and a new center line stationing may be needed. Station Equations are a method to link an old and a new roadway stationing. Station equations are used to change the stationing forward or back from a some spot along the alignment. Approaching stationing, behind the spot, where station equation is applied is called Back Station, departing stationing, which is after this spot is called Ahead Station.




Original stationing — second segment is 5 meters long, the third station is 0+15.00, and the end station is 0+19.00.




The second segment has been prolonged to 7 meters. Third station became 0+17.00, and the end station became 0+21.00.




The Station Equation is applied to the third station. Its formula is *Back Station = 0+17.00, Ahead Station = 0+15.00*. The end station is 0+19.00 again.

The *Station Equations* tab is displayed only if the job contains at least one station equations set. The tab displays a table containing two panels. The left panel contains all sets of station equations, and the right panel displays station equations from the selected set.

**Fields of the left panel**

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a Station Equations set. |
| *Name* | Defines the name of the station equation set. |

**Fields of the right panel**

| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a Station Equation. |
| *Order* | Defines the order of the station equation in the set. |
| *Name* | Defines the name of the station equation. |
| *Back Station* | Defines stationing of the approaching segment, behind the spot, where station equation is applied |
| *Ahead Station* | Defines stationing of the departing segment, after the spot, where station equation is applied |

Right-click on a highlighted line to display a pop-up menu. This menu contains a set of commands and they can be divided into three groups:

- Common commands for all tabs of the Tabular View. See "Common pop-up menu of the Tabular View" section below for details.

### Pop-up menu for the left panel of the Station Equations tab

In the left panel of the *Station Equations* tab you can perform the following special command:

**Add Station Equations Set** — adds station equations set.

1. In the left pane of the Station Equations tab, right-click and select **Add Station Equations Set**.

   The ***Add Station Equations Set*** dialog is displayed.
2. In the *Name* editbox, type the name of the station equations set.
3. Click **OK**.

   The newly created station equations set is displayed in the left panel of the *Station Equations* tab.

### Pop-up menu for the right panel of the Station Equations tab

In the right panel of the *Station Equations* tab you can perform the following special command:

**Add Station Equation** — adds station equation to the selected set.

1. In the left pane of the Station Equations tab, select the required Station Equations Set.
2. In the right panel, right-click and select **Add Station Equation**.

   The ***Add Station Equation*** dialog is displayed.
3. In the *Name* editbox, type the name of the station equation.
4. In the *Back Station* editbox, specify the stationing for the approaching segment.
5. In the *Ahead Station* editbox, specify the stationing for the departing segment.
6. Click **OK**.

## Common pop-up menu of the Tabular View

In any tab of the Tabular view you can highlight a line, right click it and perform the following commands:

- Exporting data to Civil 3D format. Select **Export to Civil 3D** from the pop-up menu.
- Exporting data to an appropriate file format.
  1. Select **Export** from the pop-up menu.

     The ***Export*** dialog is displayed.
  2. In the *Name* editbox, type the file name.
  3. From the *Format* drop-down list, select the file format.
  4. Click **Save** to start the export procedure.
- Cutting a line from the Tab. Select **Cut** from the pop-up menu. The highlighted line will be removed from the tab, and the content of the line will be placed to the clipboard.
- Copying a line to a text editor such as Microsoft®Excel or Microsoft®Word. Select **Copy** from the pop-up menu. Open the target application and paste the information.
- Deleting a line from the Tab. Select **Delete** from the pop-up menu. The highlighted line will be removed from the tab.

- Showing the related objects for the lines. This function will automatically highlight the related objects in the corresponding tab. Select the **Show related objects** from the pop-up menu, and define the target tab:


- Open the ***Properties*** dialog. Select **Properties** from pop-up menu. See "MAGNET Tools Entities Properties" section on page 218 for details.
- Open the ***Options*** dialog for this tab. Right click in any place of the tab and select **Options** from pop-up menu. See "Options dialog" section on page 316 for details.

The list of the available commands depends on the number of selected line . If ONE line is selected, you see the list of commands which are related to ONLY one object. If several lines are selected, you see the list of commands which are related to every object.

# Observations View

The Observation View displays a graphic representation of the GPS, RTK, TS and DL survey data in the horizontal plane of the current coordinate datum or projection. The displayed points and observations use symbols described in the Legend window.

You can show or hide the coordinate grid, scale bar, legend window, background image and change the background color in the Observation View. See "Observations View Options dialog" section on page 317 for details.

In the window for any displayed point or/and observation you can open a menu of commands. These commands are identical to the commands for these objects in the Tabular view.

# Map View

The Map View displays graphic representation of the points, polylines, surfaces and roads in the horizontal plane of the current coordinate datum or projection. Objects are displayed with the color/width/style of the corresponding layer. You can show or hide objects of the given layer by means of switching the corresponding attribute in the Layers window.

In the ***Map View Options*** dialog you can show or hide the coordinate grid, scale bar, legend window, background image and change the background color in the Map View. See "Map View Options dialog" section on page 319 for details.

In the window you can switch on the Bing maps view by clicking the **Bing Map view** icon from the *Spatial* group of the *View* tab. See "Bing Map view icon" section on page 43 for details.

> NOTE
> The Bing maps will be displayed in WebSphereMercator map projection only to display the job objects on the Bing maps, MAGNET Tools automatically transforms the objects coordinates from the current coordinate system to the WebSphereMercator projection. In the *Points* tab of the Tabular view, the coordinates of all objects of the job are displayed in the current coordinate system.

In the window for any displayed point or/and observation you can open a menu of commands. These commands are identical to the commands for these objects in the Tabular view.

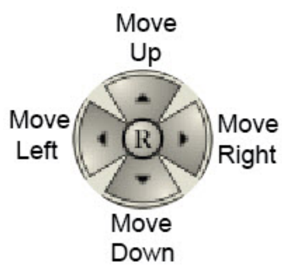
# 3D View

The 3 D View displays points, lines, surfaces, roads and polylines using a three-dimensional representation of the data. Surfaces and roads are displayed with the color of the layer. Lines are displayed in the color set for this lines.

## Pan mode

To activate the Pan mode use one of the following:

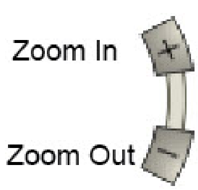
- Click and hold the mouse wheel.
- Right-click and select **Pan mode** from the pop-up menu.
- In the *Zoom* group of the *Window* tab, click the **Pan Mode** icon.
- Use the internal arrows of the Navigation Control:




## Zoom mode

To activate the Zoom mode use one of the following:

- Scroll the mouse wheel of the mouse
- right-click and select **Zoom** from the pop-up menu.
- In the *Zoom* group of the *Window* tab, clickclick the desired zoom icons on
- Use the internal arrows of the Navigation Control:

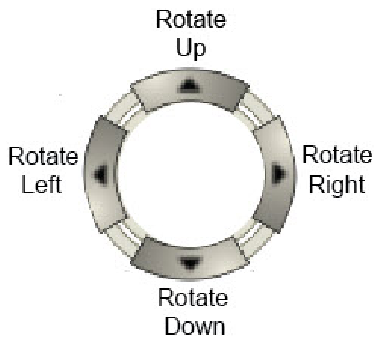



## Object rotation

To rotate an object use one of the following:

- Right-click and select *Rotate* from the pop-up menu.
- In the *Zoom* group of the *Window* tab, click the **Rotate Mode** icon.

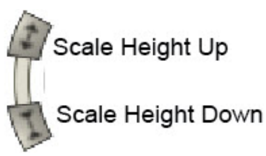
- use the internal arrows of the Navigation Control:




## Vertical scaling

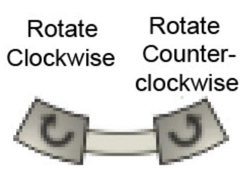
To increase/decrease the vertical scale in the 3D view, use one of the following

- Scroll the mouse wheel while holding the *Ctrl* + *Alt* keys.
- use the buttons of the Navigation Control:




## Objects rotation

To turn the object clockwise /counterclockwise in the screen plane, use the buttons of the Navigation Control:




## Restoring defaults

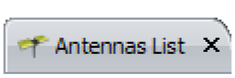
To restore the default scale and rotation in the window, click  on the Navigation Control.

You can:

- display either the solid model or the wireframe model or both the solid and a wireframe models
- show or hide the coordinate grid, scale bar, legend window, background image
- change the background color

See "3D View Options dialog" section on page 319 for information about 3D view configuration.

# Antenna List

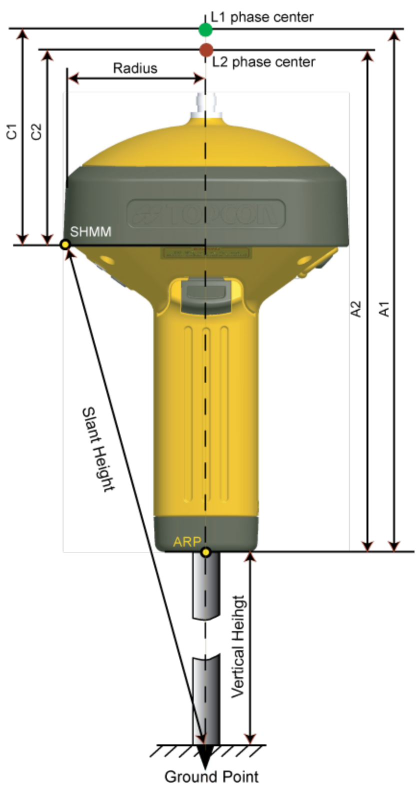



The window displays parameters of all GPS antennas which were calibrated either by NGS, or TPS. These parameters are viewable, but not editable. Also the window displays the user-defined antenna types. You can edit and remove the custom antennas from the antenna list. Fields of the list are described in the table below.

**Fields of the Antenna List**

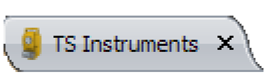
| Field | Description |
|---|---|
| *NGS Name* | Displays the standard NGS (http://www.ngs.noaa.gov/ANTCAL/) or TPS antenna name. This name is editable only for the custom antenna type. This name displays in the 'Antenna number and type' line of the RINEX observation file and in the corresponding line of the TPS raw data file. |
| *Name* | Displays the antenna name used in the software interface. This name is editable only for the custom antenna type. |
| *Antenna Calibration* | Displays the type of antenna calibration. The absolute calibration is a default setting. The user can select only the absolute calibration for the custom antenna. The NGS and TPS calibration contains the absolute and relative calibrations:<br>• Relative – the antenna offsets and phase center variations are computed with respect to the AOAD/M_T antenna<br>• Absolute – the recalculated relative calibration that takes into account the absolute values for AOAD/M_T antenna. |
| *Radius* | Displays the antenna's radius in millimeters. This parameter is editable only for the custom antenna type. See picture below for details. |
| *L1 Base Offset (A1)* | Displays the vertical offset measured from ARP (Antenna Reference Point) to the phase center for GPS frequency L1 in millimeters. This parameter is editable only for the custom antenna type. See picture below for datails. |
| *L2 Base Offset (A2)* | Displays the vertical offset measured from ARP (Antenna Reference Point) to the phase center for GPS frequency L2 in millimeters. This parameter is editable only for the custom antenna type. See picture below for datails. |
| *L1 Plane Offset (C1)* | Displays the vertical offset measured from the antenna slant height measure mark (SHMM) to the phase center for GPS frequency L1 in millimeters. This parameter is editable only for the custom antenna type. See picture below for datails. |
| *L2 Plane Offset (C2)* | Displays the vertical offset measured from the antenna slant height measure mark (SHMM) to the phase center for GPS frequency L2 in millimeters. This parameter is editable only for the custom antenna type. See picture below for datails. |
| *L1 Easting Offset (E1)* | Displays the easting offset of the phase center for GPS frequency L1 from the ARP (Antenna Reference Point) in the horizontal plane in millimeters. This parameter is editable only for the custom antenna type. |
| *L2 Easting Offset (E2)* | |
| *L1 Northing Offset (N1)* | Displays the norting offset of the phase center for GPS frequency L1 from the ARP (Antenna Reference Point) in the horizontal plane in millimeters. This parameter is editable only for the custom antenna type. |

| Field | Description |
|---|---|
| *L2 Northing Offset (N2)* | Displays the norting offset of the phase center for GPS frequency L2 from the ARP (Antenna Reference Point) in the horizontal plane in millimeters. This parameter is editable only for the custom antenna type. |
| *Manufacturer* | Displays the antenna manufacturer. This parameter is editable only for the custom antenna type. |
| *Note* | Displays any additional information for the selected antenna. For NGS calibration this field contains a part number of the given antenna. For TPS calibration this filed contains "TPS Calibration". This parameter is editable only for the custom antenna. |




**Antenna parameters**

# TS Instruments




The window displays Total Station parameters. These parameters are viewable, but not editable. Also the window displays the user-defined instrument type. You can edit and remove the custom Total Station from the list. Fields are described in the table below.

| Field | Description |
|---|---|
| *Name* | Displays the unique name of the device. This parameter is editable only for the custom instrument type. |

| Field | Description |
|---|---|
| *EDM* | Displays the value of the first component for the calculation of the distance determination error when using this device. The distance determination error of the instrument is calculated by the formula: $\sqrt{EDM^2 + PPM^2 * Distance * 10^{-6}}$ |
| *ppm* | isplays the value of the second component for the calculation of the distance determination error when using this device. The distance determination error of the instrument is calculated by the formula: $\sqrt{EDM^2 + PPM^2 * Distance * 10^{-6}}$ |
| *Vert. Accuracy* | Displays the error of the vertical angle measurement, in seconds. This parameter is editable only for the custom instrument type. |
| *Horz. Accuracy* | Displays the error of the horizontal angle measurement, in seconds. This parameter is editable only for the custom instrument type. |
| *Max Distance* | Displays the maximum range for this device. This parameter is editable only for the custom instrument type. |
| *Note* | Displays any additional notes for the selected instrument. This parameter is editable only for the custom instrument type. |
| *Manufacturer* | Displays the instrument manufacturer. This parameter is editable only for the custom instrument type. |

## Classes View


The window displays the list of the classes for Total Station measurements. Each class has a specified number of measurements of horizontal angle / vertical angle / distance and tolerances of angle and distance measurements. In this window you can edit any existing class and add a new class. Fields of the view are described in the table below.

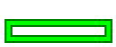
| Field | Description |
|---|---|
| *Icon* | Displays a symbol assigned to a TS measurement class. |
| *Name* | Defines the name of the class. The class name is unique and the field cannot be empty. |
| *Note* | Defines any additional note about class. |
| *Num Sets* | Defines the set number of horizontal angle (HA) measurements. You can select either direct, or single direct and reverse, or multiple direct and reverse measurements of HA. |

| Field | Description |
| --- | --- |
| *VA* | Defines when the vertical angle (VA) will be measured. You can select either vertical angle measurement for direct measurements only, or for first direct and reverse measurements, or for all direct and reverse measurements of HA. |
| *Dist* | Defines when the distance will be measured. You can select either do not measure the distance, or perform the distance measurement for first direct measurements only, or for first direct and reverse measurements, or for all direct or all direct and reverse measurements. |
| *Num Dist* | Defines the number of measurements for distance determination. You can select either one, or multiple measurements. Only the first distance measurement is used in position calculation.The other ones are just recorded. |
| *Hz* | Defines the tolerance value in the horizontal plane in current angular units. The field is available for one or more direct and reverse measurements of the HA. |
| *Hz (r+l)* | Defines the tolerance value of the oscillation of the direction in the horizontal plane in current angular units. The field is available for one or more direct and reverse measurements of the HA. |
| *Hz (r-l)* | Defines the tolerance value of the oscillation of the collimation error in the horizontal plane in current angular units. The field is available for one or more direct and reverse measurements of the HA. |
| *VA* | Defines the tolerance value in the vertical plane in current angular units. This field is available when VA is measured either for one direct and reverse measurements or for all direct and reverse measurements of HA. |
| *Distance* | Defines the tolerance value for the repeated distance measurements during one set. The field is available when the value of the Num Dist parameter is more than 1. |
| *Dist Sets Dev* | Defines the tolerance value for the repeated distance measurements during several sets. The field is available when the value in the filed Dist is either 1DR, or D, or RD. |

# Occupation View

The Occupation View displays occupations for the current job.The Occupation View is a diagram window with date and time displayed on the horizontal axis, and points or receivers on the vertical axis.Occupations are shown as filled or unfilled rectangular plots. See the ***Legend*** window for more detailed information.

You can see the following occupations:

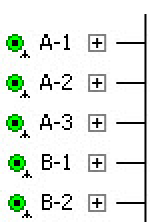
| | |
| --- | --- |
|  | Static occupation. For this occupation, raw data was collected with the base or rover receiver during static GPS measurements. The GPS antenna of the base / rover receiver remains motionless during data collection for the point. |
|  | Kinematic occupation. For this occupation, raw data was collected with the rover receiver during kinematic GPS measurements. The rover antenna is movable during data collection. |

| | |
|---|---|
|  | Stop occupation. For this occupation, raw data was collected with the rover receiver in the static part of the Stop and Go measurements. The GPS antenna of the rover receiver remains motionless during data collection for the point. |
|  | Go occupation. For this occupations, raw data was collected with the rover receiver in the kinematic part of the Stop and Go measurements. The rover antenna is movable during data collection. |
|  | Base occupation. For this occupation, data was collected at the base station during RTK measurements. This occupation does not contain code and carrier phase measurements. |
|  | Topo occupation. For this occupations, data was collected with the rover receiver during kinematic RTK measurements. The rover antenna remains motionless during data collection for the point. The rover antenna is movable during data collection. This occupation does not contain code and carrier phase measurements. |
|  | AutoTopo occupation. For this occupations, data was collected during static RTK measurements. . This occupation does not contain code and carrier phase measurements. |

The Occupation view option allows you to view a session’s occupations in two different modes — occupation by receivers and occupation by points.

In the occupation by receivers mode the vertical axis of the occupation view graph represents the serial numbers of the receivers used for data collection:


In the occupation by points mode the vertical axis of the occupation view graph represents the names of the points where the data was collected:

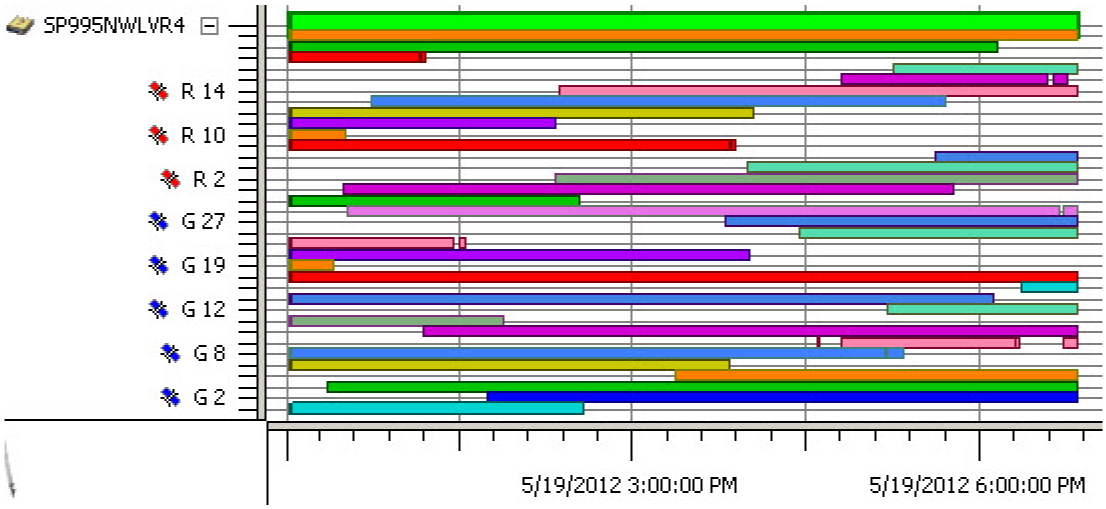



To select the desired display mode:

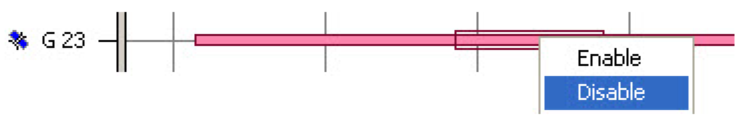
1. In the Occupation view, right click and select **Options** from the pop-up menu.

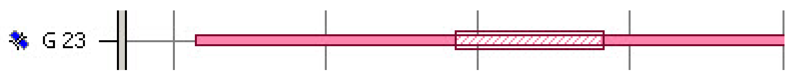
   The ***Occupation View Options*** dialog is displayed.
2. Open the *Occupation View* tab.
3. Select the display mode, by selecting the appropriate radiobutton.
4. Click **OK**.

To view individual satellite epochs for a GPS occupation (not for RTK occupation), click the node (⊞) for the point/receiver. When the node is expanded, the satellite availability bars will be displayed for each occupation.



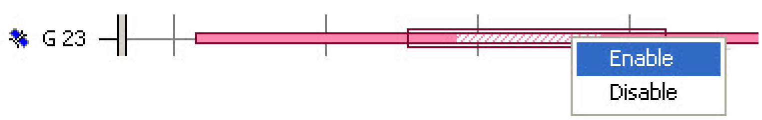

In the View you can disable any satellite's observation in whole or in part. The MAGNET Tools engine does not use the disabled intervals for the satellites, when computing the corresponding baselines or trajectories. To disable the satellite’s observations, select the required part of the observation for a satellite, right click on any place of the View and select Disable from the pop-up menu:

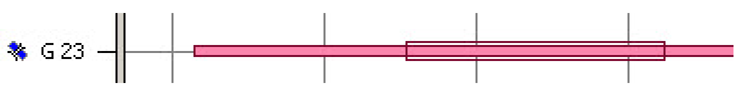



**Disabled observation**

To recover the disabled part of the observation for a satellite, select the part of the observation, right click on any place of the View and select Enable from the pop-up menu:




# Ephemeris View

The Ephemeris View displays the list of the ephemeris which were imported to the current project. The right panel of the view displays:

- the operational part of the broadcast navigation message for GPS, Glonass and Galileo ephemeris.
- the true coordinates and velocity of the GPS, Glonass and Galileo satellites for precise ephemeris.

You cannot edit any parameters in the view.

# Codes


The window displays the list of all codes and their attributes used in the job. The window contains two panels. The left panel contains codes and the right panel contains code attributes.

To create a new code:

1. Right-click in the left panel and select **New Code** from the pop-up menu.

   The ***New Code*** dialog is displayed.
2. In the *Name* editbox, type the name for the new code.
3. From the *Type* drop-down list, select the required type of the code.
4. If needed, configure the layout parameters of the code for lines, points areas and surfaces at the appropriate tabs.
5. Click **OK**.

To create a new code attribute:

1. In the left panel, select the required code.

   *NOTE*

   *You can create an attribute for a code, if the code is not used for an object in the job.*
2. Right-click in the right panel and select **New Attrubute** from the pop-up menu.
3. Select the required code type from the additional menu.

   The ***New Attribute*** dialog is displayed.
4. In the *Attribute Name* editbox, type the name for the new attribute.
5. If needed, in the *Default Value* editbox, type the default value of the attribute.
6. In needed, tick the *Required* checkbox.
7. Click **OK**.

**Fields of the left panel.**

| Field | Description |
|---|---|
| *Icon* | The icon • is used. |
| *Name* | Displays the name of the code. You can edit the code's name, if the code is not used for an object of the job. |
| *Description* | Displays any additional text information about the code. |
| *Type* | In this field you can select the type of the code:<br>• Point — if you apply this type for a points of the job, you can use or not use the points in a surface.<br>• Line — if you apply this type for a lines of the job, you can use or not use the lines in a surface, and use or not use the lines as breakline in a surface.<br>• Area — if you apply this type for a areas of the job, you can use or not use the areas in a surface, use or not use the areas as breakline, and use or do not use the areas as exclusion area (hole) in a surface. |

| Field | Description |
|---|---|
| *Layer* | Displays the Layer where the code resides. The Layer sets the plotting style for the code. Every code has a non-empty Layer. In this field, you can select any Layer from the list of user-created layers. By default the selected Layer sets the plotting style of the code and all plotting style (symbol and color for point; color, style and width for line; color, fill style and fill transparency for area) automatically are set to BYLAYER. You can change the plotting style. |
| *Line Color* | Displays the polyline color for Map View. By default the parameter is set to BYLAYER. You can choose any color from the list. |
| *Line Style* | Displays the polyline style (solid, dashed, dashed-and-doted, doted) for Map View. By default the parameter is set to BYLAYER. You can choose any style from the list. |
| *Line Width* | Displays the polyline width (from 1 to 10 pixels) for MapView. By default the parameter is set to BYLAYER. You can choose any width from the list. |
| *Point Symbol* | Displays the point symbol in Map View. By default the parameter is set to BYLAYER. You can choose any symbol from the list. |
| *Point Color* | Displays the point color in Map View. By default the parameter is set to BYLAYER. You can choose any color from the list. |
| *Area Color* | Displays the color of the closed polyline (area) in Map View. By default the parameter is set to BYLAYER. You can choose any color from the list. |
| *Area Fill Style* | Displays the fill stile for closed polyline (area) in Map View. By default the parameter is set to BYLAYER. You can choose any fill style from the list. |
| *Fill Transparency* | Displays the transparency value for closed polyline (area) in 3D View. By default the parameter is set to BYLAYER. |
| *Use in Surface* | When ticked, the points, lines or areas with the code may be used in a surface.<br>When unticked, the points, lines or areas with the code cannot be used in a surface. |
| *Breakline* | When ticked, the lines or areas with the code may be used as breakline in a surface.<br>When unticked, the lines or areas with the given code cannot be as breakline in a surface. |
| *Exclusion Area* | When ticked, the areas with the code will be used as exclusion area (hole) in a surface.<br>When unticked, the areas with the code will not be as exclusion area (hole) in a surface. |

**Fields of the right panel.**

| Field | Description |
|---|---|
| *Icon* | The icon • is used. |
| *Attribute Name* | Displays the name of the attribute. You can edit the attribute's name, if the corresponding code is not used for an object of the job. |

| Field | Description |
|---|---|
| *Default Value* | In this field you can enter or select from the list the default value for each attribute's type. You can edit the attribute's default values, if the corresponding code is not used for a object of the job. The field cannot be empty if you the *Required* checkbox is ticked. |
| *Type* | Displays the type of the attribute. You cannot edit the type for the created attribute. You can select one of the following types when creating a new attribute:<br>• Integer — any integer number<br>• Real Number — any real number<br>• Text — any alpha-numeric string that contains up to 255 characters<br>• Menu — you can select any attribute from a list. You can add and remove any value and text to/from the list<br>• Date/Time — the current date and time<br>• Boolean — you can select *True* or *False* values. |
| *Required* | When ticked, the attribute's value must be defined for code. |

*NOTE*
*You can create a code of different type, but in MAGNET Tools you can apply the code only to a point. A code of the line type or the area type can be assigned in MAGNET Field. MAGNET Tools will display such codes after importing the MAGNET Field job.*

# Layers


The window displays the list of all layers and their plotting styles used in the job. By default, every MAGNET Tools job includes a layer named "0" (zero). Layer 0 cannot be deleted or renamed. However, you can edit the plotting style of the layer. In the window you can create a new layer.

To create a new layer:

1. In the *Layers* window, right-click and select **Add Layer** from the pop-up menu.

   The ***Add Layer*** dialog is displayed.
2. In the *Name* editbox, type the name for the new layer.
3. Configure the rest of parameters as you need. See table below for field descriptions.
4. Click **OK**.

   The layer is created.

**Fields of the *Layers* window**

| Field | Description |
|---|---|
| *Name* | Displays the name of the layer. You can edit the layer's name for any layer, except the layer with zero name. |
| *Visible* | Defines the visibility of the layer. Layer is visible when checkbox is ticked. |

| Field | Description |
| --- | --- |
| *Line Style* | Displays the polyline style (solid, dashed, dashed-and-doted, doted) for Map View. You can choose any style from the list. |
| *Line Width* | Displays the polyline width (from 1 to 10 pixels) for Map View. You can choose any width from the list. |
| *Color* | Displays the color for any objects with the given layer. You can choose any color from the list for displaying in Map View. |
| *Point Symbol* | Displays the point symbol in Map View. You can choose any symbol from the list. |
| *Breakline Type* | In this field you can select one of the following types:<br>• Auto — when creating a surface, the polyline/area with the given layer can be as boundary or breakline or exclusion,<br>• Breakline — when creating a surface, the polyline/area with the given layer can be only breakline,<br>• Boundary — when creating a surface, the polyline/area with the given layer can be only boundary,<br>• Exclusion — when creating a surface, the area with the given layer can be only exclusion area. |
| *Note* | Displays any additional text information about the layer. |
| *Area Fill Style* | Displays the fill style for closed polyline (area) in Map View. You can choose any fill style from the list. |
| *Fill Transparency* | Displays the transparency value for closed polyline (area) in 3D View. |

# MAGNET Tools Entities Properties

Each entity used in the MAGNET Tools projects has a set of properties, which allows you to configure them to fits you needs. You may edit properties of any object at any time by using the ***Properties*** dialog.

To edit properties of an object, or a group of objects, select them, right-click select **Properties** from the pop-up menu, or click the **Properties** icon from the *Properties* group of the *Edit* tab. For more information refer to the corresponding sections:


- "Point Properties dialog" section below
- "GPS Occupation Properties dialog" section on page 228
- "GPS Obs Properties dialog" section on page 234
- "TS Obs Properties dialog" section on page 246
- "DL Obs Properties dialog" section on page 257
- "Lines Properties dialog" section on page 261
- "Surface Properties dialog" section on page 269
- "Road Properties" section on page 274
- "X-Sections Template Properties dialog" section on page 296
- "Inverse Properties dialog" section on page 297
- "Code properties dialog" section on page 300
- "Code Attribute properties dialog" section on page 303
- "Layer properties dialog" section on page 304
- "Text properties dialog" section on page 309
- "Class properties dialog" section on page 311
- "Datum properties dialog" section on page 313
- "Projection properties dialog" section on page 314


## Point Properties dialog

A point is a two- or three-dimensional in space.

The ***Point Properties*** dialog allows you to edit properties of the selected point. You may view and edit a vary of parameters. The dialog has six tabs, described in the appropriate sections:


- "General tab" section on the facing page
- "Coordinates tab" section on page 220
- "Adjustment tab" section on page 222
- "Quality Control tab" section on page 223
- "Photo Notes tab" section on page 223
- "Codes and Style tab" section on page 224
- "Offset tab" section on page 226


To open the dialog:

1. Select the required point in one of the following views:
    - Map view
    - Observation view

- 3D view
- At the *Points* tab of the Tabular view.

2. Right-click and select **Properties** from the pop-up menu.

## General tab

The *General* tab of the ***Properties*** dialog for a point allows you to view and edit basic properties for a point. Fields of the tab are described in the table below.

To open the tab:

1. Select the required point in one of the following views:
   - Map view
   - Observation view
   - 3D view
   - At the *Points* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Name* | Displays the point's name. To edit the name, click on the highlighted field and enter a new name. The point name is unique and the field cannot be empty. |
| *Note* | Displays any additional notes for the point. To edit the value, click on the highlighted field and type any necessary information. |
| *Control* | Displays the status of the point's coordinates. You can select one of the following statuses from the drop-down list:<br>• None — all coordinates can be changed after adjustment or coordinate calculation.<br>• Vertical — the elevation/ellipsoidal height is left unchangeable after adjustment or coordinate calculation. The / symbol is set in the *Icon* column for this status.<br>• Horizontal — the horizontal coordinates are left unchangeable after adjustment or coordinate calculation.The / symbol is set in the *Icon* column for this status.<br>• Both — the horizontal and vertical coordinates are left unchangeable after adjustment or coordinate calculation.The / symbol is set in the *Icon* column for this status. |
| *Code* | Displays codes of the point. If a point has multiple codes, all codes of the point will be displayed using a comma as separator, for example "1,AA,BB".<br>To edit a code, click on the highlighted field and either select a new one from the drop-down list of existing codes; or type a new code(s); or set the Code to empty. |

| Field | Description |
|---|---|
| *Layer* | Displays the Layer where the point resides. The Layer sets the plotting style for the point. Every point has a non-empty Layer. In this field, you can select any Layer from the list of user-created layers. |
| *Source* | Displays the path of the raw data on the computer disk drive, local area network, or storage media. |
| *Enabled for Adjustment* | When ticked (default setting for all point types), the point and all objects related to the given points is included in adjustment, coordinate calculation and export. If this parameter is unchecked, adjustment, coordinate calculation and export will ignore the points and all objects related to the given points. A disabled point is grayed-out in all views. |

## Coordinates tab

The *Coordinates* tab of the ***Properties*** dialog for a point allows you to view and edit coordinates of a point. Fields of the tab are described in the table below.

To open the tab:

1. Select the required point in one of the following views:
   - Map view
   - Observation view
   - 3D view
   - At the *Points* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Coordinates* tab.

#### Fields of the *Coordinates* tab

| Field | Description |
|---|---|
| *WGS-84 Latitude* | Displays the point's latitude coordinate in WGS84 coordinate system. To edit the value, click on the highlighted field and type a new value.<br>The coordinates in WGS-84 coordinate system are available when *WGS84 Lat, Lon, Ell.H* is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *WGS-84 Longitude* | Displays the point's longitude coordinate in WGS84 coordinate system. To edit the value, click on the highlighted field and type a new value.<br>The coordinates in WGS-84 coordinate system are available when *WGS84 Lat, Lon, Ell.H* is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *WGS-84 Ell.Height* | Displays the point's ellipsoidal (geodetic) height in WGS84 coordinate system. To edit the value, click on the highlighted field and type a new value.<br>The coordinates in WGS-84 coordinate system are available when "**WGS84 Lat, Lon, Ell.H**" is selected in the Status bar or in the Job Configuration window. |

| Field | Description |
|---|---|
| *X* | Displays X coordinate in Cartesian geocentric (WGS-84) coordinate system in the current units. To edit the value, click on the highlighted field and enter a new value.<br>The Cartesian coordinates are available when *WGS84 X, Y, Z* is selected in the Status bar or in the ***Job Configuration*** dialog . |
| *Y* | Displays Y coordinate in Cartesian geocentric (WGS-84) coordinate system in the current units. To edit the value, click on the highlighted field and enter a new value.<br>The Cartesian coordinates are available when *WGS84 X, Y, Z* is selected in the Status bar or in the ***Job Configuration*** dialog . |
| *Z* | Displays Z coordinate in Cartesian geocentric (WGS-84) coordinate system in the current units. To edit the value, click on the highlighted field and enter a new value.<br>The Cartesian coordinates are available when *WGS84 X, Y, Z* is selected in the Status bar or in the ***Job Configuration*** dialog . |
| *Latitude* | Displays the point's latitude coordinate in the selected Datum coordinate system. To edit the value, click on the highlighted column and type a new value.<br>The Datum coordinates are available when *Datum Lat, Lon, Ell.H* or *Datum Lat, Lon, Elevation* is selected in the Status bar or in the ***Job Configuration*** window. |
| *Longitude* | Displays the point's longitude coordinate in the selected Datum coordinate system. To edit the value, click on the highlighted column and type a new value.<br>The Datum coordinates are available when *Datum Lat, Lon, Ell.H* or *Datum Lat, Lon, Elevation* is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Ell.Height* | Displays the point's ellipsoidal height in the selected Datum coordinate system. To edit the value, click on the highlighted column and type a new value.<br>The Datum coordinates are available when *Datum Lat, Lon, Ell.H* is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Elevation* | Displays the point's orthometric height in the selected Datum coordinate system, if the corresponding geoid file is added to the job and the geoid covers the area where the job’s points are located. If the corresponding geoid file is not added to the job, or it does not cover the desired area, the column will display ellipsoidal height for all points of the job.<br>To edit the value, click on the highlighted column and type a new value.<br>This column will be displayed if you have selected either *Ground \| None* or *Ground \| Localization* or *Grid* or *Datum Lat, Lon, Elevation* coordinate systems in the ***Job Configuration*** dialog or in the Status Bar. |

| Field | Description |
|---|---|
| *Ground Northing* | Displays the point's northing coordinate in Ground coordinates. To edit the value, click on the highlighted column and enter a new value.<br>The Ground coordinates are available when *Ground \| None* or *Ground \| Localization* coordinate systems are selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Ground Easting* | Displays the point's easting coordinate in Ground coordinates. To edit the value, click on the highlighted column and enter a new value.<br>The Ground coordinates are available when *Ground \| None* or *Ground \| Localization* coordinate systems are selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Grid Northing* | Displays the point's northing coordinate in Grid coordinates. To edit the value, click on the highlighted column and enter a new value.<br>The Grid coordinates are available when a projection is defined for the job and *Grid* coordinate system is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Grid Easting* | Displays the point's easting coordinate in Grid coordinates. To edit the value, click on the highlighted column and enter a new value.<br>The Grid coordinates are available when a projection is defined for the job and *Grid* coordinate system is selected in the Status bar or in the ***Job Configuration*** dialog. |
| *Geoid Separation* | Displays some constant, which is the characteristic of the current geoid model and is calculated for the given point. To get the orthometric height of the point, subtract the value of this constant from the value of ellipsoidal height. This Geoid Separation value is displayed when the corresponding geoid is selected for this job in the *Coordinate System* item of the ***Job Configuration*** dialog. |

## Adjustment tab

The *Adjustment* tab of the ***Properties*** dialog for a point allows you to view point coordinates deviations. Fields of the tab are described in the table below.

To open the tab:

1. Select the required point in one of the following views:
    - Map view
    - Observation view
    - 3D view
    - At the *Points* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

    The ***Properties*** dialog is displayed.
3. Click the *Adjustment* tab.

**Fields of the *Adjustment* tab**

| Field | Description |
|---|---|
| *Std Dev n* | Displays the standard deviation of the northing coordinate for the point after adjustment in Grid coordinate system. |
| *Std Dev e* | Displays the standard deviation of the easting coordinate for the point after adjustment in Grid coordinate system. |
| *Std Dev u* | Displays the standard deviation of the height coordinate for the point after adjustment in Grid coordinate system. |
| *Std Dev Hz* | Displays the standard deviation of the coordinate in the horizontal plane for the point after adjustment in Grid coordinate system. |
| *Error Ellipses Azimuth* | Displays the azimuth of the major semi-axis of the error ellipse for the given point after adjustment. This value depends on the current Confidence Level. See "General tab" section on page 100 for details about the Confidence Level. |
| *Error Ellipse major semi-axis* | Displays the length of the major semi-axis of the error ellipse for the given point after adjustment. This value depends on the current Confidence Level. |
| *Error Ellipse minor semi-axis* | Displays the length of the minor semi-axis of the error ellipse for the given point after adjustment. This value depends on the current Confidence Level. |

## Quality Control tab

The *Quality Controlk* tab of the ***Properties*** dialog for a point allows you to review points, which did not pass the quality test. Fields of the tab are described in the table below.

To open the tab:

1. Select the required point in one of the following views:
   - Map view
   - Observation view
   - 3D view
   - At the *Points* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Quality Control* tab.

The pane displays information about highlighted points (marked in red in the views) that did not pass some of the quality control checks.

**Fields of the *Quality Control* tab**

| Field | Description |
|---|---|
| *Ignore QC* | When ticked, all quality control tests are not performed for the selected point. |

## Photo Notes tab

The *Photo Notes* tab of the ***Properties*** dialog for a point displays all images that were attached to the point. An unlimited number of pictures can be attached to a point.

To open the tab:

1. Select the required point in one of the following views:
   - Map view
   - Observation view
   - 3D view
   - At the *Points* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Photo Notes* tab.

To see a picture, select it from the *Photo Note Number* drop-down list.

To add a picture:

1. Click **Add Photo Note**.

   The ***Open*** dialog is displayed.
2. Navigate to the required picture and open it.

To remove a picture:

1. Select the required picture from the *Photo Note Number* drop-down list.
2. Click **Remove Photo Note**.

## Codes and Style tab

The *Codes and Style* tab of the ***Properties*** dialog for a point allows you to view and edit code, string, control codes and plotting style for a point. Fields of the tab are described in the table below.

To open the tab:

1. Select the required point in one of the following views:
   - Map view
   - Observation view
   - 3D view
   - At the *Points* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Codes and Style* tab.

**Fields of the *Codes and Style* tab**

| Field | Description |
|---|---|
| *Code* | Displays codes of the point. If a point has multiple codes, all codes of the point will be displayed using a comma as separator, for example "1,AA,BB".<br><br>To edit a code, click on the highlighted field and either select a new one from the drop-down list of existing codes; or type a new code(s); or set the Code to empty. |
| *String* | Displays the string for the point. A complex of strings and codes allows you to create a line in the job automatically. The software will automatically create a line between points with the same Code and String value. |

| Field | Description |
|---|---|
| *Control Code* | Displays the control code used for the point. The Control Code list can contain the following codes:<br>• Codes, created by Topcon programmers (default codes). Using these codes will modify the existing linework or add a line to the existing linework. You can apply the control codes only to the points which have the same Code and String value. You select the following default control code from the list:<br>    • Arc Start — defines the start point of an arc<br>    • Arc End — defines the end point of an arc<br>    • Close — automatically add a line to close the figure. This option will work only for a figure that contains more than two points<br>    • Rectangle — automatically adds point to close the figure as a rectangle. This option will work only for a figure that contains three points<br>• Codes, created by a user. Using these codes do not modify the existing linework.<br>Let's see how the default code can modify an existing line.<br>None — does not change an existing linework.<br>See "Control Code field" section on page 127 for details. |
| *Control Code 2* | Control Code 2 displays the control code used for the point. It has the same properties as Control Code. MAGNET Tools allows you to simultaneously use two different values of Control Code and Control Code 2.<br>See "Control Code field" section on page 127 for details. |
| *Color* | Displays point color for Map View. The color can be chosen from the list. If you set BYCODE or BYLAYER, the color of the point automatically will be set in the color that was selected for the point's code or point's layer. |
| *Point Symbol* | Displays a point symbol for Map View. The symbol can be chosen from the list. If you set BYCODE or BYLAYER, the symbol of the point will be automatically set to the symbol that was selected for the point's code or the point's layer. |

To create a new code:

1. Right-click in the left panel of the *Codes* group box, and select **New Code** from the pop-up menu.

   The ***New Code*** dialog is displayed.
2. In the *Name* editbox, type the name for the new code.
3. From the *Type* drop-down list, select the required type of the code.
4. If needed, configure the layout parameters of the code for lines, points areas and surfaces at the appropriate tabs.
5. Click **OK**.

To create a new code attribute:

1. In the *Codes* group box, select the required code.

   *NOTE*

   *You can create an attribute for a code, if the code is not used for an object in the job.*

2. Right-click in the right panel and select **New Attrubute** from the pop-up menu.
3. Select the required code type from the additional menu.

   The ***New Attribute*** dialog is displayed.
4. In the *Attribute Name* editbox, type the name for the new attribute.
5. If needed, in the *Default Value* editbox, type the default value of the attribute.
6. In needed, tick the *Required* checkbox.
7. Click **OK**.

To delete a cod:

1. In the *Codes* group box, select the required code.
2. Right click and select **Delete** from the pop-up menu.

   The code will no longer be used for the point. Note, that deleting a code from the Codes and Style tab only deletes the code from the list for this point, not the job.

## Offset tab

The *Offset* tab of the ***Properties*** dialog for a point allows you to view point offsets. The tab is displayed only when the imported MAGNET Field job contains offset data from a GPS point. The tab can have different fields depending on the offset type in the imported MAGNET Field job. Fields of the tab are described in the table below. See "Editing and viewing MAGNET Field Offsets in the Job" section on page 345 for more information about offsets.

To open the tab:

1. Select the required point in one of the following views:
   - Map view
   - Observation view
   - 3D view
   - At the *Points* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

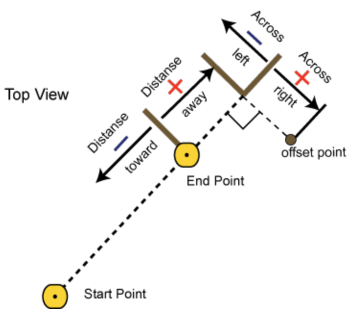
   The ***Properties*** dialog is displayed.
3. Click the *Offset* tab.

When the imported MAGNET Field job contains Offset Line from the GPS point, the point has the the symbol and tab contains the following offset information:

**Fields of the *Offset* tab**

| Field | Description |
|---|---|
| *Offset Dist* | Displays the distance from the "To Point"to the projection of the offset point along the line "From Point-To Point" in the current linear units. To edit the parameter, click on the highlighted column and type a new value. |
| *Offset Ht* | Displays the height difference between the ground point or the top of "To Point"and the offset point, in the current linear units. To edit the parameter, click on the highlighted column and type a new value. |
| *Offset Across* | Displays the distance from the offset point to the line "From Point-To Point" in the current linear units. To edit the parameter, click on the highlighted column and type a new value. |

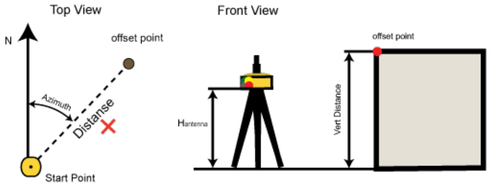
| Field | Description |
|---|---|
| *From Point* | Displays the start point of the line that contains offset point. You can select any other point of the job from the list. |
| *To Point* | Displays the end point of the line that contains offset point. You can select any other point of the job from the list. |
| *Relative/Absolute* | Displays the method of height measuring. If you select Relative, the height of the offset point is measured from the top of "To Point"(Antenna Reference Point (ARP) of the receiver at "To Point"). If you select Absolute, the height of the offset point is measured from the ground. |



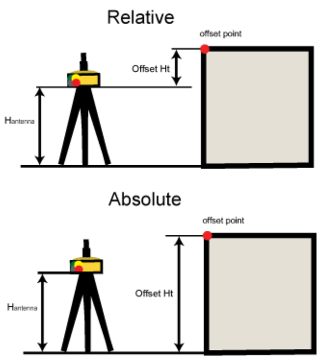

**Offset line**

When the imported MAGNET Field job contains Azimuth & Offsets from a GPS point, the point has the symbol and the tab contains the following information:

| Field | Description |
|---|---|
| *Azimuth* | Displays the horizontal angle to the offset point, in current angular units. The field displays non-zero values when the imported MAGNET Field job contains Azimuth & Offsets data and this offset was performed from the measured point. See picture below for details. To edit the parameter, click on the highlighted column and type a new value. |
| *Offset Dist* | Displays the distance from the Start Point to the offset point, in current linear units. The field displays non-zero values when the imported MAGNET Field job contains Azimuth & Offsets data and this offset was performed from the measured point. See picture below for details. To edit the parameter, click on the highlighted column and type a new value. |
| *Offset Ht* | Displays the height difference between the ground point and the offset point, in current linear units.<br>The field displays non-zero values when the imported MAGNET Field job contains Azimuth & Offsets data and this offset was performed from the measured point. See picture below for details. To edit the parameter, click on the highlighted column and type a new value. |
| *From Point* | Displays the start point of the line that contains offset point. You can select any other point of the job from the list. |
| *Relative/Absolute* | Displays the method of height measuring. If you select Relative, the height of the offset point is measured from the top of "To Point"(Antenna Reference Point (ARP) of the receiver at "To Point"). If you select Absolute, the height of the offset point is measured from the ground. |




**See the picture of the Azimuth & Offsets**




**Height measuring method**

To obtain the coordinates of the new offset point, click **Compute Coordinates**.

# GPS Occupation Properties dialog

The ***GPS Occupation Properties*** dialog allows you to view and edit properties of the selected GPS Occupaiton. You may view and edit a vary of parameters. The dialog has seven tabs, described in the appropriate sections

- General tab
- Occupation tab
- Antenna tab
- Survey Session tab
- Quality Control tab
- Offset tab
- Covariance Matrix tab

To open the dialog:

1. In the *GPS Occupations* tab from the Tabular view, select the required occupation.
2. Right-click and select **Properties** from the pop-up menu.

## General tab

The *General* tab of the ***Properties*** dialog for a GPS Occupation allows you to view and edit basic properties for an occupation. Fields of the tab are described in the table below.

To open the tab:

1. In the *GPS Occupations* tab from the Tabular view, select the required occupation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Point Name* | Displays the name of the occupied point. For all types of the RTK occupation and for static GPS occupation, this column cannot be empty. To edit the name, click on the highlighted column and enter a new value. |
| *Original Name* | Displays the initial name of the occupation as indicated in the source file. The column cannot be empty for all types of occupation. To edit the name, click on the highlighted column and type a new value. |
| *Note* | Displays any additional notes for the selected GPS occupation. To edit the value, click on the highlighted field and enter your comments, if necessary. |
| *Method* | Displays the surveying method for the occupation. The following methods are presented for the GPS occupations:<br>• Base — data collected on the base station during RTK measurements.<br>• Topo — data collected during static RTK measurements. (The rover antenna remains motionless during data collection for the point.) The point name is the name of a ground point. This name is entered manually.<br>• AutoTopo — data collected during kinematic RTK measurements. (The rover antenna is movable during collection data.) The point name is the name of a current epoch. This name is created by the field software automatically.<br>• Autonomous — the rover receiver does not receive the correction data from a base during RTK measurements.<br>• Static — data collected on the base or rover receiver during static GPS measurements. (The GPS antenna of the base / rover receiver remains motionless during data collection for the point.) The point name is the name of a ground point.<br>• Stop — data collected on the rover receiver during static part of the Stop and Go measurements. (The GPS antenna of the rover receiver remains motionless during data collection for the point.) The point name is the name of a ground point.<br>• Go — data collected on the rover receiver during kinematic part of the Stop and Go measurements. (The rover antenna is movable during collection data.) The point name is empty.<br>• Kinematic — data collected on the rover receiver during kinematic measurements. (The rover antenna is movable during collection data.) The point name is empty. |
| *Source* | Displays the path of the raw data to the computer disk drive, local area network, or storage media. |
| *Start Time* | Displays the first epoch time of the GPS occupation. The column cannot be empty. |
| *Stop Time* | Displays the end epoch time of the GPS occupation. The column cannot be empty. |

| Field | Description |
|---|---|
| *Duration* | Displays the duration of time in which the observational data was logged for the given GPS occupation (Duration = Stop Time - Start Time). |
| *Enabled* | When ticked, the GPS observation is included in adjustment, coordinate calculation and export. If this parameter is unchecked, adjustment, coordinate calculation and export will ignore the vector. A disabled GPS observation is grayed-out in all views. |

## Occupation tab

The *Occupation* tab of the ***Properties*** dialog for a GPS Occupation allows you to view and edit occupation properties for an GPS occupation. Fields of the tab are described in the table below.

To open the tab:

1. In the *GPS Occupations* tab from the Tabular view, select the required occupation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Occupation* tab.

**Fields of the *Occupation* tab**

| Field | Description |
|---|---|
| *Orbit* | Displays the orbit of satellites during the occupation. |
| *NEpoch* | Displays the number of epochs for the occupation. |
| *Interval* | Displays the occupation logging interval, in milliseconds. |
| *GPS week, day* | Displays GPS week and day of occupation start time (the time from January, 6 1980: the day of GPS launch). The field cannot be empty. |
| *Receiver* | Displays the receiver's serial number. |
| *Receiver Vendor* | Displays the name of the vendor which developed this GPS receiver. You can select a desired company from the list. This selects a vendor of the receiver to accommodate differences in post - processing of the GLONASS measurements by different companies. |
| *RMS* | Displays the precision estimate of the GPS occupation in the current linear units. |
| *H RMS* | Displays the horizontal precision estimate of the GPS occupation in the current linear units. |
| *V RMS* | Displays the vertical precision estimate of the GPS occupation in the current linear units. |

## Antenna tab

The *Antenna* tab of the ***Properties*** dialog for a GPS Occupation allows you to view and edit antenna information for an occupation. Fields of the tab are described in the table below.

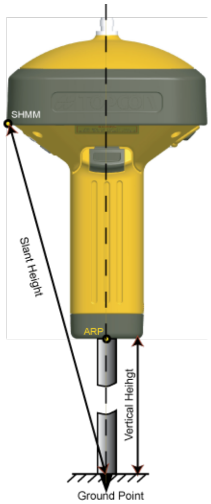
To open the tab:

1. In the *GPS Occupations* tab from the Tabular view, select the required occupation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Antenna* tab.

**Fields of the *Antenna* tab**

| Field | Description |
|---|---|
| *Antenna Type* | Displays the model of the GPS antenna used for the occupation. To change the antenna type, click and select other antenna type from the drop-down list. Also you can create a custom antenna by clicking **Custom**. See "Adding Custom Antenna Type" section on page 328 for details.<br>NOTE<br>If the *None* antenna type is selected, the software will use zero values for A1/A2 parameters and in this case, the antenna phase center for L1 and L2 frequencies coincides with the Antenna Reference Point. |
| *Antenna Height* | Displays the GPS antenna's height for the occupation, in the current units. To edit the value, click on the highlighted column and type a new value. |
| *Antenna Height Method* | Displays the method used to measure the antenna height. Select the requiered method from the drop-down list. The following methods are available:<br>• Vertical — measured from the ground point to the antenna reference point (ARP) located on the bottom of the receiver.<br>• Slant — measured from the ground point to the antenna slant height measure mark (SHMM).<br>See picture below for details. |
| *Antenna Centering Error* | Displays the centering error of Antenna Reference Point (ARP) position over the mark, in the horizontal plane. This error will be taken into account when estimating adjustment results. To edit the value, click on the highlighted column and type a new value. |
| *Antenna Height Error* | Displays the measurement error of the antenna height over the mark. This error will be taken into account when estimating adjustment results. To edit the value, click on the highlighted column and enter a new value. |




## Survey Session tab

The *Survey Session* tab of the ***Properties*** dialog for a GPS Occupation allows you to view information about survey session conditions. Fields of the tab are described in the table below.

To open the tab:

1. In the *GPS Occupations* tab from the Tabular view, select the required occupation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Survey Session* tab.

**Fields of the *Survey Session* tab**

| Field | Description |
|---|---|
| *Surveyor* | Displays the name of surveyor. |
| *Temperature* | Displays the temperature during the survey session. |
| *Pressure* | Displays the atmosphere pressure during the survey session. |
| *Humidity* | Displays the atmosphere humidity during the survey session. |
| *Weather* | Displays the weather during the survey session. |
| *Wind* | Displays the wind during the survey session. |

## Offset tab

The *Offset* tab of the ***Properties*** dialog for a GPS Occupation allows you to view and edit an occupation offset information. Fields of the tab are described in the table below. For more information about offsets, see "Editing and viewing MAGNET Field Offsets in the Job" section on page 345.

The Original Name of this GPS occupation is "Start Point". The offset point calculated from the given GPS occupation and the linear and angular offsets has the  icon.

To open the tab:

1. In the *GPS Occupations* tab from the Tabular view, select the required occupation.
2. Right-click and select **Properties** from the pop-up menu.

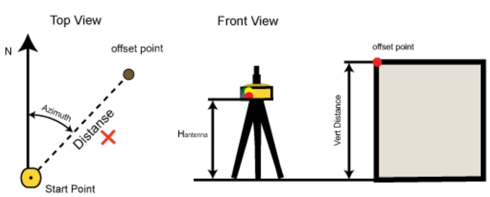
The ***Properties*** dialog is displayed.

3. Click the *Offset* tab.

**Fields of the *Offset* tab**

| Field | Description |
|---|---|
| *Azimuth* | Displays the horizontal angle to the offset point, in current angular units. The field displays non-zero values when the imported MAGNET Field job contains Azimuth & Offsets data and this offset was performed from the measured point. See picture below for details. To edit the parameter, click on the highlighted column and type a new value. |
| *Offset Dist* | Displays the distance from the Start Point to the offset point, in current linear units. The field displays non-zero values when the imported MAGNET Field job contains Azimuth & Offsets data and this offset was performed from the measured point. See picture below for details. To edit the parameter, click on the highlighted column and type a new value. |
| *Offset Ht* | Displays the height difference between the ground point and the offset point, in current linear units.<br>The field displays non-zero values when the imported MAGNET Field job contains Azimuth & Offsets data and this offset was performed from the measured point. See picture below for details. To edit the parameter, click on the highlighted column and type a new value. |
| *Offset Across* | Displays the distance from the offset point to the line "From Point-To Point" in the current linear units |

To obtain the coordinates of the new offset point, click **Compute Coordinates**.




## Covariance Matrix tab

The *Covariance Matrix* tab of the ***Properties*** dialog for a GPS Occupation displays the six modified elements of covariance matrix for the GPS observation and GPS Occupation. Fields of the tab are described in the table below.

To open the tab:

1. In the *GPS Occupations* tab from the Tabular view, select the required occupation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Covariance Matrix* tab.

**Fields of the *Covariance Matrix* tab**

| Field | Description |
|---|---|
| *Sigma X* | Displays the square root of the Cov [X,X] diagonal element for the RTK GPS observation in the current units. |
| *Sigma Y* | Displays the square root of the Cov [Y,Y] diagonal element for the RTK GPS observation in the current units. |
| *Sigma Z* | Displays the square root of the Cov [Z,Z] diagonal element for the RTK GPS observation in the current units. |
| *Corr XY* | Displays the dimensionless correlation factor X-Y for the RTK GPS observation. Corr[X,Y] =Cov[X,Y]/(SigmaX*SigmaY). |
| *Corr XZ* | Displays the dimensionless correlation factor X-Z for the RTK GPS observation. Corr[X,Z] =Cov[X,Z]/(SigmaX*SigmaZ). |
| *Corr YZ* | Displays the dimensionless correlation factor Y-Z for the RTK GPS observation. Corr[Y,Z] =Cov[Y,Z]/(SigmaY*SigmaZ). |

## Quality Control tab

The *Quality Control* tab of the ***Properties*** dialog for a GPS Occupation allows you to review occupations, which did not pass the quality test. Fields of the tab are described in the table below.

To open the tab:

1. In the *GPS Occupations* tab from the Tabular view, select the required occupation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Quality Control* tab.

The pane displays information about highlighted GPS Occupations (marked in red in the views) that did not pass some of the quality control checks.

**Fields of the *Quality Control* tab**

| Field | Description |
|---|---|
| *Ignore QC* | When ticked, all quality control tests are not performed for the selected occupations. |

# GPS Obs Properties dialog

The ***GPS Obs Properties*** dialog allows you to view and edit properties of the selected GPS observation. You may view and edit a vary of parameters. The dialog has nine tabs, described in the appropriate sections:


- "General tab" section on the facing page
- "Quality tab" section on page 236
- "Observation tab" section on page 240
- "Adjustment tab" section on page 240
- "Quality Control tab" section on page 242
- "Covariance Matrix tab" section on page 242
- "Base Antenna tab" section on page 243

- "Rover Antenna tab" section on page 244
- "Last Processing tab" section on page 245

To open the dialog:

1. In the *GPS Obs* tab from the Tabular view, select the required observation.
2. Right-click and select **Properties** from the pop-up menu.

## General tab

The *General* tab of the ***Properties*** dialog for a GPS Observation allows you to view and edit basic properties for an observation. Fields of the tab are described in the table below.

To open the tab:

1. In the *GPS Obs* tab from the Tabular view, select the required observation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Point From* | Displays the name of the base station point for GPS observation (vector). The column cannot be empty. You can edit the name only at the *GPS Occupation* tab. |
| *Point To* | Displays the name of the rover station point for GPS observation (vector). The column cannot be empty. You can edit the name only in the *GPS Occupation* tab. |
| *Start Time* | Displays the first epoch time of common interval for the GPS observation (vector). The column cannot be empty. |
| *Stop Time* | Displays the end epoch time of common interval for the GPS observation (vector). The column cannot be empty. |
| *Duration* | Displays duration of common time interval for base and rover occupations for the given GPS observation (Duration = Stop Time - Start Time). |
| *Note* | Displays any additional notes for the selected GPS observation. To edit the value, click on the highlighted field and enter comments, if necessary. |
| *GPS week, day* | Displays GPS week and day of observation start time (the time from January, 6 1980: the day of GPS launch). The field cannot be empty. |

| Field | Description |
|---|---|
| *Method* | Displays the observation method. The following methods are presented:<br>• *RTK Topo* — an RTK observation is created from a Base and aTopo occupations<br>• *RTK Auto Topo* — an RTK observation is created from a Base and a AutoTopo occupations<br>• *PP* — an observation is created from two Static occupations<br>• *PP Stop* — an observation is created from one Static and one Stop occupations<br>• *PP Go* — an observation is created from one Static and one Go occupations<br>• *PP Kinematic* — an observation is created from one Static and one Kinematic occupations.<br>The field cannot be empty. |
| *Enabled* | When ticked, the GPS observation is included in adjustment, coordinate calculation and export. If this parameter is unchecked, adjustment, coordinate calculation and export will ignore the vector. A disabled GPS observation is grayed-out in all views. |

## Quality tab

The *Quality* tab of the ***Properties*** dialog for a GPS Observation allows you to view quality parameters of an observation. Fields of the tab are described in the table below.

To open the tab:

1. In the *GPS Obs* tab from the Tabular view, select the required observation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Quality* tab.

**Fields of the *Quality* tab**

| Field | Description |
|---|---|
| *Horizontal Precision* | Displays the horizontal precision estimate of the GPS observation, in current linear units. |
| *Error Ellipses Azimuth* | Displays the azimuth of the major semi-axis of the error ellipse for the given GPS observation. |
| *Error Ellipses major semi-axis* | Displays the length of the major semi-axis of the error ellipse for the given GPS observation. |
| *Error Ellipses minor semi-axis* | Displays the length of the minor semi-axis of the error ellipse for the given GPS observation. |
| *Vertical Precision* | Displays the vertical precision estimate of the GPS observation, in current linear units. |

| Field | Description |
|---|---|
| *Solution Type* | Displays the type of solution for RTK and GPS observations.<br>For RTK vectors or trajectory:<br>• *Fixed, Phase Diff* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover. All ambiguities have been fixed to integers.<br>• *Fixed, Phase Diff, mmGPS+* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS), a rover and mmGPS aided rover receiver. All ambiguities have been fixed to integers.<br>• *Fixed, Phase Diff, Degraded* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover with the specified level of vertical/horizontal positional accuracy in the rover receiver's option. All ambiguities have been fixed to integers.<br>• *Fixed, Phase Diff, Degraded, mmGPS+* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover with the specified level (in the rover receiver's option) of vertical/horizontal positional accuracy, and the mmGPS aided. All ambiguities have been fixed to integers.<br>• *Float, Phase Diff* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover. All ambiguities are float numbers.<br>• *Float, Phase Diff, mmGPS+* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS), a rover and mmGPS aided rover receiver. All ambiguities are float numbers<br>• *Float, Phase Diff, Degraded* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover with the specified level (in the rover receiver's option) of vertical/horizontal positional accuracy. All ambiguities are float numbers.<br>• *Float, Phase Diff, Degraded, mmGPS+* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) of the base (or VRS) and a rover with the specified level (in the rover receiver's option) of vertical/horizontal positional accuracy. The mmGPS aided rover receiver. All ambiguities are float numbers.<br>• *Code Diff* — the solution is computed by using L1/L2 GPS/GLONASS code measurements when positioning.<br>For GPS observation:<br>• *Fixed, L1* — the solution is computed by using L1 frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). |

| Field | Description |
|---|---|
| | All ambiguities have been fixed to integers.<br>• *Fixed,L2* — the solution is computed by using L2 frequency measurements (L2 GPS/GLONASS code and carrier phase measurements). All ambiguities have been fixed to integers.<br>• *Fixed* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length is shorter than 10 km. L1 and L2 observables will be treated by the engine as independent data sets. All ambiguities have been fixed to integers.<br>• *Fixed, IonoFree* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 10 km to 30 km interval. After integer ambiguity resolution for a GPS observation with dual frequency measurements, ionofree combinations will be created and ionospheric error is eliminated. All ambiguities have been fixed to integers.<br>• *Fixed, Wide Lane* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 30 km to 1500 km interval. At early stages of processing of dual frequency measurements integer ambiguity resolution for L1 and L2 observables is performed with assistance of L1-L2 (Wide Lane) combination. All ambiguities have been fixed to integers.<br>• *VLBL* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for very long baselines using triple differences (No ambiguity resolution).<br>• *Float, L1* — the solution is computed by using L1 frequency measurements (L1 GPS/GLONASS code and carrier phase measurements). All ambiguities are float numbers.<br>• *Float, L2* — the solution is computed by using L2 frequency measurements (L2 GPS/GLONASS code and carrier phase measurements). All ambiguities are float numbers.<br>• *Float* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length is shorter than 10 km. L1 and L2 observables will be treated by the engine as independent data sets. All ambiguities are float numbers.<br>• *Float, IonoFree* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase measurements) for GPS observation length falling into the 10 km to 30 km interval. After integer ambiguity resolution for a GPS observation with dual frequency measurements, ionofree combinations will be created and ionospheric error is eliminated. All ambiguities are float numbers.<br>• *Float, Wide Lane* — the solution is computed by using dual frequency measurements (L1/L2 GPS/GLONASS code and carrier phase meas- |

| Field | Description |
|---|---|
| | urements) for GPS observation length falling into the 30 km to 1500 km interval. At early stages of processing of dual frequency measurements integer ambiguity resolution for L1 and L2 observables is performed with assistance of L1-L2 (Wide Lane) combination. All ambiguities are float numbers.<br>• *Code Diff* — the solution is computed by using L1/L2 GPS/GLONASS code measurements only.<br>• *Failed, No Ephemeris* — the GPS observation is not processed; the corresponding navigation file is absent,<br>• *Failed, No Satellites* — the GPS observation is not processed; the data from satellites are absent. |
| *Epochs* | Displays number of epochs in the common data time interval. |
| *Orbit* | Displays the ephemerides are used for processing the given GPS observation:<br>• Broadcast — for RTK and GPS observations, when only broadcast ephemerides were used.<br>• Precise — for GPS observations only, when only precise ephemerides were used.<br>• Absent — for GPS observations only.<br>If the ephemerides are absent for the GPS observation time interval, the given GPS observation are not post-processed. |
| *GPS Satellites* | Displays the number of GPS satellites. It is the maximum number of common GPS satellites observed by the base and rover in the common interval. |
| *GLONASS Satellites* | Displays the number of Glonass satellites. It is the maximum number of common Glonass satellites observed by the base and rover in the common interval. |
| *SBAS Satellites* | Displays one of the following:<br>• for Europe — the number of EGNOS satellites.<br>• for USA — the number of WAAS satellites.<br>It is the maximum number of common satellites observed by the base and rover in the common interval. |
| *QZSS Satellites* | Displays the number of OZSS satellites. It is the maximum number of common OZSS satellites observed by the base and rover in the common interval. |
| *GAL Satellites* | Displays the number of Galileo satellites. It is the maximum number of common Galileo satellites observed by the base and rover in the common interval. |
| *BDS Satellites* | Displays the number of BDS satellites. It is the maximum number of common BDS satellites observed by the base and rover in the common interval. |
| *PDOP* | Displays the average value of total position dilution of precision (PDOP) for common epochs interval. PDOP is equal to square root of sum-of-squares of the HDOP and VDOP values. |
| *HDOP* | Displays the average value of position dilution of precision in the horizontal plane (HDOP), for common epochs interval. |

| Field | Description |
|---|---|
| *VDOP* | Displays the average value of position dilution of precision in the vertical plane (VDOP), for common epochs interval. |

## Observation tab

The *Observation* tab of the ***Properties*** dialog for a GPS Observation allows you to view observation info. Fields of the tab are described in the table below.

To open the tab:

1. In the *GPS Obs* tab from the Tabular view, select the required observation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Observation* tab.

**Fields of the *Observation* tab**

| Field | Description |
|---|---|
| *dX* | Displays the GPS observation's dX component (in Cartesian geocentric coordinate system), in current units. |
| *dY* | Displays the GPS observation's dY component (in Cartesian geocentric coordinate system), in current units. |
| *dZ* | Displays the GPS observation's dZ component (in Cartesian geocentric coordinate system), in current units. |
| *Azimuth* | Displays the GPS observation azimuth. |
| *Elevation Angle* | Displays the GPS observation's elevation angle. |
| *Distance* | Displays the GPS observation's distance, in current units. |
| *dN* | Displays the GPS observation's dN component (in topocentric coordinates), in current units. |
| *dE* | Displays the GPS observation's dE component (in topocentric coordinates), in current units. |
| *dHt* | Displays the GPS observation's vertical component (in topocentric coordinates), in current units. |

## Adjustment tab

The *Adjustment* tab of the ***Properties*** dialog for a GPS Observation allows you to view adjustment parameters of an observation. Fields of the tab are described in the table below.

Zero value in the Res fields means that the GPS observation is included to the unclosed network, and does not contain repeated GPS observations.

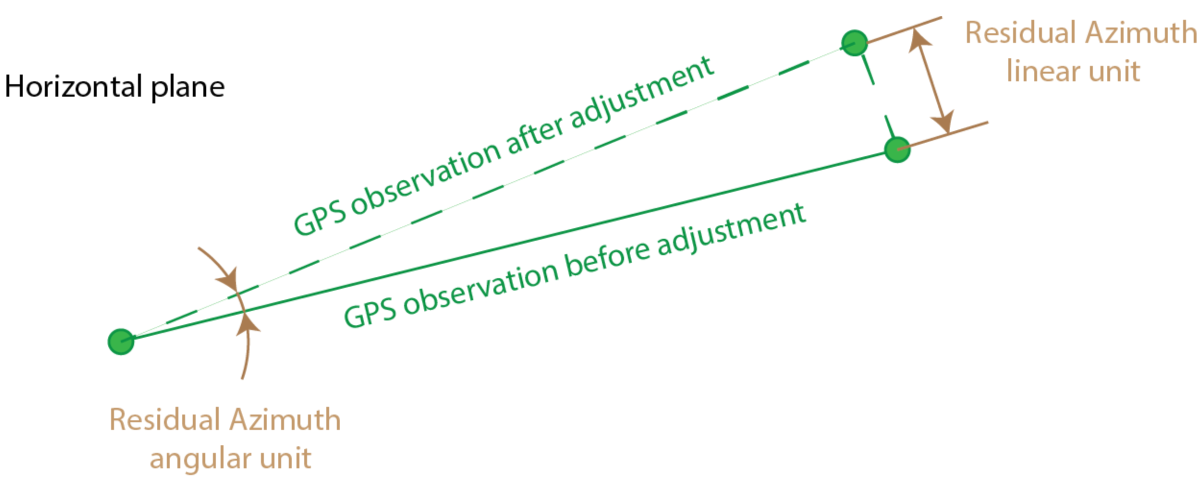
To open the tab:

1. In the *GPS Obs* tab from the Tabular view, select the required observation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Adjustment* tab.

**Fields of the *Adjustment* tab**

| Field | Description |
|---|---|
| *Auto Reject* | In this field you can select the status of the given GPS observation for adjustment:<br>• *Allowed* — the GPS observation will be used in adjustment.<br>• *Not Allowed* — the GPS observation will not be used in adjustment. |
| *Adjustment Status* | Displays the status of the given GPS observation after adjustment:<br>• *Not Adjusted* — the GPS observation is not adjusted.<br>• *Adjusted* — the GPS observation is adjusted.<br>• *AutoRejected* — the GPS observation is not adjusted, because the vector had the status Not Allowed before the adjustment procedure.<br>• *Disable* — the GPS observation is not adjusted, because the vector was disabled before the adjustment procedure. |
| *Res X* | Displays the residual of the X component (in Cartesian geocentric coordinate system) of the GPS observation after adjustment. |
| *Res Y* | Displays the residual of the Y component (in Cartesian geocentric coordinate system) of the GPS observation after adjustment. |
| *Res Z* | Displays the residual of the Z component (in Cartesian geocentric coordinate system) of the GPS observation after adjustment. |
| *Res n* | Displays the residual of the n component (in topocentric coordinates) of the GPS observation after adjustment. |
| *Res e* | Displays the residual of the e component (in topocentric coordinates) of the GPS observation after adjustment. |
| *Res u* | Displays the residual of the u component (in topocentric coordinates) of the GPS observation after adjustment. |
| *Res D* | Displays the residual of the GPS observation's distance after adjustment. |
| *Res A* | Displays the linear residual of the GPS observation's azimuth after adjustment. |
| *Res El* | Displays the residual of the GPS observation's elevation after adjustment. |



## Quality Control tab

The *Quality Control* tab of the ***Properties*** dialog for a GPS Observation allows you to review observations, which did not pass the quality test. Fields of the tab are described in the table below.

To open the tab:

1. In the *GPS Obs* tab from the Tabular view, select the required observation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Quality Control* tab.

The pane displays information about highlighted GPS Observations (marked in red in the views) that did not pass some of the quality control checks.

**Fields of the *Quality Control* tab**

| Field | Description |
|---|---|
| *Ignore QC* | When ticked, all quality control tests are not performed for the selected observations. |

## Covariance Matrix tab

The *Covariance Matrix* tab of the ***Properties*** dialog for a GPS Occupation displays the six modified elements of covariance matrix for the GPS observation and GPS Occupation. Fields of the tab are described in the table below.

To open the tab:

1. In the *GPS Occupations* tab from the Tabular view, select the required occupation.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Covariance Matrix* tab.

**Fields of the *Covariance Matrix* tab**

| Field | Description |
|---|---|
| *Sigma X* | Displays the square root of the Cov [X,X] diagonal element for the RTK GPS observation in the current units. |
| *Sigma Y* | Displays the square root of the Cov [Y,Y] diagonal element for the RTK GPS observation in the current units. |
| *Sigma Z* | Displays the square root of the Cov [Z,Z] diagonal element for the RTK GPS observation in the current units. |
| *Corr XY* | Displays the dimensionless correlation factor X-Y for the RTK GPS observation. Corr[X,Y] =Cov[X,Y]/(SigmaX*SigmaY). |
| *Corr XZ* | Displays the dimensionless correlation factor X-Z for the RTK GPS observation. Corr[X,Z] =Cov[X,Z]/(SigmaX*SigmaZ). |
| *Corr YZ* | Displays the dimensionless correlation factor Y-Z for the RTK GPS observation. Corr[Y,Z] =Cov[Y,Z]/(SigmaY*SigmaZ). |

# Base Antenna tab

The *Base Antenna* tab of the ***Properties*** dialog for a GPS Observation allows you to view and edit properties for the antenna of the base. Fields of the tab are described in the table below.

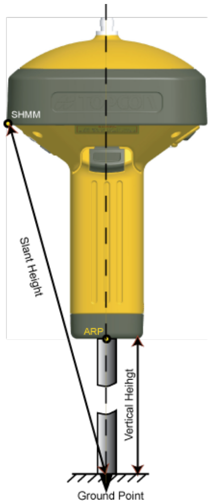
To open the tab:

1. Select the required Observation at the *GPS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Base Antenna* tab.

**Fields of the *Base Antenna* tab**

| Field | Description |
|---|---|
| *Antenna Type* | Displays the model of the GPS antenna used at the base. To change the antenna type, click and select other antenna type from the drop-down list. Also you can create a custom antenna by clicking the Custom button. See "Adding Custom Antenna Type" section on page 328 for more details.<br>*NOTE*<br>*If the None antenna type is selected, the software will use zero values for A1/A2 parameters, and in this case, the antenna phase center for L1 and L2 frequencies coincides with the Antenna Reference Point.* |
| *Antenna Height* | Displays the GPS antenna's height at the base station, in current units. To edit the value, click on the highlighted column and type a new value. |
| *Ant Height Method* | Displays the method used to measure the antenna height. You can change the type of the method (slant or vertical) with the help of the drop-down list. See picture below for details.<br>• *Vertical* — measured from the ground point to the antenna reference point (ARP) located on the bottom of the receiver.<br>• *Slant* — measured from the ground point to the antenna slant height measure mark (SHMM). |




## Rover Antenna tab

The *Rover Antenna* tab of the ***Properties*** dialog for a GPS Observation allows you to view and edit properties for a rover's antenna. Fields of the tab are described in the table below.

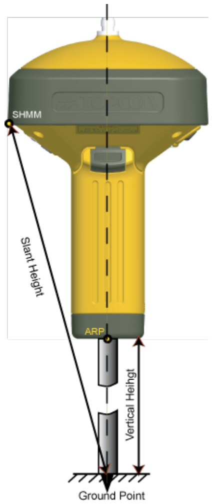
To open the tab:

1. Select the required Observation at the *GPS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Rover Antenna* tab.

**Fields of the *Rover Antenna* tab**

| Field | Description |
|---|---|
| *Antenna Type* | Displays the model of the GPS antenna used at the rover. To change the antenna type, click and select other antenna type from the drop-down list. Also you can create a custom antenna by clicking the Custom button. See "Adding Custom Antenna Type" section on page 328 for more details.<br>*NOTE*<br>*If the None antenna type is selected, the software will use zero values for A1/A2 parameters, and in this case, the antenna phase center for L1 and L2 frequencies coincides with the Antenna Reference Point.* |
| *Antenna Height* | Displays the GPS antenna's height at the rover, in current units. To edit the value, click on the highlighted column and type a new value. |
| *Ant Height Method* | Displays the method used to measure the antenna height. You can change the type of the method (slant or vertical) with the help of the drop-down list. See picture below for details.<br>• *Vertical* — measured from the ground point to the antenna reference point (ARP) located on the bottom of the receiver.<br>• *Slant* — measured from the ground point to the antenna slant height measure mark (SHMM). |




## Last Processing tab

The *Last Processing* tab of the ***Properties*** dialog for a GPS Observation allows you to view post-processing info. Fields of the tab are described in the table below. These fields are related to the post-processed GPS observation only. For RTK GPS observation, the field is empty

To open the tab:

1. Select the required Observation at the *GPS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Last Processing* tab.

**Fields of the *Last Processing* tab**

| Field | Description |
|---|---|
| *Time* | Displays the time and data of the observation. |
| *Elevation Mask* | Displays an elevation cut-off angle (in degrees) for satellites used in data processing. This parameter was entered in the GPS+ PostProcess (the General tab) Process sub-menu option for the last post-processing of the GPS observation. |
| *Satellite System* | Displays the navigation system (either GPS and GLONASS or only GPS satellites) that is used for postprocessing the GPS observation. This selection was entered in the GPS+ PostProcess (the General tab) Process sub-menu option for the last post-processing of the GPS observation. |
| *Engine/Mode* | Display the Engine Type and Engine Mode that were selected in the GPS+ PostProcess (the Engine tab) Process sub-menu option for last post-processing of the GPS observation. |
| *Troposphere Model* | Displays the current Troposphere model. This model was entered in the GPS+ PostProcess (the Troposphere tab) Process sub-menu option for the last post-processing of the GPS observation. |

| Field | Description |
|---|---|
| *Meteo Model* | Displays the current Meteo model. This model was entered in the GPS+ PostProcess (the Troposphere tab) Process sub-menu option for the last post-processing of the GPS observation. |
| *Meteo param at height* | Displays the height for the basic meteo parameters. |
| *Dry temperature* | Displays the temperature reduced to the dry humidity. |
| *Pressure* | Displays the atmosphere pressure. |
| *Humidity* | Displays the atmosphere humidity. |
| *Constant Zenith delay* | Displays the period of time in hours (defined by the user in the Troposphere tab of the Process sub-menu) during which the zenith delay is applied as constant. |

# TS Obs Properties dialog

The *TS Obs* tab from the Tabular view has two panels —left for the TS occupations and right for the TS observations of selected occupation. Each of them has its own ***Properties*** dialog.

The ***Properties*** dialog for the TS occupation (the left pane of the TS *Obs* tab) contains the following tabs:

- "General tab" section below
- "Accuracy tab" section on the facing page
- "Instrument Type tab" section on page 248
- "Offset tab" section on page 248

To open the dialog:

1. In the left pane of the *TS Obs* tab from the Tabular view, select the required occupation .
2. Right-click and select **Properties** from the pop-up menu.

The ***Properties*** dialog for the TS observation (the right pane of the TS *Obs* tab) contains three tabs:

- "General tab" section on page 250
- "Observation tab" section on page 251
- "Offset tab" section on page 252
- "Adjustment tab" section on page 254
- "Quality Control tab" section on page 255
- "Image tab" section on page 256
- "Prism tab" section on page 256
- "Survey Session tab" section on page 256

To open the dialog:

1. Select the required observation in the right pane of the *TS Obs* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

## General tab

The *General* tab of the ***Properties*** dialog for a TS occupation allows you to view and edit basic properties for an occupation. Fields of the tab are described in the table below.

To open the tab:

1. Select the required occupation in the left panel of the *TS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Point Name* | Displays the name of the point where the Total Station was set. You can set any point's name from the list. |
| # | Displays the number of a TS occupation contained in the raw file. You can set any number from the list. |
| *Instrument Height* | Displays the instrument height — the vertical distance from the Instrument Center Mark to the ground, in current linear units. To edit the value, click on the highlighted field and enter a new value. |
| *Enabled* | When ticked, the TS occupation is included in adjustment, coordinate calculation and export. If this parameter is unchecked, adjustment, coordinate calculation and export will ignore the TS occupations. |

## Accuracy tab

The *Accuracy* tab of the ***Properties*** dialog for a TS occupation allows you to view and edit accuracy properties for an occupation. Fields of the tab are described in the table below.

To open the tab:

1. Select the required occupation in the left panel of the *TS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Accuracy* tab.

**Fields of the *Accuracy* tab**

| Field | Description |
|---|---|
| *Instrument Centering Error* | Displays the error of centering the Total Station position over the mark. This error will be taken into account during adjustment of the network with the given TS occupation. To edit the value, click on the highlighted field and enter a new value. |
| *Instrument Height Error* | Displays the measurement error of the Total Station height over the mark. This error will be taken into account during adjustment of the network with the given TS occupation. To edit the value, click on the highlighted field and enter a new value. |
| *Reflector Centering Error* | Displays the error of centering the reflector position over the mark. This error will be taken into account during adjustment of the network with the given TS occupation. To edit the value, click on the highlighted field and enter a new value. |

| Field | Description |
|---|---|
| *Reflector Height Error* | Displays the measurement error of the reflector height over the mark. This error will be taken into account during adjustment of the network with the given TS occupation. To edit the value, click on the highlighted field and enter a new value. |
| *Class* | Displays the class which was selected for the TS occupation. To change the class, click and select other class from the drop-down list. Also you can create a custom class by clicking **Custom**. |

## Instrument Type tab

The *Instrument Type* tab of the ***Properties*** dialog for a TS occupation allows you to define the instrument type for an occupation. Fields of the tab are described in the table below.

To open the tab:

1. Select the required occupation in the left panel of the *TS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Instrument Type* tab.

**Fields of the *Instrument Type* tab**

| Field | Description |
|---|---|
| *Instrument Type* | Displays the Instrument Type for the given TS occupation. To change the instrument type, click and select other instrument type from the drop-down list. Also you can create a custom instrument type by clicking the Custom button. See "Adding TS Instrument Type" section on page 331 for details. |

## Offset tab

The *Offset* tab of the ***Properties*** dialog for a TS Occupation allows you to view and edit basic offset for an occupation. Fields of the tab are described in the table below. The tab displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset. See "Editing and viewing MAGNET Field Offsets in the Job" section on page 345 for details.

To open the tab:

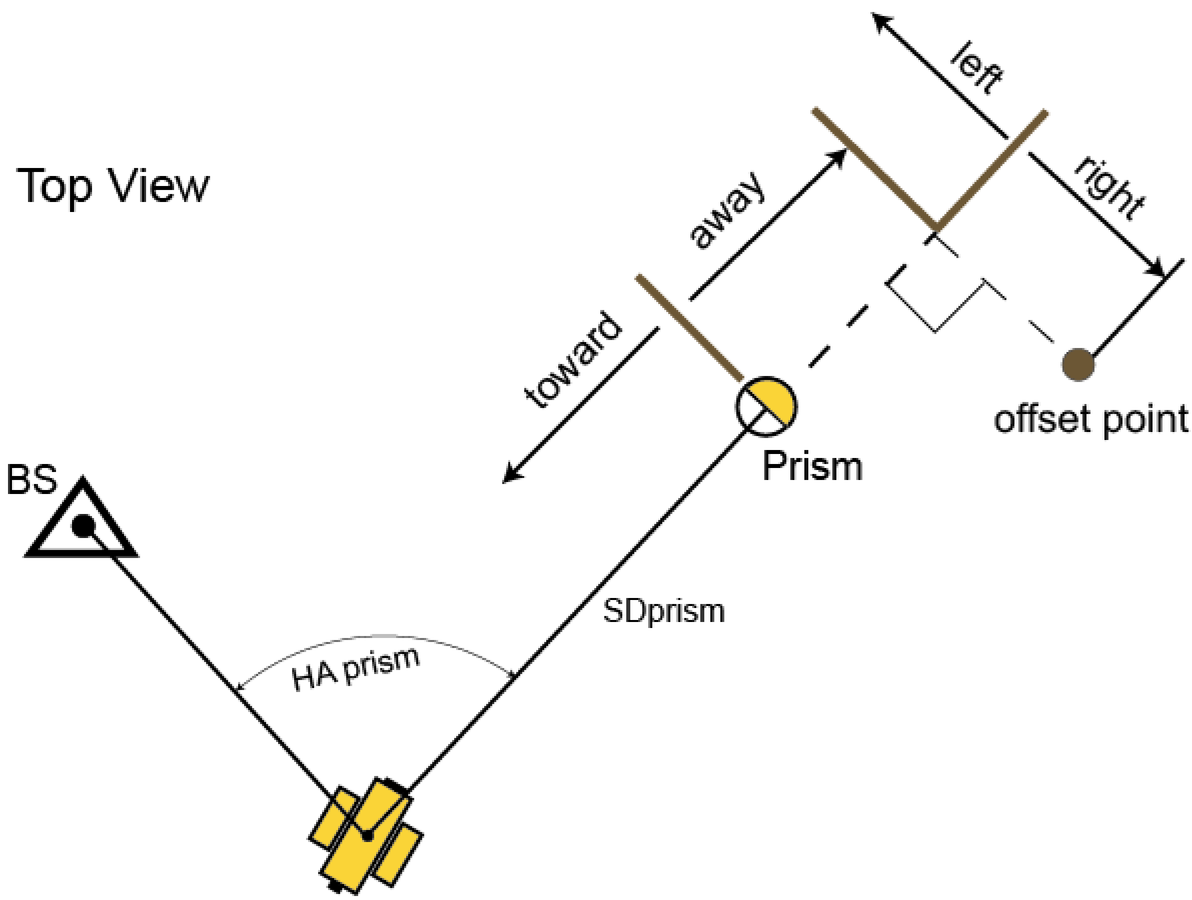
1. Select the required observation in the left panel of the *TS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Offset* tab.

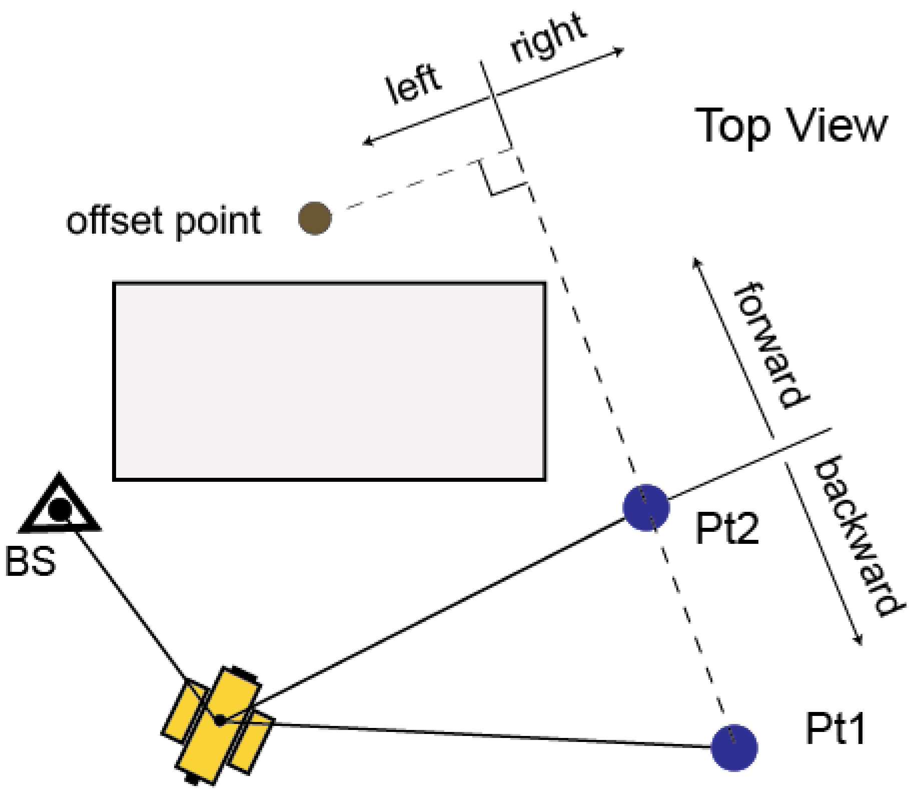
To obtain the coordinates of the offset point, select **Compute Coordinates** from the pop-up menu.

**Fields of the *Offset* tab**

| Field | Description |
|---|---|
| *Offset Along* | Displays the distance from the "To Point" to the projection of the offset point along the line "From Point-To Point", in current linear units. The field displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset.<br>To edit the value, click on the highlighted filed and enter a new value. |
| *Offset Across* | Displays the distance from the offset point to the line "From Point-To Point", in current linear units. The field displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset.<br>To edit the value, click on the highlighted filed and enter a new value. |
| *Offset dHt* | Displays the height difference between the ground point or the top of "To Point"and the offset point, in current linear units. The field displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset.<br>To edit the value, click on the highlighted filed and enter a new value. |
| *Offset Type* | Displays the current type of the given offset. For the Distance Offset and the Line Offset created in MAGNET Field, you see "From Observation Line" type. |




**Distance Offset**




**Line Offset**

## General tab

The *General* tab of the ***Properties*** dialog for a TS observation allows you to view and edit basic properties for an observation. Fields of the tab are described in the table below.

To open the tab:

1. Select the required observation in the right panel of the *TS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Point From* | Displays the name of the point where the Total Station is set. You cannot edit this name. |
| # | Displays the number of the TS observation contained in the raw file. |
| *Date* | Displays the date and time of the total station measurement. You cannot edit this field. |
| *Code* | Displays code of the TS observation. A TS observation can have only one code. To edit the code, click on the highlighted field and select a new one from the drop-down list of existing codes or enter a new codes, or remove the Code and leave the field empty. |

| Field | Description |
|---|---|
| *String* | Displays the string for the TS observation. The string entered for a TS occupation is automatically displayed as string for the corresponding point in the *Points* tab. Using a complex of string and codes allows you to automatically create a line in the job. The software will automatically create a line between points with the same Code and String values. See picture and table below for details. |
| *Control Code* | Displays the control code for the TS observation. See "Control Code field" section on page 152 for details. |
| *Control Code2* | Displays the second control code for the TS observation. See "Control Code2 field" section on page 154 for details. |
| *Source* | Displays the path of the raw data on the computer disk drive, local area network, or storage media. |
| *Enabled* | When ticked (default setting for all point types), the point and all objects related to the given points is included in adjustment, coordinate calculation and export. If this parameter is unchecked, adjustment, coordinate calculation and export will ignore the points and all objects related to the given points. A disabled point is grayed-out in all views. |

## Observation tab

The *Observation* tab of the ***Properties*** dialog for a TS observation allows you to view and edit basic properties for an observation. Fields of the tab are described in the table below.

To open the tab:

1. Select the required observation in the right panel of the *TS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Observation* tab.

#### Fields of the *Observation* tab

| Field | Description |
|---|---|
| *Point To* | Displays the name of the point at which the reflector was set. You can set any point's name from the list. |
| *Type* | Displays the current type of the Total Station occupation. See "Type field" section on page 154 for details. |
| *Reflector Height* | Displays the vertical distance from the center of the prism to a ground point, in current linear units. To edit the value, click on the highlighted field and enter a new value. |
| *Horizontal Circle* | For the SS, FS, Horizontal Resection/Vertical Resection/Resection types of Total Station observation, the field displays the measured horizontal angle from the previous to the next observation. For BKB type, the field displays the horizontal circle reading when pointing to the backsight point. You cannot edit this parameter. |

| Field | Description |
|---|---|
| *Zenith Angle* | Displays the vertical angle to the reflector measured from zenith. You cannot edit this parameter. |
| *Slope Distance* | Displays the slope distance between the TS station (Point From) and the TS occupation (Point To). You cannot edit this parameter. |
| *Vertical Angle* | Displays the vertical angle to the reflector measured from horizon. You cannot edit this parameter. |
| *Horizontal Distance* | Displays the distance between the TS station (Point From) and the TS occupation (Point To) in the horizontal plane. You cannot edit this parameter. |
| *Vertical Distance* | Displays the vertical angle to the reflector measured from horizon. You cannot edit this parameter. |
| *Note* | Displays any additional TS occupation's note. To edit the note, click on the highlighted field and enter comments, if needed. |
| **Exclude** | |
| *Horizontal Circle* | When ticked, the Horizontal Circle measurement for this TS occupation is excluded from the adjustment, calculating coordinates and export. |
| *Vertical Angle* | If the box is checked, the Vertical Angle measurement for this TS occupation is excluded from the adjustment, calculating coordinates and export. |
| *Slope Distance* | If the box is checked, the Slope Distance measurement for this TS occupation is excluded from the adjustment, calculating coordinates and export. |

## Offset tab

The *Offset* tab of the ***Properties*** dialog for a TS observation allows you to view and edit basic offset for an observation. Fields of the tab are described in the table below. The tab displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset.

To open the tab:

1. Select the required observation in the right panel of the *TS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

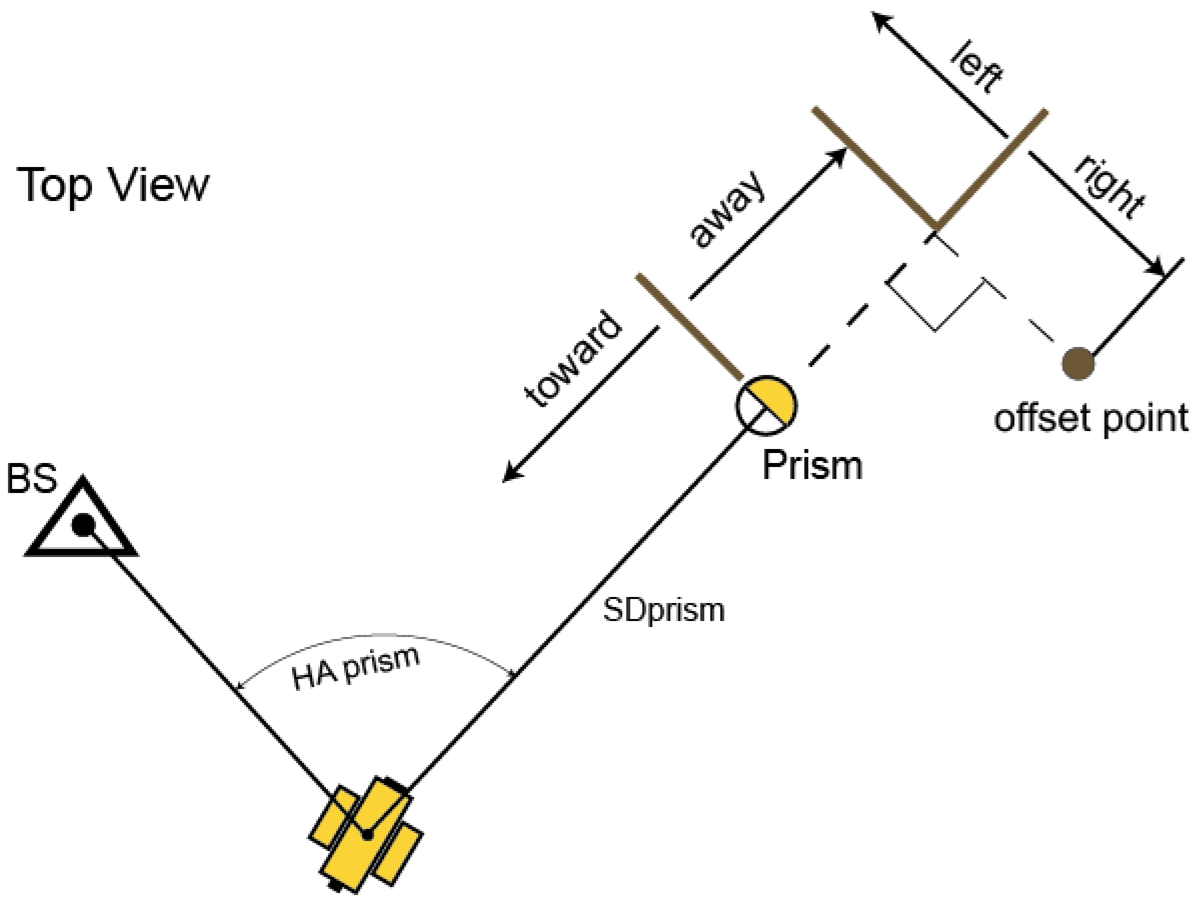
   The ***Properties*** dialog is displayed.
3. Click the *Offset* tab.

To obtain the coordinates of the offset point, select **Compute Coordinates** from the pop-up menu.

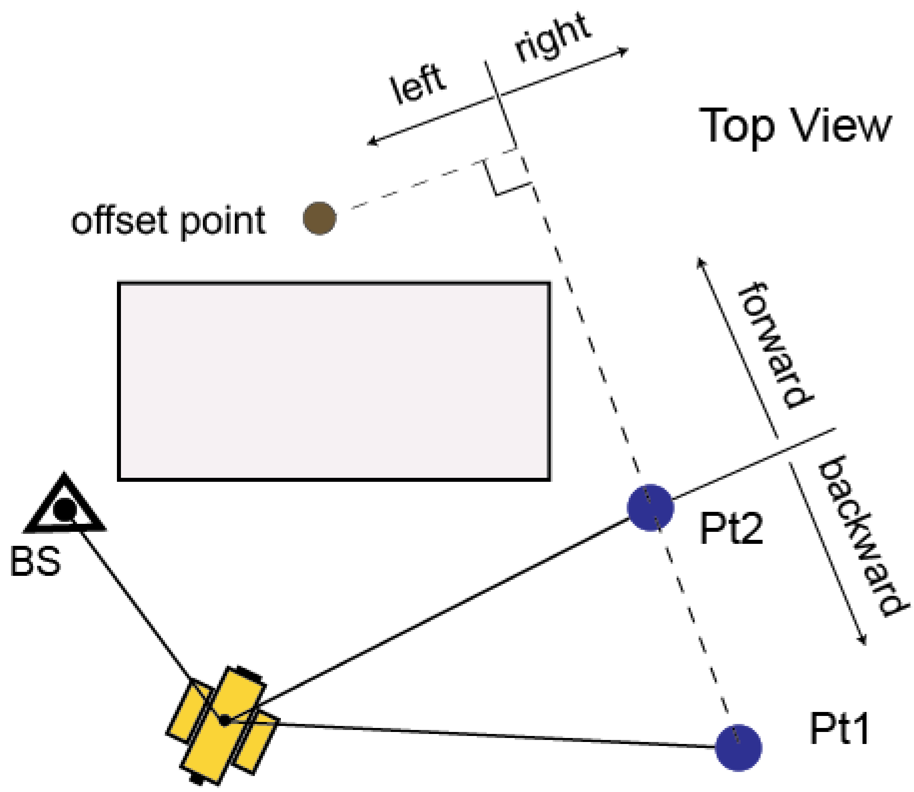
#### Fields of the *Offset* tab

| Field | Description |
|---|---|
| *Offset Along* | Displays the distance from the "To Point" to the projection of the offset point along the line "From Point-To Point", in current linear units. The field displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset.<br><br>To edit the value, click on the highlighted filed and enter a new value. |

| Field | Description |
|---|---|
| *Offset Across* | Displays the distance from the offset point to the line "From Point-To Point", in current linear units. The field displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset.<br>To edit the value, click on the highlighted filed and enter a new value. |
| *Offset dHt* | Displays the height difference between the ground point or the top of "To Point"and the offset point, in current linear units. The field displays non-zero values when the imported MAGNET Field job contains the Distance Offset and the Line Offset.<br>To edit the value, click on the highlighted filed and enter a new value. |
| *Offset Type* | Displays the current type of the given offset. For the Distance Offset and the Line Offset created in MAGNET Field, you see "From Observation Line" type. |




**Distance Offset**




**Line Offset**

## Adjustment tab

The *Adjustment* tab of the ***Properties*** dialog for a TS observation allows you to view adjustment data for an observation. Fields of the tab are described in the table below.

To open the tab:

1. Select the required observation in the right panel of the *TS Obs* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Adjustment* tab.

**Fields of the *Adjustment* tab**

| Field | Description |
|---|---|
| *Auto Reject* | In this field you can select the GPS observation availability for Adjustment:<br>• Allowed — the GPS observation will be used in Adjustment.<br>• Not Allowed — the GPS observation will not be used in Adjustment. |

| Field | Description |
|---|---|
| *Adjustment Status* | Displays the status of the GPS observation after Adjustment:<br>• Not Adjusted — the TS observation is not adjusted.<br>• Adjusted — the TS observation is adjusted.<br>• AutoRejected — the TS observation is not adjusted, because the vector had the status Not Allowed before the adjustment procedure.<br>• Disable — the TS observation is not adjusted, because the vector was disabled before the adjustment procedure. |
| *SDist Residual* | Displays the residual of the slope distance after adjustment for both enabled and disabled TS observations. |
| *HAngle Residual* | Displays the residual of the horizontal angle after adjustment for both enabled and disabled TS observations. |
| *Azimuth Residual* | Displays the residual of azimuth after adjustment for both enabled and disabled TS observations. |
| *VAngle Residual* | Displays the residual of the vertical angle after adjustment for both enabled and disabled TS observations. |
| *ZAngle Residual* | Displays the residual of the zenith angle after adjustment for both enabled and disabled TS observations. |
| *HDist Residual* | Displays the residual of the horizontal distance after adjustment for both enabled and disabled TS observations. |
| *VDist Residual* | Displays the residual of the vertical distance after adjustment for both enabled and disabled TS observations. |
| *Cross Residual* | Displays the residual of the horizontal angle represented in the linear measure after adjustment for both enabled and disabled TS observations. |

Zero value in the Residual fields means that the TS observation is included in the unclosed network, and does not contain repeated TS observations.

The residuals for a disabled TS observation are calculated as differences between the values determined from the inverse solution for the adjusted points and the values of measured angles and distance.

## Quality Control tab

The *Quality Control* tab of the ***Properties*** dialog for a TS Observation allows you to review observations, which did not pass the quality test. Fields of the tab are described in the table below.

To open the tab:

1. Select the required Observation in the right panel of the *TS Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Quality Control* tab.

The pane displays information about highlighted TS Observations (marked in red in the views) that did not pass some of the quality control checks.

#### Fields of the ***Quality Control*** tab

| Field | Description |
|---|---|
| *Ignore QC* | When ticked, all quality control tests are not performed for the selected observations. |

## Image tab

Displays the images for the TS occupation, obtained from built in Camera on GPT-700*i and IS.

## Prism tab

The *Prism* tab of the ***Properties*** dialog for a TS observation allows you to view information about the reflector's prism. Fields of the tab are described in the table below.

To open the tab:

1. Select the required observation in the right panel of the *TS Obs* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Prism* tab.

#### Fields of the ***Prism*** tab

| Field | Description |
|---|---|
| *Prism type* | Displays the type of the prism. |
| *Prism Constant* | Defines the parameter of the prism characterizing the difference between the reflection plane and the center of the prism. Measurements will be recalculated if you change the value. |

## Survey Session tab

The *Survey Session* tab of the ***Properties*** dialog for a TS observation allows you to view information about the survey session of the observation. Fields of the tab are described in the table below.

To open the tab:

1. Select the required observation in the right panel of the *TS Obs* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Survey Session* tab.

#### Fields of the ***Survey Session*** tab

| Field | Description |
|---|---|
| *Surveyor* | Displays the name of the person who performed survey session. |
| *Temperature* | Displays the temperature during the survey session in the current units. |
| *Pressure* | Displays the pressure during the survey session in the current units. |
| *Humidity* | Displays the humidity during the survey session in the current units. |

# DL Obs Properties dialog

The *DL Obs* tab form the Tabular view has two panes — for the DL occupations and for the DL observations. Each of them has its own ***Properties*** dialog.

The ***Properties*** window for the DL occupation (the left panel of the *DL Obs* tab) contains the following tabs:

- "General tab" section below
- "Quality Control tab" section on the next page

To open the dialog:

1. Select the required occupation in the left pane of the *DL Obs* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

The Properties window for DL observation (the right pane of the DL Obs tab) contains the following tabs:

- "General tab" section on the next page
- "Observation tab" section on page 259
- "Adjustment tab" section on page 260
- "Quality Control tab" section on page 260

To open the dialog:

1. Select the required observation in the right pane of the *DL Obs* tab of the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

## General tab

The *General* tab of the ***Properties*** dialog for a DL occupation allows you to view and edit basic properties for an occupation. Fields of the tab are described in the table below.

To open the tab:

1. Select the required occupation in the left panel of the *DL Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| # | Displays the number of the DL run (DL occupation) contained in the current job. You can set any number from the list. |
| *From* | Displays the start leveling point of the job. You cannot select other point as start point. |
| *To* | Displays the finish leveling point of the job. You cannot select other point as finish point. |
| *Level Run* | Display the name of the leveling job created in a digital level. |
| *Date* | Displays the start date (day/month/year) and time of the job creation. You can-not edit the value. |

| Field | Description |
|---|---|
| *Note* | Displays any additional DL run's note. To edit the note, click on the highlighted field and enter your comments. |
| *Distance* | Displays the sum of all backsight and foresight distances. You cannot edit the parameter. |
| *Balance* | Display the sum of differences between DL to BS point and DL to FS point of the job. You cannot edit the value. |
| *Enabled* | When ticked, the DL run and all objects related to the given observations, are included in adjustment, coordinate calculation and export. If unticked, adjustment, coordinate calculation and export will ignore the DL run and all objects related to the given occupations. |

## Quality Control tab

The *Quality Control* tab of the ***Properties*** dialog for a DL Occupation allows you to review occupations, which did not pass the quality test. Fields of the tab are described in the table below.

To open the tab:

1. Select the required occupation in the left panel of the *DL Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Quality Control* tab.

The pane displays information about highlighted DL Occupations (marked in red in the views) that did not pass some of the quality control checks.

#### Fields of the *Quality Control* tab

| Field | Description |
|---|---|
| *Ignore QC* | When ticked, all quality control tests are not performed for the selected occupations. |

## General tab

The *General* tab of the ***Properties*** dialog for a DL observation allows you to view and edit basic properties for an observation. Fields of the tab are described in the table below.

To open the tab:

1. Select the required observation in the right panel of the *DL Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *General* tab.

#### Fields of the *General* tab

| Field | Description |
|---|---|
| *Level Run* | Display the name of the leveling job created in a digital level.You cannot edit the parameter. |

| Field | Description |
|---|---|
| # | Displays the number of the DL observation contained in the current job. You cannot set any number from the list. |
| *Note* | Display any additional DL observation's note. To edit the note, click on the highlighted field and enter comments, if needed. |
| *Date* | Displays the start date (day/month/year) and time of creating the measurement. You cannot edit the value. |
| *Source* | Displays the path of the raw data to the computer disk drive, local area net-work, or storage media. |
| *Enabled* | When ticked, the DL observation and all objects related to it are included to adjustment, coordinate calculation and export. If unticked, the adjustment, coordinate calculation and export will ignore the DL observations. |

## Observation tab

The *Observation* tab of the ***Properties*** dialog for a DL observation allows you to view an observation. Fields of the tab are described in the table below.

To open the tab:

1. Select the required observation in the right panel of the *DL Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Observation* tab.

#### Fields of the *Observation* tab

| Field | Description |
|---|---|
| *Type* | Displays the current type of the Digital Level observation. This field contains the list of the DL observation types. You cannot select the other type from the list:<br>• SS (side shot) — the measurement to a point that is not a BS/FS point, or Changing Point/ Bench Mark point.<br>• BS (backsight) — the measurement to the previous occupation point in the DL run.<br>• FS (foresight) — the measurement to the next occupation point in the DL run.<br>• End of Changing Pt — the end measurement of the DL run to the point that is used to carry the measurements forward in the DL run.<br>• End of Bench Mark — the end measurement of the DL run to the point with known elevation. |
| *Point* | Displays the name of turning or side shot point. You can select a point from the list. |
| *Ht. Measurement* | Displays the rod reading on the given point, in current linear units. You cannot edit the measurement. |
| *Vert Offset* | Displays the vertical offset from the horizontal plane for traverse and sideshot points. |

| Field | Description |
|---|---|
| *Distance* | Displays the measured distance from DL to the given point. You cannot edit the measurement. |
| *Instrument Elevation* | Displays the elevation of sight that includes the elevation of BS point and the rod reading on BS point. You cannot edit the measurement. |
| *Std Dev* | Displays the standard deviation for the level measurement. This value is created in the Digital Level. You cannot edit the parameter. |

## Adjustment tab

The *Adjustment* tab of the ***Properties*** dialog for a DL observation allows you to view observation adjustment details. Fields of the tab are described in the table below.

To open the tab:

1. Select the required observation in the right panel of the *DL Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Adjustment* tab.

**Fields of the *Adjustment* tab**

| Field | Description |
|---|---|
| *AutoReject* | Defines the status of the DL observation for Adjustment:<br>• Allowed — the DL observation will be used in Adjustment.<br>• Not Allowed — the DL observation will not be used in Adjustmen |
| *Adjustment Status* | Displays the status of the DL observation after Adjustment:<br>• Not Adjusted — the DL observation is not adjusted.<br>• Adjusted — the DL observation is adjusted.<br>• AutoRejected — the DL observation is not adjusted because the vector had the status Not Allowed before the adjustment procedure.<br>• Disable — the DL observation is not adjusted because the vector was disabled before the adjustment procedure. |
| *Ht Residual* | Displays the adjustment residuals for the level measurements. You cannot edit the value. |
| *Elevation* | Displays the elevation on FS point that includes the elevation of sight and rod reading on FS point. You cannot edit the value. |

## Quality Control tab

The *Quality Control* tab of the ***Properties*** dialog for a DL Observation allows you to review observations, which did not pass the quality test. Fields of the tab are described in the table below.

To open the tab:

1. Select the required occupation in the left panel of the *DL Obs* tab of the Tabular view
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Quality Control* tab.

The pane displays information about highlighted DL Occupations (marked in red in the views) that did not pass some of the quality control checks.

**Fields of the *Quality Control* tab**

| Field | Description |
|---|---|
| *Ignore QC* | When ticked, all quality control tests are not performed for the selected observations. |

# Lines Properties dialog

The *Lines* tab of the Tabular view displays a table containing two panels. The left panel displays all polylines (type, layers, plotting styles, codes and string) in the job, and the right panel displays all segments for the selected polyline.

The ***Properties*** dialog for the polyline/area contains the following tabs:

- "Line tab" section below
- "Plotting styles tab" section on the next page
- "COGO tab" section on page 263
- "Photonotes tab" section on page 264

To open the dialog:

1. In the left panel of the *Lines* tab from the Tabular view, select the required line/area.
2. Right-click and select **Properties** from the pop-up menu.

The Properties window for the selected segments of the line contains the following tabs:

- "General tab" section on page 265
- "End Position tab" section on page 268

To open the dialog:

1. Select the required line/area in the Map view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. In the left panel, select the *Properties: Line Segment* item.

## Line tab

The *Line* tab of the ***Properties*** dialog for a polyline/area allows you to select type and a layer for the entity. Fields of the tab are described in the table below.

To open the tab from the tabular view:

1. Select the required line/area in the left panel of the *Lines* tab from the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click *Line* tab.

To open the tab from the map view:

1. Select the required line/area in the Map view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. In the left panel, select the *Properties: Line* item.
4. In the right panel, click the *Line* tab.

**Fields of the *Line* tab**

| Field | Description |
|---|---|
| *Name* | Defines the name of the line. It can be empty. If specified, the name should be unique. |
| *Type* | In this field you can select the type of the polyline:<br>• Line — unclosed polyline.<br>• Area — closed polyline.<br>When you select Area for a polyline with the Line type, the application automatically adds a segment to close the existing polyline if the existing polyline has more than one segment. When you select Line for a polyline which has the Area type, the application automatically removes a segment to open the area. |
| *Layer* | Displays the Layer in which the polyline resides. The Layer sets the plotting style for the polyline and all segments of the polyline. Every polyline has its non-empty Layer. In this field, you can select any Layer from the list of user-created layers. |

## Plotting styles tab

The *Plotting styles* tab of the ***Properties*** dialog for a polyline/area allows you to configure the layout of polylines for map view and plotting. Fields of the tab are described in the table below.

To open the tab from the tabular view:

1. Select the required line/area in the left panel of the *Lines* tab from the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click *Plotting styles* tab.

To open the tab from the map view:

1. Select the required line/area in the Map view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. In the left panel, select the *Properties: Line* item.
4. In the right panel, click the *Plotting styles* tab.

**Fields of the *Plotting styles* tab**

| Field | Description |
|---|---|
| *Line Style* | Displays the polyline style for Map View. The style can be chosen from the list. If you set BYCODE or BYLAYER, the style of the polyline will be set automatically to the style that was selected for the polyline's code, or polyline's layer. |
| *Line Width* | Displays the polyline width for Map View. The width can be chosen from the list. If you set BYCODE or BYLAYER, the width of the polyline will be set automatically to the width that was selected for the polyline's code, or polyline's layer. |
| *Line Color* | Displays the polyline color for Map View. The color can be chosen from the list. If you set BYCODE or BYLAYER, the color of the polyline will be set automatically to the color that was selected for the polyline's code, or polyline's layer. |
| *Area Fill Style* | Displays the fill stile for closed polyline (area) in Map View. The fill style can be chosen from the list. If you set BYCODE or BYLAYER, the fill style for the polyline will be set automatically to the fill style that was selected for the polyline's code, or polyline's layer. |
| *Point Type* | Displays the symbol for the point of the polyline in Map View. The symbol can be chosen from the list. If you set BYCODE or BYLAYER, the point symbol will be set automatically to the symbol that was selected for the polyline's code, or polyline's layer. |
| *Fill Transparency* | Displays the transparency value for closed polyline (area) in Map View. The value can be chosen from the list. If you set BYCODE or BYLAYER, the value will be set automatically to the symbol that was selected for the polyline's code, or polyline's layer. |
| *Area Color* | Displays the color for the closed polyline (area) in Map View. The color can be chosen from the list. If you set BYCODE or BYLAYER, the area color will be set automatically to the color that was selected for the polyline's code, or polyline's layer. |
| *Point Color* | Displays the color for the point of the polyline in Map View. The color can be chosen from the list. If you set BYCODE or BYLAYER, the point color will be set automatically to the color that was selected for the polyline's code, or polyline's layer. |

## COGO tab

The *COGO* tab of the ***Properties*** dialog for a polyline/area displays the distance/area info of the polyline/area. Fields of the tab are described in the table below.

To open the tab from the tabular view:

1. Select the required line/area in the left panel of the *Lines* tab from the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click *COGO* tab.

To open the tab from the map view:

1. Select the required line/area in the Map view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. In the left panel, select the *Properties: Line* item.
4. In the right panel, click the *COGO* tab.

**Fields of the *COGO* tab**

| Field | Description |
|---|---|
| *Distance* | Displays the summary length of the polyline, in current linear units. This distance can be of either geodetic, or grid, or ground type depending on the selected coordinate type for the current job. |
| *Area* | Displays the area of the closed line. This area can be of either geodetic, or grid, or ground type depending on the selected coordinate type for the current job. |

## Photonotes tab

The *Photonotes* tab of the ***Properties*** dialog for a polyline/area allows you to view and manage pictures attached to a line. Fields of the tab are described in the table below.

To open the tab from the tabular view:

1. Select the required line/area in the left panel of the *Lines* tab from the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click *Photonotes* tab.

To open the tab from the map view:

1. Select the required line/area in the Map view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. In the left panel, select the *Properties: Line* item.
4. In the right panel, click the *Photonotes* tab.

The *Photo Note Number* field displays the number of the images for the polyline/area.

To see a picture, select it from the *Photo Note Number* drop-down list.

To add a picture:

1. Click **Add Photo Note**.

   The ***Open*** dialog is displayed.
2. Navigate to the required picture and open it.

To remove a picture:

1. Select the required picture from the *Photo Note Number* drop-down list.
2. Click **Remove Photo Note**.

# General tab

The *General* tab of the ***Properties*** dialog for a polyline segment allows displays the base information about the segment. Fields of the tab are described in the table below.

To open the tab from the map view:

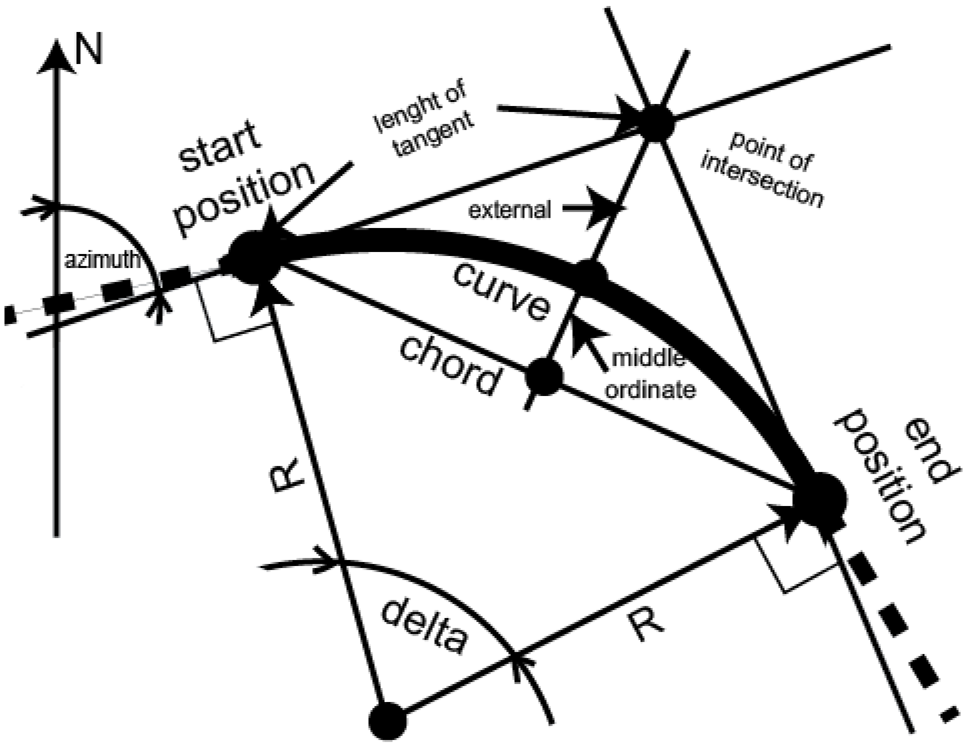
1. Select the required line/area in the Map view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. In the left panel, select the *Properties: Line Segment* item.
4. In the right panel, click the *General* tab.

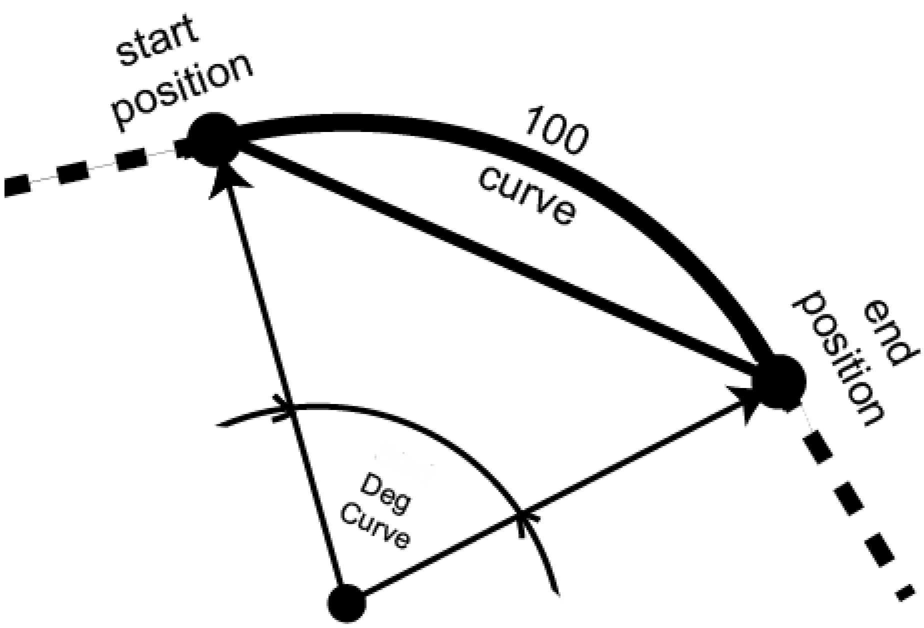
**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Type* | Displays the type of selected segment. You can select one of the following segment type:<br>• Line<br>• Curve<br>• Curve by 2 points<br>• Curve by 3 points<br>• Bulge<br>• Circle |
| **For Line type** | |
| *Length* | Displays the distance of the segment (from the previous point to this point), in current linear units. You cannot edit this value. |
| *Azimuth* | Displays the end azimuth of the tangent to the given point (vertex) of the segment. You cannot edit this value. |
| **For curves** | |
| *Length* | Displays the distance of the segment (from the previous point to this point), in current linear units. You cannot edit this value. |
| *Turn* | Defines the direction of the curve turn. The *Right* value stands for clockwise direction, and the *Left* value stands for counter-clockwise direction. You can edit the direction only for *Curve* segment type. |
| *Radius* | Defines the radius of the curve. |
| *Azimuth* | Displays the end azimuth of the tangent to the given point (vertex) of the segment. You cannot edit this value. |

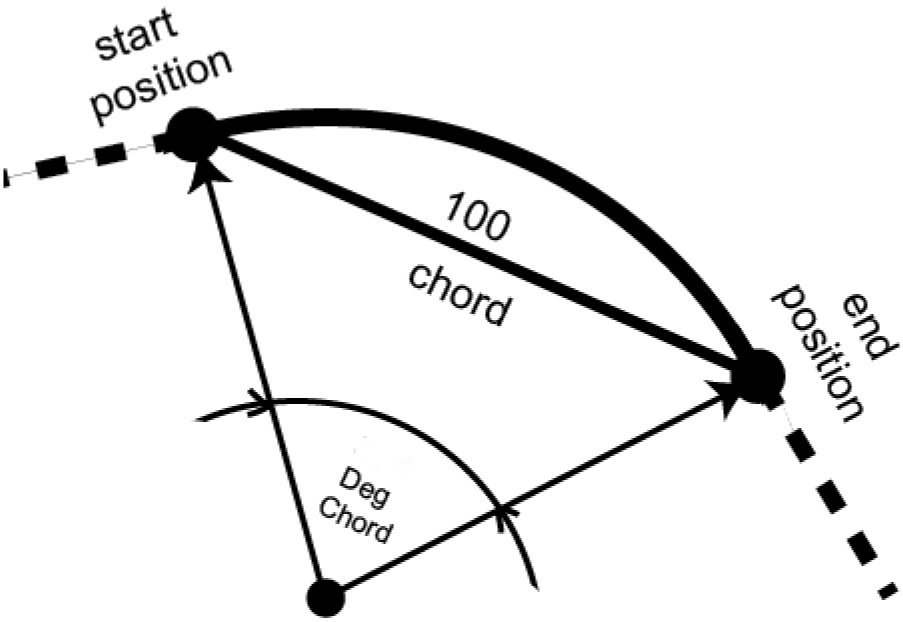
| Field | Description |
|---|---|
| *Deg Curve* | Displays the angle in degrees used to compute the radius of curve whose curve is 100 units long.<br>Using the degree of curve (DCV) parameter, the radius of the curve can be calculated as follows:<br>$R = \frac{100 \times 180}{\pi} \times \frac{1}{DCV}$ |
| *Deg Chord* | Displays the angle in degrees used to compute the radius of curve which chord is 100 units long:<br>Using the degree of chord (DCH) parameter, the radius of the curve can be calculated as follows:<br>$R = \frac{50}{\sin(\frac{DCH}{2} + \frac{\pi}{180})}$ |
| *Delta* | Displays the angle between the radii corresponding to the curve. |
| *Chord* | Displays the length of the segment joining start and end points of a curve in the current linear units. |
| *Tangent* | Displays the length of the segment going through the start point of the given curve and perpendicular to the radii pf the curve in the start point. The length of the tangent is in the current linear units. |
| *Mid Ord* | Displays the distance from the midpoint of a chord to the midpoint of the corresponding curve (Middle Ordinate) in the current linear units. |
| *External* | Displays the distance from the midpoint of the curve to the intersection point of the tangents in the current linear units. |




**Curve parameters**




**Deg curve**




**Deg chord**

## End Position tab

The *End Position* tab of the ***Properties*** dialog for a polyline segment allows displays the information about the end point of the segment. Fields of the tab are described in the table below.

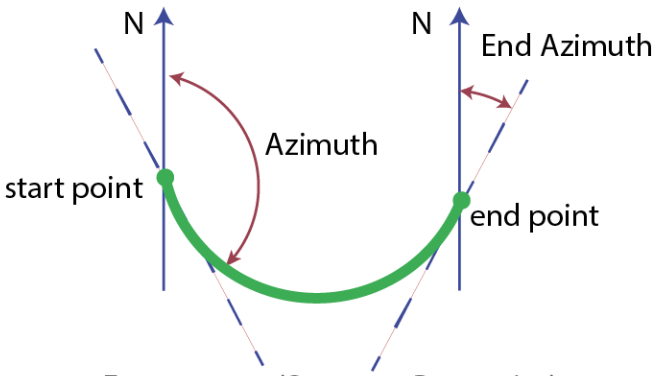
To open the tab from the map view:

1. Select the required line/area in the Map view.
2. Right-click and select **Properties** from the pop-up menu.

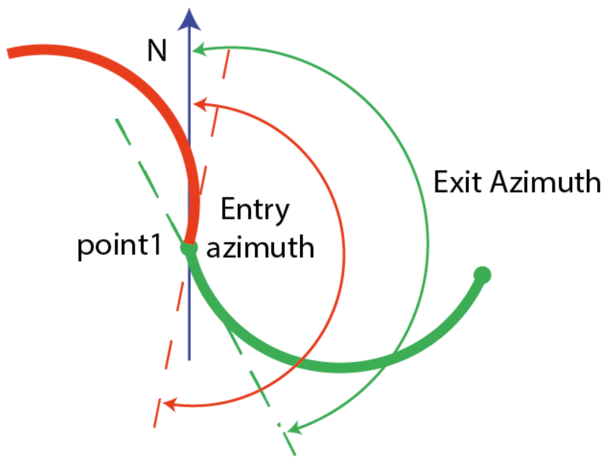
   The ***Properties*** dialog is displayed.
3. In the left panel, select the *Properties: Line Segment* item.
4. In the right panel, click the *End Position* tab.

**Fields of the *End Position* tab**

| Field | Description |
|---|---|
| *End Northing* | Displays the end point northing coordinate in Ground / Grid coordinate system. You cannot edit this value. |
| *End Easting* | Displays the end point easting coordinate in Ground / Grid coordinate system. You cannot edit this value. |
| *End Azimuth* | Displays the azimuth of the tangent to the given point (vertex) for the current segment. You cannot edit this value. See picture below for details. |




For segment (Segment Properties)




For points in the left panel of the Lines tab

# Surface Properties dialog

The *Surfaces* tab of the Tabular view displays a table containing all surfaces.

The ***Properties*** dialog for surfaces may displays different information, depending on the method of surface creation.

If the surface was created from points and/or lines and not converted from roads and lines, the ***Properties*** dialog contains two tabs, described in the following sections:

- "General tab" section on the next page
- "Options tab" section on page 271

  To open the dialog:

  1. Select the required surface either in the Map view, or in the *Surface* tab from the Tabular view.
  2. Right-click and select **Properties** from the pop-up menu.

If the surface was created by conversion from a road, the ***Properties*** dialog two tabs, described in the following sections:

- "General tab" section on the next page
- "Road tab" section on page 271

If the surface was created from a geoid, the ***Properties*** dialog contains only the *General* tab.

## General tab

The *General* tab of the ***Properties*** dialog for a surface allows you to view and edit basic info for the surface. Fields of the tab are described in the table below.

To open the tab from the tabular view:

1. Select the required surface at the *Surfaces* tab from the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click *General* tab.

To open the tab from the map view:

1. Select the required surface in the Map view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Name* | Displays the name of the surface. To edit the name, click on the highlighted field and type a new name. The surface name is unique and the field cannot be empty. |
| *Focus Point* | Displays the name of a focus point. If the column is empty, the triangulation is completed in relation to the ground plane. If set to some existing point, the triangulation will be done with respect to that point, that is as if the surface is viewed from that point. You can select a point from the list of the job's points. |
| *Number of Points* | Displays the quantity of points in the surface, including intersection points of lines forming this model. You cannot edit this parameter. |
| *Number of Triangles* | Displays the quantity of triangles created on the surface. You cannot edit this parameter. |
| *Comment* | Defines any additional information about the surface. |
| *Min. Northing* | Displays the minimum value of northing coordinates of points included in the surface. You cannot edit this parameter. |
| *Max Northing* | Displays the maximum value of northing coordinates of points included in the surface. You cannot edit this parameter. |
| *Min. Easting* | Displays the minimum value of easting coordinates of points included in the surface. You cannot edit this parameter. |
| *Max. Easting* | Displays the maximum value of easting coordinates of points included in the surface. You cannot edit this parameter. |
| *Min. Elevation* | Displays the minimum value of elevation coordinates of points included in the surface. You cannot edit this parameter. |
| *Max. Elevation* | Displays the maximum value of elevation coordinates of points included in the surface. You cannot edit this parameter. |

| Field | Description |
|---|---|
| *Area* | Displays the sum of areas of the triangle projections on the horizontal plane (if the triangulation is done with respect to the ground plane) and the vertical plane (if the triangulation is done with respect to a vertical plane from a focus point for the given surface). You cannot edit this parameter. |
| *Layer* | Displays the name of the Layer in which the surface resides. The Layer sets the plotting style for the surface. Every surface has to have a Layer. In this field, you can select any Layer from the list of user-created layers. |
| *Need Update* | Displays the current status of the surface. If set to "No", the surface is not changed, or automatic update is done. If set to "Yes", the surface is changed, and automatic update of the changed surface is disabled. |
| *Auto Update* | When unticked (default setting), automatic update of the changed surface is disabled. If ticked, automatic update of the changed surface is enabled. |

## Options tab

The *Options* tab of the ***Properties*** dialog for a surface allows you to configure the parameters for triangles creating. Fields of the tab are described in the table below.

To open the tab from the tabular view:

1. Select the required surface at the *Surfaces* tab from the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click *Options* tab.

To open the tab from the map view:

1. Select the required surface in the Map view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Options* tab.

This tab is enabled only for surfaces which were created from points and/or lines and not converted from roads and lines.

#### Fields of the *Options* tab

| Field | Description |
|---|---|
| *with Interior Angle <* | Defines the minimal allowable interior angle of a created triangle in the current angular units. The Interior Angle cannot be less than the defined value. By default the field is empty. |
| *with Area >* | Displays the maximal allowable area of a triangle in the current linear units. The Area cannot be more than the defined value. By default the value is empty. |

## Road tab

The *Road* tab of the ***Properties*** dialog for a surface allows you to configure the parameters for triangles creating. Fields of the tab are described in the table below.

To open the tab from the tabular view:

1. Select the required surface at the *Surfaces* tab from the Tabular view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click *Road* tab.

To open the tab from the map view:

1. Select the required surface in the Map view.
2. Right-click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.
3. Click the *Road* tab.

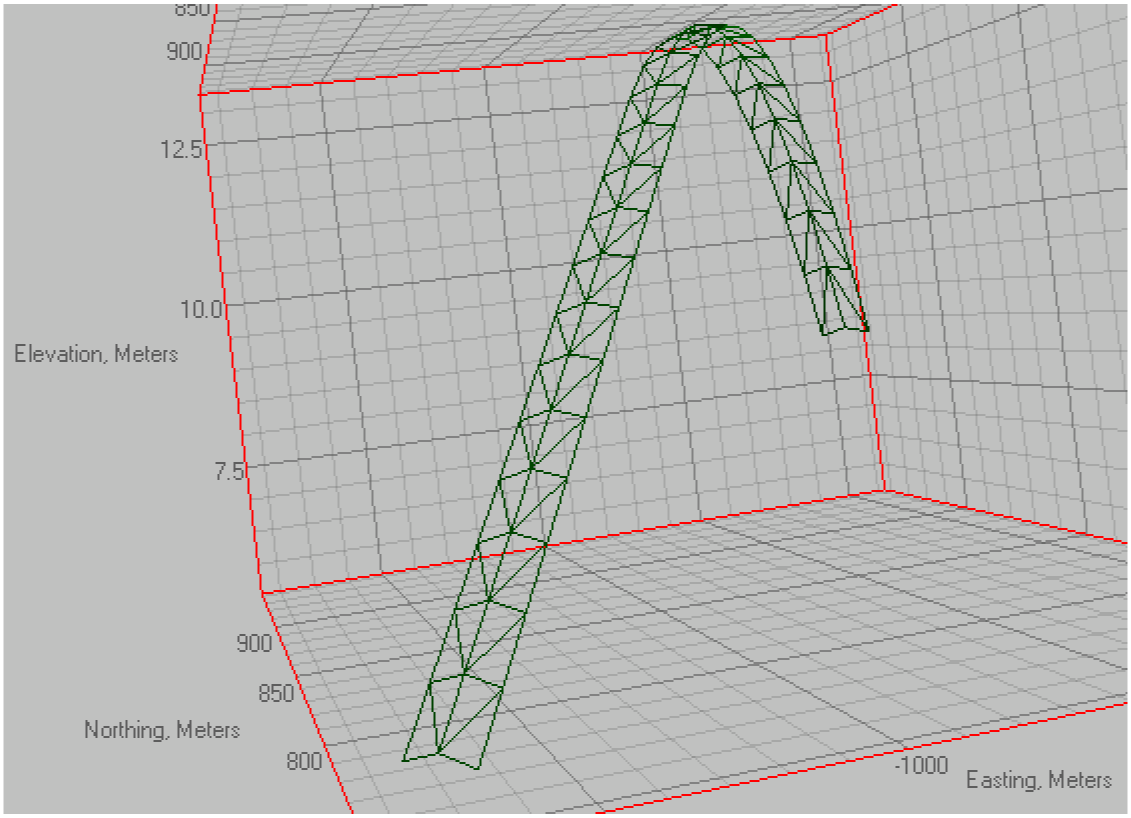
This tab is enabled only for surfaces which were created by conversion from a road.

**Fields of the *Road* tab**

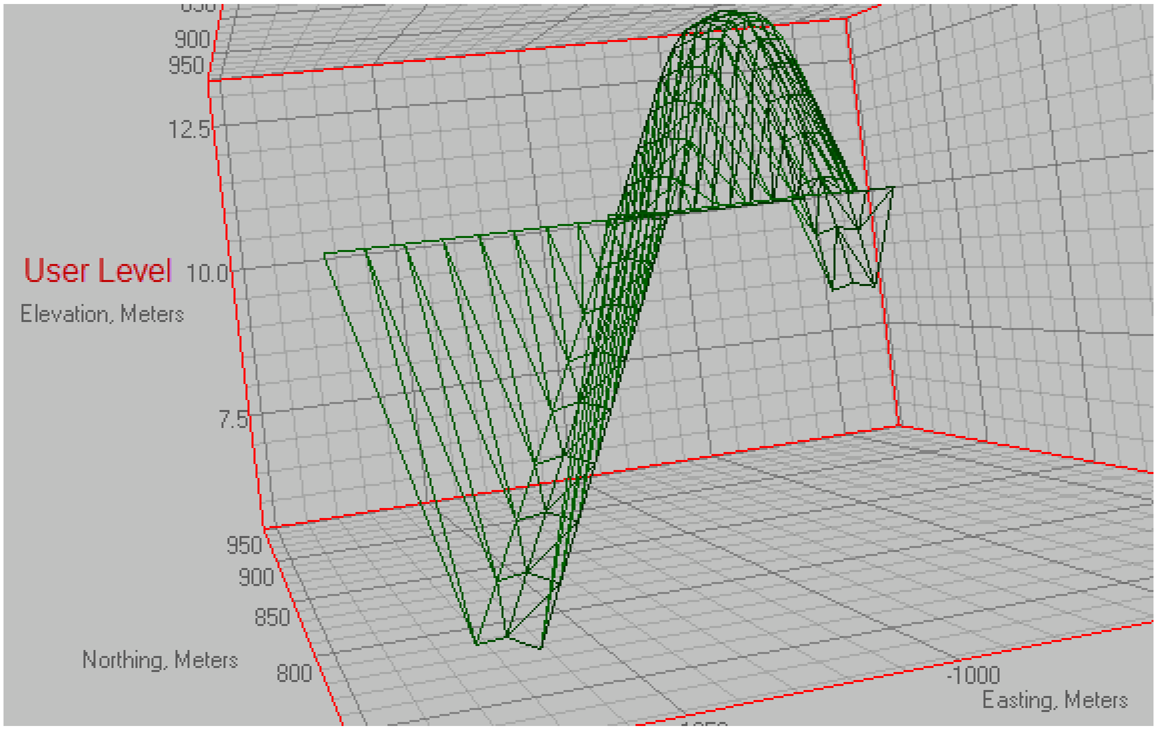
| Field | Description |
|---|---|
| *Interval* | Defines the interval between triangles set for creating the surface from the road in the current linear unit. |
| *Level* | This value defines the level of the ground surface. After entering the value (not empty), the application will calculate and display in graphic mode the cut and fill for the surface of the road taking into account this level value. See "Level" section below for details. |
| *Road* | Displays the name of the road from which the surface was created. |

## Level

The picture displays the surface of the road without any relation to the ground (the field Level is empty):




Then set the ground level in 10 meters and click the Update surface command. The picture displays the surface of the road under the level and over the level and cut and fill areas of this surface:




# Road Properties

The *Roads* tab from the Tabular view has two panels — the left panel displays a table containing all roads, the right panel displays details of the selected road — horizontal alignment, vertical alignment, and either X-sections (cross sections) or road string set. Each of these objects has its own ***Properties*** dialog.

For detailed description see the appropriate sections:

- "Road Properties dialog" section below
- "Horizontal alignment properties dialog" section on page 277
- "Vertical alignment properties dialog" section on page 278
- "X-section Properties dialog" section on page 279
- "Road string set Properties dialog" section on page 280
- "Road String Properties dialog" section on page 280
- "Pair of the horizontal and vertical alignments Properties dialog" section on page 295
- "Horizontal element properties dialog" section on page 281
- "Vertical element Properties dialog" section on page 290
- "X-Section station Properties dialog" section on page 294

## Road Properties dialog

The ***Properties*** dialog for a single road contains the following tabs:

- "General tab" section on the facing page
- "Alignment names tab" section on page 276
- "Station Equations tab" section on page 277

You may access the ***Properties*** dialog for a road for an already existing road, or while creating a new road.

To open the dialog for an existing road:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Road*** dialog is displayed.

To open the dialog when creating a new road:

1. In the *Add* group of the *Add* tab, click the **Road** icon.

   The ***Add Road*** dialog is displayed.

## General tab

The *General* tab of the ***Properties*** dialog for a road or the ***Add Road*** dialog contains the base road information and its start coordinates.

You may access the *General* tab of the ***Properties*** dialog for a road for an already existing road, or while creating a new road.

To open the tab for an existing road:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Road*** dialog is displayed.
3. Click *General* tab.

To open the tab when creating a new road:

1. In the *Add* group of the *Add* tab, click the **Road** icon.

   The ***Add Road*** dialog is displayed.
2. Click *General* tab.

#### Fields of the *General* tab

| Field | Description |
|---|---|
| *Name* | Defines the name of the road. To edit the name, click on the highlighted field and type a new name. The road name is unique and the field cannot be empty. |
| *Start Point* | Defines the road start point. You can select the desired point from the list. After selecting the point, the *Northing*, *Easting* and *Elevation* fields will display the coordinates of the selected point. |
| *Northing* | Displays the road start point's northing coordinate in the current coordinate system. You can edit the value, if the start point is not selected in the *Start Point* drop-down list. |
| *Easting* | Displays the road start point's easting coordinate in the current coordinate system. You can edit the value, if the start point is not selected in the *Start Point* drop-down list. |
| *Elevation* | Displays the road start point's elevation coordinate in the current coordinate system. You can edit the value, if the start point is not selected in the *Start Point* drop-down list. |
| *Start Sta/Chainage* | Defines starting station or chainage for the road. |
| *Station Stakeout Interval* | Displays the Station Interval, for staking out the previous/next station. You can edit the value. |

| Field | Description |
|---|---|
| *Left Corridor Offset* | Defines the left border for the Road Stakeout.<br>The parameter relates to the Roads with the String Set only and doesn't appear for the roads with the X-sections.<br>Entering the value in the application does not change the view of the road in this software. There is the following rule for creating the working corridor: the value of the left corridor offset has to be less or equal to the value of the right corridor offset. |
| *Right Corridor Offset* | Defines the right border for the Road Stakeout.<br>The parameter relates to the Roads with the String Set only and doesn't appear for the roads with the X-sections.<br>Entering the value in the application does not change the view of the road in this software. There is the following rule for creating the working corridor: the value of the left corridor offset has to be less or equal to the value of the right corridor offset. |
| *Layer* | Displays the Layer in which the road resides. The Layer sets the plotting style for the road. In this field, you can select any Layer from the list of user-created layers. |

## Alignment names tab

The *Alignment names* tab of the ***Properties*** dialog for a road or the ***Add Road*** dialog contains information about alignments used in the road.

You may access the *Alignment names* tab of the ***Properties*** dialog for a road for an already existing road, or while creating a new road.

To open the tab for an existing road:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Road*** dialog is displayed.
3. Click *Alignment names* tab.

To open the tab when creating a new road:

1. In the *Add* group of the *Add* tab, click the **Road** icon.

   The ***Add Road*** dialog is displayed.
2. Click *Alignment names* tab.

#### Fields of the *Alignment names* tab

| Field | Description |
|---|---|
| *Horizontal Alignment Name* | Defines the current horizontal alignment name. You can select other horizontal alignment from the list. |
| *Vertical Alignment Name* | Defines the current vertical alignment name. You can select other vertical alignment from the list. |
| *X-Section Set Name* | Defines the current X-Section Set name. You can select other X-Section Set from the list. |

| Field | Description |
|---|---|
| *Road String Set Name* | Displays the current Road String Set name. You can select other Road String Set from the list. |

### Station Equations tab

The *Station Equations* tab of the ***Properties: Road*** dialog or the ***Add Road*** dialog contains information about station equations set, assigned to the road.

You may access the *Station Equations* tab of the ***Properties: Road*** dialog for an already existing road, or while creating a new road.

To open the tab for an existing road:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Road*** dialog is displayed.
3. Click *Station Equations* tab.

To open the tab when creating a new road:

1. In the *Add* group of the *Add* tab, click the **Road** icon.

   The ***Add Road*** dialog is displayed.
2. Click *Station Equations* tab.

#### Fields of the *Station Equations* tab

| Field | Description |
|---|---|
| *Station Equations Set* | Defines the station equations set, assigned to the road. Select the required set from the drop-down list. |

## Horizontal alignment properties dialog

The ***Properties*** dialog for the horizontal alignment of the road contains only the *General* tab. See "General tab" section below for details.

To open the dialog:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road and expand it.
2. Select the required horizontal alignment.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Horizontal Alignment*** dialog is displayed.

### General tab

The *General* tab of the ***Properties*** dialog for a horizontal alignment allows you to configure the base horizontal element information. Fields of the tab are described in the table below.

To open the dialog :

1. In the left panel of the *Roads* tab from the Tabular view, select the required road and expand it.
2. Select the required horizontal alignment.

3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Horizontal Alignment*** dialog is displayed.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Name* | Defines the name of the horizontal alignment. You can rename this alignment. |
| *Start Point* | Defines the name of the horizontal alignment start point. You can select the desired point from the list. After selecting the point, the Northing and the Easting fields display the coordinates of the selected point. These coordinates cannot be changed for the selected point. |
| *Northing* | Defines the horizontal alignment start point's northing coordinate in the current coordinate system (Grid or Ground). You can edit the value, when a point is not selected in the Start Point field. |
| *Easting* | Defines the horizontal alignment start point's easting coordinate in the current coordinate system (Grid or Ground). You can edit the value, when a point is not selected in the Start Point field. |
| *Start Sta/Chainage* | Defines the starting station or chainage for the horizontal alignment. You can edit the value. |

## Vertical alignment properties dialog

The ***Properties*** dialog for the vertical alignment of the road contains only the *General* tab. See "General tab" section below for details.

You may access the ***Properties*** dialog for a vertical alignment for an already existing vertical alignment, or while creating a new vertical element.

To open the dialog for an existing vertical alignment:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road and expand it.
2. Select the required vertical alignment.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Vertical Alignment*** dialog is displayed.

To open the dialog when creating a new vertical alignment element:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road and expand it.
2. Do one of the following:
   - Right click road item and select **Add Vert Element** from the pop-up menu.
   - Right click vertical alignment item and select **Add Vert Element** from the pop-up menu.

   The ***Add Vert Element*** dialog is displayed.

### General tab

The *General* tab of the ***Properties*** dialog for a vertical alignment or ***Add Vert Element*** dialog allows you to configure the base vertical element information. Fields of the tab are described in the table below.

You may access the ***Properties*** dialog for a vertical alignment for an already existing vertical alignment, or while creating a new vertical element.

To open the dialog for an existing vertical alignment:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road and expand it.
2. Select the required vertical alignment.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Vertical Alignment*** dialog is displayed.

To open the dialog when creating a new vertical alignment element:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road and expand it.
2. Do one of the following:
   - Right click road item and select **Add Vert Element** from the pop-up menu.
   - Right click vertical alignment item and select **Add Vert Element** from the pop-up menu.

   The ***Add Vert Element*** dialog is displayed.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Name* | Defines the name of the vertical alignment. You can rename this alignment. |
| *Start Point* | Defines the name of the vertical alignment start point. You can select the desired point from the list. After selecting the point, the Northing and the Easting fields display the coordinates of the selected point. These coordinates cannot be changed for the selected point. |
| *Elevation* | Defines the vertical alignment start point's elevation coordinate in the current coordinate system (Grid or Ground). You can edit the value, when a point is not selected in the Start Point field. |
| *Start Sta/Chainage* | Defines the starting station or chainage for the vertical alignment. You can edit the value. |

# X-section Properties dialog

The ***Properties*** dialog for the X-Section of the road contains only the *General* tab. See "General tab" section below for details.

To open the dialog:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road and expand it.
2. Select the required X-Section.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: X-Section*** dialog is displayed.

## General tab

The *General* tab of the ***Properties*** dialog for a X-Section allows you to configure the base X-Section information. Fields of the tab are described in the table below.

To open the dialog :

1. In the left panel of the *Roads* tab from the Tabular view, select the required road and expand it.
2. Select the required X-Section.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: X-Section*** dialog is displayed.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Name* | Defines the name of the X-Section. You can rename this X-Section. |

## Road string set Properties dialog

The ***Properties*** dialog for the Road String Set of the road contains only the *General* tab. See "General tab" section below for details.

To open the dialog for:

1. In the left panel of the *Roads* tab from the Tabular view, select the required road and expand it.
2. Select the required Road String Set.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Road String Set*** dialog is displayed.

### General tab

The *General* tab of the ***Properties*** dialog for a Road String Set allows you to configure the base Road String Set information. Fields of the tab are described in the table below.

To open the dialog :

1. In the left panel of the *Roads* tab from the Tabular view, select the required road and expand it.
2. Select the required Road String Set.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Road String Set*** dialog is displayed.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Name* | Defines the name of the Road String Set. You can rename this Road String Set. |

## Road String Properties dialog

The ***Properties*** dilaog for the Road String (for the road with String Set) contains only the *General* tab. See General tab for detials.

To open the dialog :

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Expand the Road string set.
3. Right click the required Road String and select **Properties** from the pop-up menu.

   The ***Properties: Road String*** dialog, opened at the *General* tab is displayed.

### General tab

The General tab of the Properties dialog for a separate Road String allows you to configure the basic information about the Road String. Fields of the tab are described in the table below.

To open the dialog :

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Expand the Road string set.
3. Right click the required Road String and select **Properties** from the pop-up menu.

   The ***Properties: Road String*** dialog, opened at the *General* tab is displayed.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Name* | Defines a Road String name. The Road String name is unique and the field cannot be empty. |
| *Order* | Defines a Road String name. To edit the name, click on the highlighted field and enter a new name. The Road String name is unique and the field cannot be empty. |

## Horizontal element properties dialog

The ***Properties*** dialog for a horizontal element contain two tabs, described in the appropriate sections:

- General tab
- End Position tab

You may access the ***Properties*** dialog for an already existing horizontal segment, or while creating a new one.

To open the dialog for an existing horizontal element from the Tabular view:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Click the *Horizontal Alignment* item.
3. In the right panel, select the required horizontal element either in the table, or in the preview area.
4. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Horz Element*** dialog is displayed.

To open the dialog for an existing horizontal element from the Map view:

1. In the Map view, select the required horizontal element.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Horz Element*** dialog is displayed.

To open the dialog when creating a new horizontal segment:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Right click the *Horizontal Alignment* item and select **Add Horz Element** from the pop-up menu.

   The ***Add Horz Element*** dialog is displayed.

### General tab

The *General* tab of the ***Properties*** dialog for a horizontal element or the ***Add Horz Element*** dialog contains the base horizontal element information.

You may access the ***Properties*** dialog for an already existing horizontal segment , or while creating a new one.

To open the dialog for an existing horizontal element from the Tabular view:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Click the *Horizontal Alignment* item.

3. In the right panel, select the required horizontal element either in the table, or in the preview area.
4. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Horz Element*** dialog is displayed.
5. Click the *General* tab.

To open the dialog for an existing horizontal element from the Map view:

1. In the Map view, select the required horizontal element.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Horz Element*** dialog is displayed.
3. Click the *General* tab.

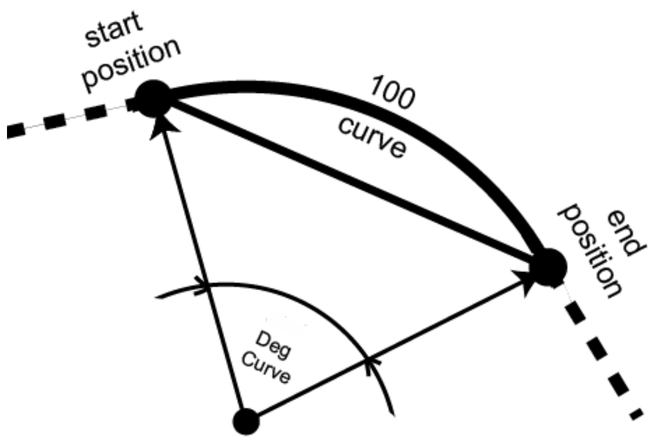
To open the dialog when creating a new horizontal segment:

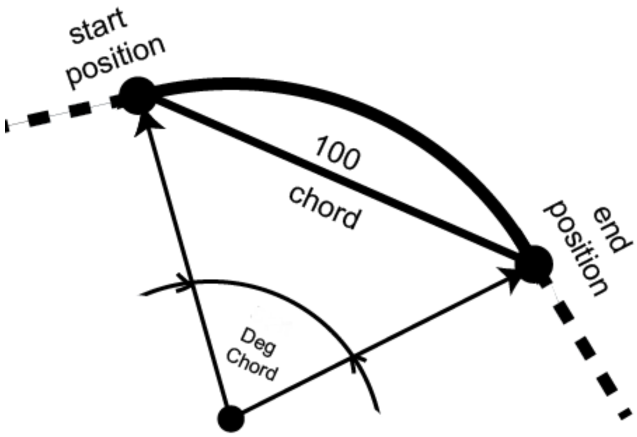
1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Right click the *Horizontal Alignment* item and select **Add Horz Element** from the pop-up menu.

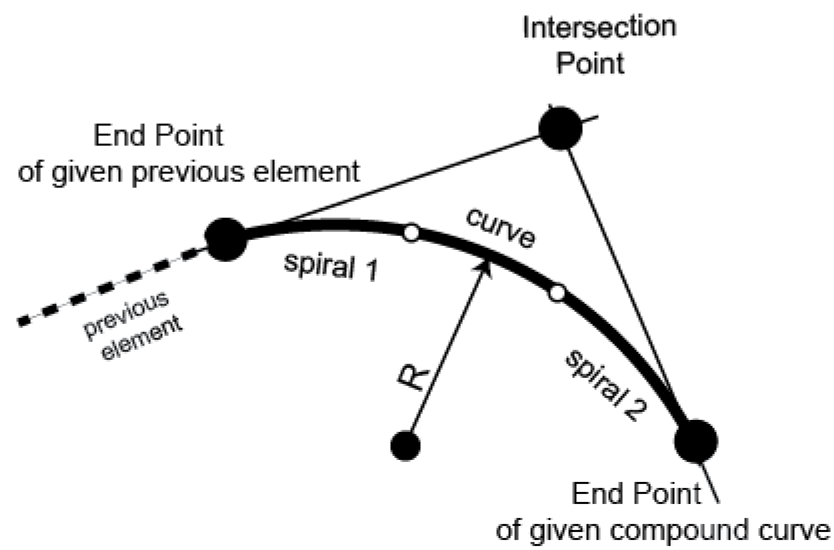
   The ***Add Horz Element*** dialog is displayed.
3. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Type* | • *Line*<br>• *Curve*<br>• *Spiral TS to SC* "Traverse-Spiral to Spiral-Curve" direction means that the start station of the spiral is the end station of the line, and the end station of the spiral is the start station of the curve:<br>• *Spiral CS to ST* "Curve-Spiral to Spiral-Traverse" direction means that the start station of the spiral is the end station of the curve, and the end station of the spiral is the start station of the line:<br>• *Spiral CS to SC* "Curve-Spiral to Spiral-Curve" direction means that the start station of the spiral is the end station of one curve, and the end station of the spiral is the start station of the other curve.<br>• *Intersection*<br>See pictures below for details. |
| *Length* | Defines the length of the horizontal element. |
| *Start Sta/Chainage* | Displays the number of the start station/ chainage for the horizontal element. |
| *Azimuth* | Defines the azimuth of the tangent to the start point of the horizontal alignment. You can edit this value only for the starting element of the road (in this case the *Tangential to previous element* checkbox is disabled). To change the azimuth of all other elements, untick the *Tangential to previous element* checkbox and type the desired value in the filed. |
| *Tangential to previous element* | If this parameter is ticked (default setting for all horizontal element types except the first road element), the defined value of the azimuth will be used for the next alignment as start azimuth, and you cannot edit the azimuth. Untick the checkbox to edit the azimuth. |

| Field | Description |
|---|---|
| *Turn* | Defines the direction of turn of the curve/spiral. The Right value stands for clockwise direction and the Left value, for counter-clockwise direction. |
| *Radius* | Defines either the radius of the curve, or the start radius of the spiral |
| *Start Radius* | Defines the start radius of the spiral of *CS to ST* or *CS to SC* type. |
| *End Radius* | Defines the end radius of the spiral of *TS to SC* or *CS to SC* type. |
| *Deg Curve* | Defines the angle in degrees used to compute either the radius of the curve whose length is 100 units long:<br><br><br>Using the degree of curve (DCV) parameter, the radius of the curve can be calculated as follows:<br>$R = \frac{100\times180}{\pi}\times\frac{1}{DCV}$ |
| *Start Deg Curve* | Defines the angle in degrees used to compute either the start radius of the spiral of the *CS to ST* or *CS to SC* type whose curve is 100 units long.<br>See the picture and formula in the description of the *Deg Curve* field. |
| *End Deg Curve* | Defines the angle in degrees used to compute either the start radius of the spiral of the *TS to SC* or *CS to SC* type whose curve is 100 units long.<br>See the picture and formula in the description of the *Deg Curve* field. |

| Field | Description |
|---|---|
| *Deg Chord* | Defines the angle in degrees used to compute either the radius of the curve, whose chord is 100 units long:   Using the degree of chord (DCH) parameter, the radius of the curve can be calculated as follows: $R = \frac{50}{\sin(\frac{DCH}{2} + \frac{\pi}{180})}$ |
| *Start Deg Chord* | Defines the angle in degrees used to compute the start radius of the spiral of the *CS to ST* or the *CS to SC* type, whose chord is 100 units long.<br>See the picture and formula in the description of the *Deg Chord* field. |
| *End Deg Chord* | Defines the angle in degrees used to compute the end radius of the spiral of the *TS to SC* or the *CS to SC* type, whose chord is 100 units long.<br>See the picture and formula in the description of the *Deg Chord* field. |
| *Chord* | Defines the length of the segment joining start and end points of a curve in the current linear units. |
| *Tangent* | Defines the length of the segment which touches the given curve in the current linear units. |
| *Mid Ord* | Defines the Middle Ordinate) — the distance from the midpoint of a chord to the midpoint of the corresponding curve in the current linear units. |
| *External* | Defines the distance from the midpoint of the curve to the intersection point of the tangents in the current linear units. |
| *Spiral Const* | Defines the spiral constant value. The spiral constant is the square root of the length multiplied by the radius of the spiral. The value is used to define a compound curve. |
| *Intersection Pt* | Defines the name of the intersection point or the end point of the compound curve. You can select the desired point from the list. After selecting the point, the *Northing* and the *Easting* fields displays the coordinates of the selected point. These coordinates cannot be changed for the selected point. |

| Field | Description |
|---|---|
| *Northing* | Defines the intersection point's or compound curve end point's northing coordinate in the current coordinate system. You can edit the value, if a point is not selected in the *Intersection Pt* list. |
| *Easting* | Defines the intersection point's or compound curve end point's easting coordinate in the current coordinate system. You can edit the value, if a point is not selected in the *Intersection Pt* list. |
| *Spiral 1 Length* | Defines the length of the first spiral of the compound curve. See picture below.   |
| *Spiral 2 Length* | Defines the length of the second spiral of the compound curve. See picture of the intersection above, in the description of the *Spiral 1 Length* field. |
| *Spiral Constant 1* | Displays the square root of the length multiplied by the radius of the first spiral for the compound curve. See picture of the intersection above, in the description of the *Spiral 1 Length* field. |
| *Spiral Constant 2* | Displays the square root of the length multiplied by the radius of the second spiral for the compound curve. See picture of the intersection above, in the description of the *Spiral 1 Length* field. |

The *Add Next Element* checkbox is present when creating new elements.If this parameter is ticked (default setting for all alignment types), after clicking **OK** in the current ***Add Horz Element*** dilaog, the next ***Add Horz Element*** dialog automatically will appear.

The content of the tab depends on the type of the alignment, defined in the *Type* field.

For *Line* type of the horizontal element, the tab contains the following fields:

- *Length*
- *Azimuth*
- *Tangential to previous element*

For *Curve* the tab contains the fields:

- *Length*
- *Turn*

- *Radius*
- *Azimuth*
- *Tangential to previous element*

  And the curve parameters in the *Curve* group box in the current linear units
- *Deg Curve*
- *Deg Chord*
- *Chord*
- *Tangent*
- *Mid Ord (Middle Ordinate)*
- *External*

For *Spiral TS to SC* the tab contains the following fields:

- *Length*
- *Turn*
- *Radius* — the end radius of the curve.
- *Azimuth*
- *Tangential to previous element*

  And the curve parameters in the *Curve* group box in the current linear units
- *Spiral Constant*
- *Deg Curve*
- *Deg Chord*

For *Spiral CS to ST* the tab contains the follwing fields:

- *Length*
- *Turn*
- *Radius*
- *Azimuth*
- *Tangential to previous element*

  And the curve parameters in the *Curve* group box in the current linear units:
- *Spiral Constant*
- *Deg Curve*
- *Deg Chord*

For *Spiral CS to SC* the tab contains the following fields:

- *Length*
- *Turn*
- *Radius*
- *Azimuth*
- *Tangential to previous element*

  And the curve parameters in the *Curve* group box in the current linear units:
- *Spiral Constant*
- *Start Deg Curve*
- *Start Deg Chord*

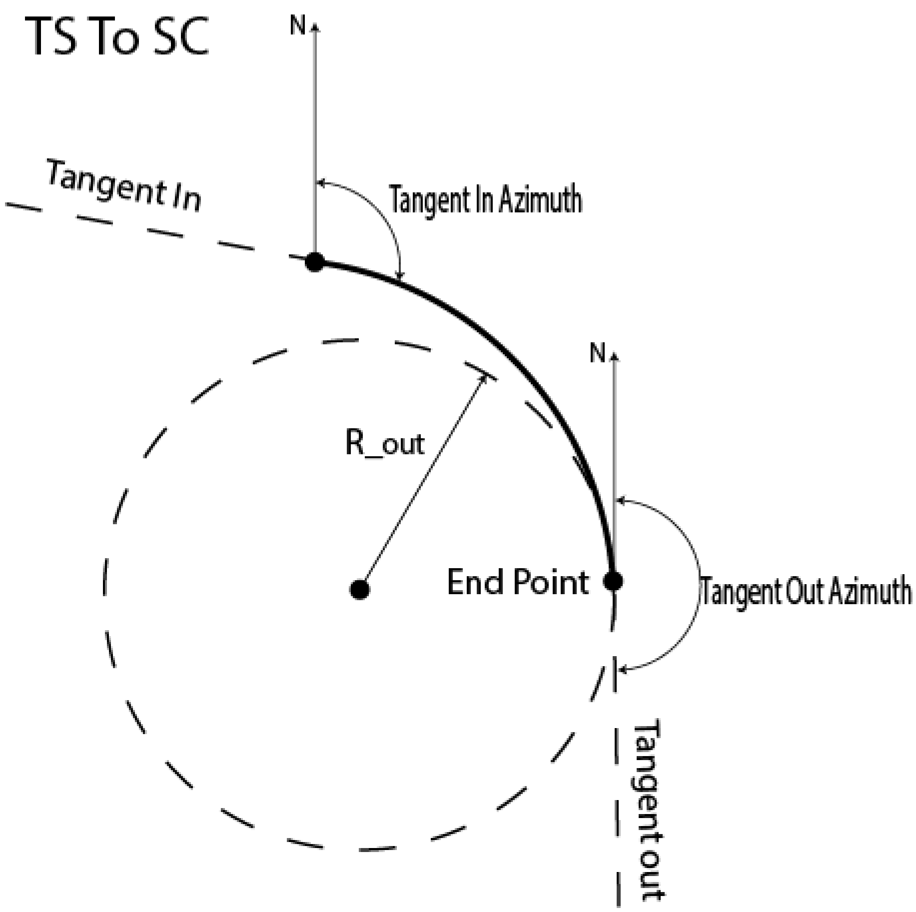
- *End Deg Curve*
- *End Deg Chord*

For *Intersection* the tab contains the following fields:

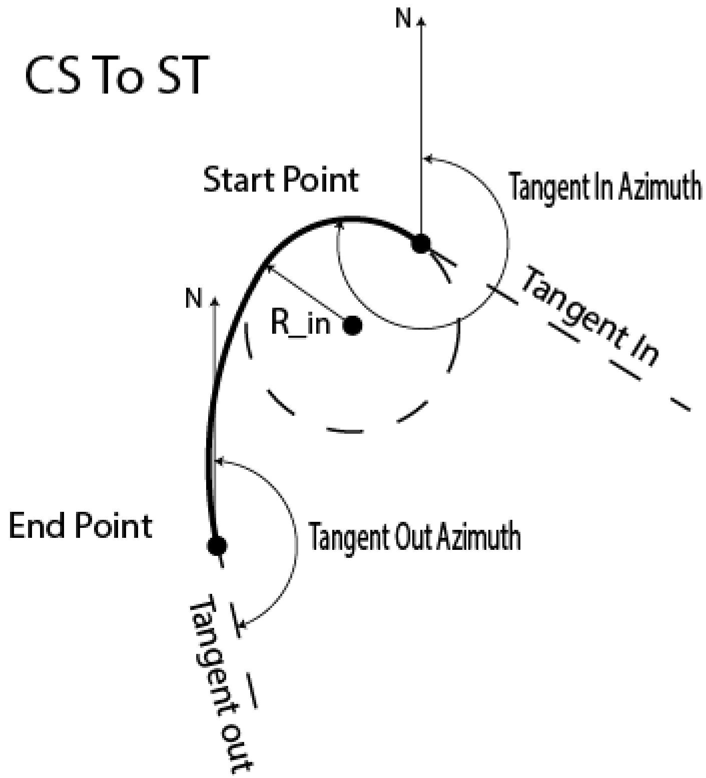
- *Intersection Pt*
- *Northing*
- *Easting*
- *Turn*
- *Spiral 1 Length*
- *Spiral 2 Length*

  And the curve parameters in the *Curve* group box in the current linear units:

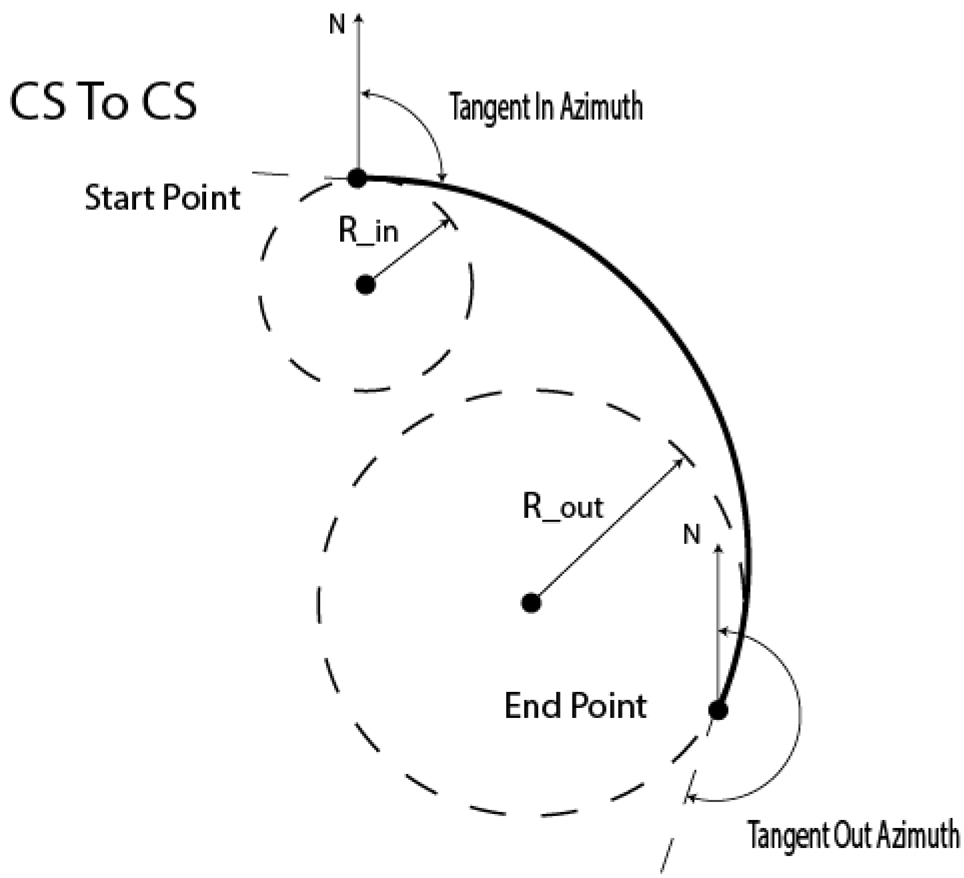
- *Spiral Constant 1*
- *Spiral Constant 2*
- *Deg Curve*
- *Deg Chord*



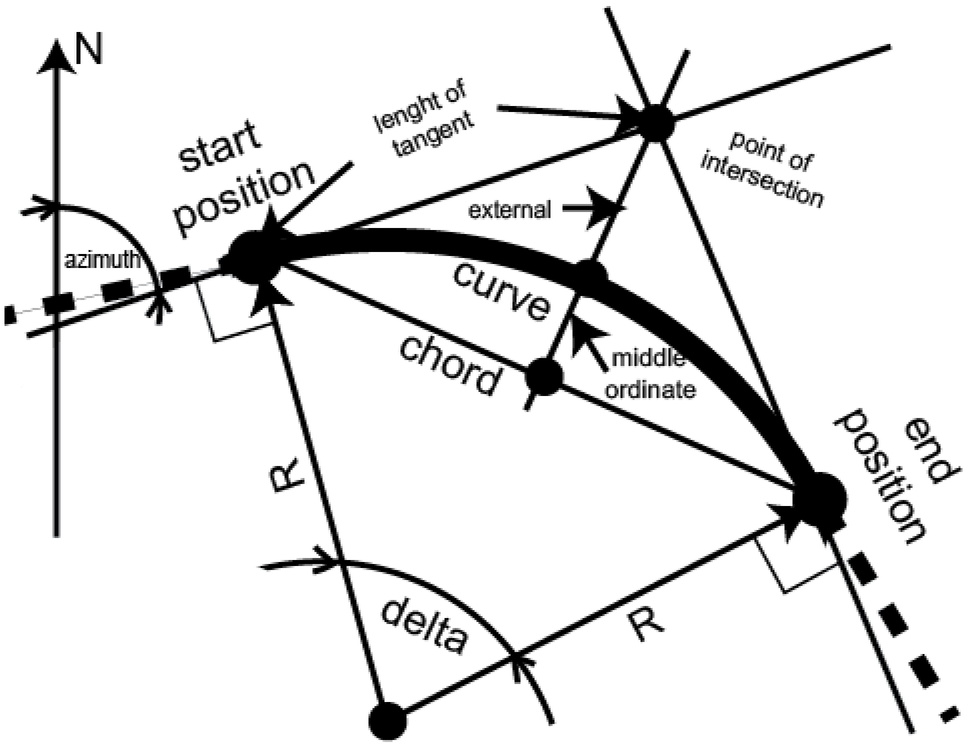

**Spiral TS to SC**




**Spiral CS to ST**




**Spiral CS to SC**




**Curve parameters**

## End Position tab

The *End Position* tab of the ***Properties*** dialog for a horizontal element or the ***Add Horz Element*** dialog contains the coordinates of the end point of the horizontal alignment in the current linear units. You cannot edit these values.

You may access the ***Properties*** dialog for an already existing horizontal segment , or while creating a new one.

To open the dialog for an existing horizontal element from the Tabular view:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Click the *Horizontal Alignment* item.
3. In the right panel, select the required horizontal element either in the table, or in the preview area.
4. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Horz Element*** dialog is displayed.
5. Click the *End Position* tab.

To open the dialog for an existing horizontal element from the Map view:

1. In the Map view, select the required horizontal element.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Horz Element*** dialog is displayed.
3. Click the *End Position* tab.

To open the dialog when creating a new horizontal segment:

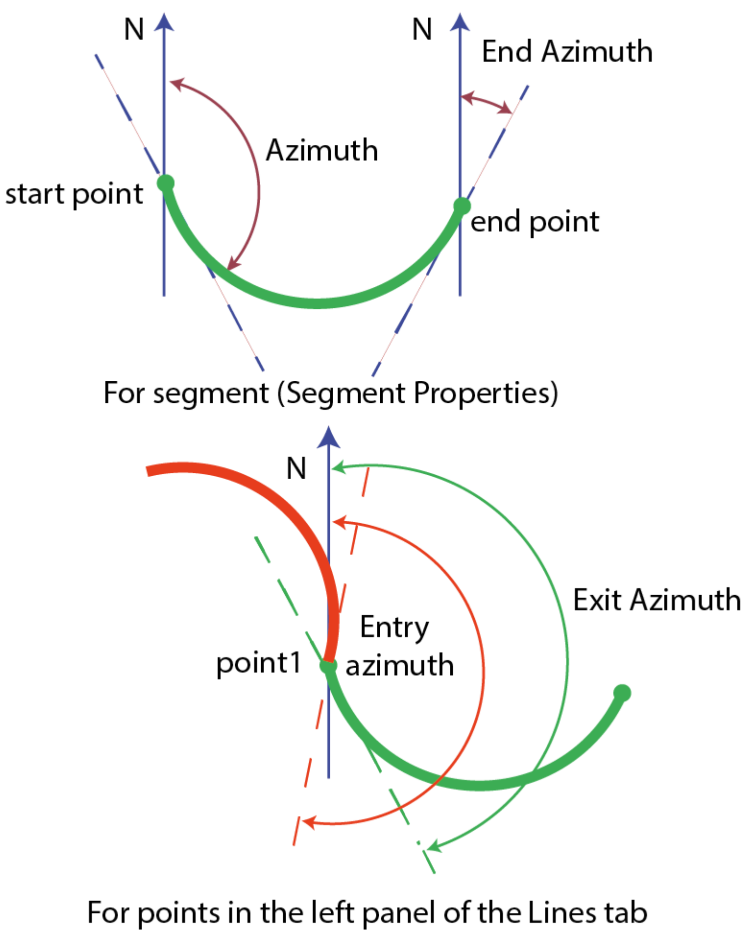
1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Right click the *Horizontal Alignment* item and select **Add Horz Element** from the pop-up menu.

The ***Add Horz Element*** dialog is displayed.

3. Click the *End Position* tab.

**Fields of the *End Position* tab**

| Field | Description |
|---|---|
| *End Sta/Chainage* | Displays the number of the end station/ chainage for the horizontal element. |
| *End Northing* | Displays the northing coordinate of the end point of the horizontal element in Ground / Grid coordinate system. |
| *End Easting* | Displays the easting coordinate of the end point of the horizontal element in Ground / Grid coordinate system. |
| *End Azimuth* | Displays the azimuth of the tangent to the given point for the horizontal element. |




**Entry and exit azumuth**

## Vertical element Properties dialog

The ***Properties*** dialog for the vertical element contains only the *General* tab. See the "General tab" section on the facing page for its description.

You may access the ***Properties*** dialog for an already existing vertical segment , or while creating a new one.

To open the dialog for an existing vertical element from the Tabular view:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Click the *Vertical Alignment* item.
3. In the right panel, select the required vertical element either in the table, or in the preview area.
4. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Vert Element*** dialog is displayed.

To open the dialog when creating a new vertical segment:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Right click the *Vertical Alignment* item and select **Add Vert Element** from the pop-up menu.

   The ***Add Vert Element*** dialog is displayed.

## General tab

The *General* tab of the ***Properties*** dialog for a vertical element or the ***Add Vert Element*** dialog contains the base vertical element information.

You may access the ***Properties*** dialog for an already existing vertical segment , or while creating a new one.

To open the dialog for an existing vertical element from the Tabular view:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Click the *Vertical Alignment* item.
3. In the right panel, select the required vertical element either in the table, or in the preview area.
4. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Vert Element*** dialog, opened at the *General* tab is displayed.

To open the dialog when creating a new vertical element:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Right click the *Vertical Alignment* item and select **Add Vert Element** from the pop-up menu.

   The ***Add Vert Element*** dialog, opened at the *General* tab is displayed

#### Fields of the *General* tab

| Field | Description |
|---|---|
| *Type* | Defines the type of a road vertical alignment. You can select one of the following types:<br>• Grade,<br>• Parabola,<br>• Circular Arc,<br>• Parabola Long Section,<br>• Arc Long Section.<br>If selecting a grade or parabola as the first element, then either a grade, or parabola, or a circular arc can be the next element added to the vertical alignment.<br>If selecting a long section as the first element, the only either a parabola long sections, or arc long sections can be the next element of the vertical alignment.<br>See pictures below for details. |

| Field | Description |
|---|---|
| *Length* | Defines the length of the vertical element. You can edit this parameters for the grade, parabola and parabola long section. The length of the circular arc is automatically calculated taking into account entered values of the *Radius*, *Start Grade* and *End Grade* parameters. For the long section element, set 0 for the start and end elements of the long section. |
| *Sta/Chainage* | Defines the number of the start station or chainage for a vertical element. You can edit this parameter for a parabola long section and an arc long section and cannot edit this parameter for grade, parabola, circular arc.<br>You can select chainage or station to use for the road center line position at the *Roads* tab of the *Display* item from the ***Job Configuration*** dialog. See "Roads tab" section on page 93 for details. |
| *Start Grade* | For grade vertical alignment type, displays the ratio of the grade length and delta H (the difference between the elevations at the end station and the start station of the grade element) multiplied by 100% .<br>For parabola and circular arc displays the start grade of the element, in percents.<br>You can edit this parameter. If the grade is rising, the value should be set positive; if the grade is falling, the value should be set negative. |
| *End Grade* | For parabola and circular arc displays the end grade of the element, in percents. You can edit this parameter. If the grade is rising, the value should be set positive; if the grade is falling, the value should be set negative. |
| *Radius* | Defines the radius of the Circular Arc and Arc Long Section vertical element. For the arc long section element, set 0 for start and end element of the long section. |
| *Elevation* | Defines the elevation on the station used for creating the long section. |

The *Add Next Element* checkbox is present when creating new elements.If this parameter is ticked (default setting for all alignment types), after clicking **OK** in the current ***Add Vert Element*** dialog, the next ***Add Vert Element*** dialog automatically will appear.

The content of this tab depends on the alignment type:

For *Grade* the tab contains the following fields:

- *Length*
- *Grade*
- *Sta/Chainage*

For *Parabola* the tab contains the following fields:

- *Length*
- *Start Grade*
- *End Grade*
- *Sta/Chainage*

For *Circular Arc* the tab contains the following fields:

- *Radius*
- *Length*

- *Start Grade*
- *End Grade*
- *Sta/Chainage*

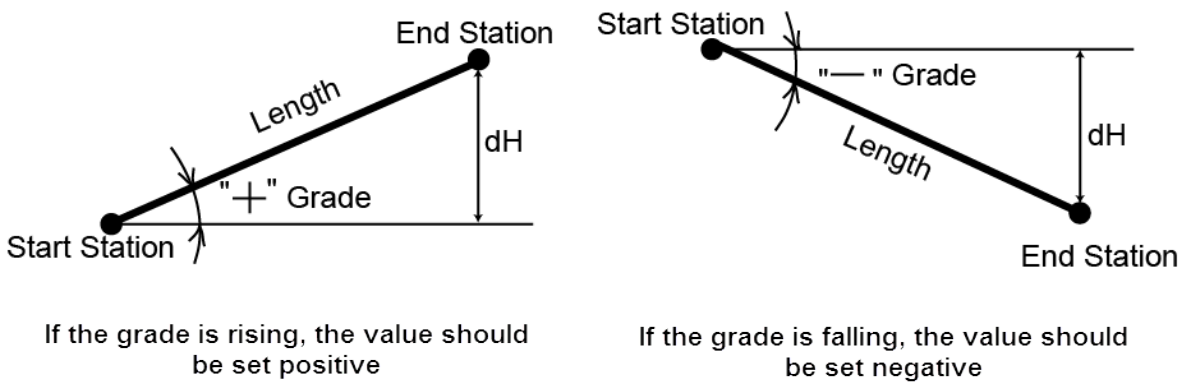
The vertical alignment can be described through a long section (parabola long section or arc long section). In this case, three points are used to draw a compound curve. To set the compound curve in the vertical plane, you need to add three long sections to the vertical alignment. When creating a complex curve, the heights for long sections 1, 2 and 3, and the length set for long section 2 will be used. See the picture of the compound curve below.

For *Parabola Long Section* the tab contains the following fields:

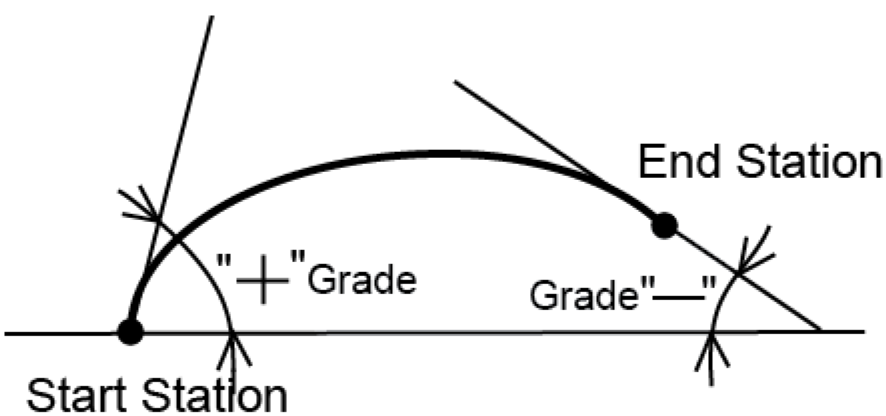
- *Sta/Chainage*
- *Length*
- *Elevation*

For *Arc Long Section* the tab contains the following fields:

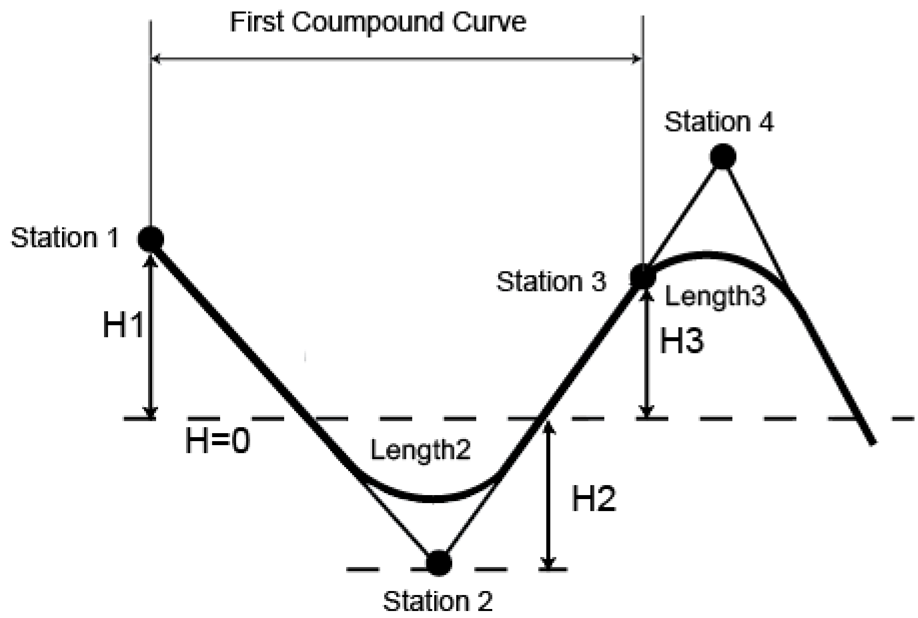
- *Sta/Chainage*
- *Radius*
- *Elevation*




**Rising and falling grades**




**Parabola**




**Compound curve in the vertical plane**

## X-Section station Properties dialog

The ***Properties*** dialog for the X-Section station contains only the General tab. See "General tab" section below for details.

You may access the ***Properties*** dialog for an already existing X-Section, or while creating a new one.

To open the dialog for an existing X-Section from the Tabular view:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Click the *X-Section* item.
3. In the right panel, select the required X-Section either in the table, or in the preview area.
4. Right click and select **Properties** from the pop-up menu.

   The ***Properties: X-Section*** dialog, opened at the *General* tab is displayed.

To open the dialog when creating a new X-Section element:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Right click the *X-Section* item and select **Add X-Sectopn** from the pop-up menu.

   The ***Add X-Section*** dialog, opened at the *General* tab is displayed

### General tab

The *General* tab of the ***Properties*** dialog for a X-Section element or the ***Add X-Section*** dialog contains the base X-Section information.

You may access the ***Properties*** dialog for an already existing X-Section, or while creating a new one.

To open the dialog for an existing X-Section from the Tabular view:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Click the *X-Section* item.
3. In the right panel, select the required X-Section either in the table, or in the preview area.

4. Right click and select **Properties** from the pop-up menu.

   The ***Properties: X-Section*** dialog, opened at the *General* tab is displayed.

To open the dialog when creating a new X-Section element:

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Right click the *X-Section* item and select **Add X-Sectopn** from the pop-up menu.

   The ***Add X-Section*** dialog, opened at the *General* tab is displayed

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Sta/Chainage* | Defines the station or chainage where the template is to be applied. If you set "0", the selected template is applied from the road start point to the road end point or to the point where a new template is applied. |
| *Side* | Defines the left or right side of the road relative to the center line where this template is to be used. |
| *Template* | Displays the name of the current template. You can select other template from the list of existing templates in the current job. |

The *Add Next X-Section* checkbox is present when creating new elements.If this parameter is ticked (default setting), after clicking **OK** in the current ***Add X-Section*** dialog, the next ***Add X-Section*** dialog automatically will appear.

## Pair of the horizontal and vertical alignments Properties dialog

The ***Properties*** dialog for the pair of the horizontal and vertical alignments (for the road with String Set) contains only the *General* tab. See "General tab" section below for details.

To open the dialog :

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Select the required pair of the horizontal and vertical alignments
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Road String*** dialog, opened at the *General* tab is displayed.

### General tab

The *General* tab of the ***Properties*** dialog for a Pair of the horizontal and vertical alignments of a road string set allows you to view and edit basic properties for an observation. Fields of the tab are described in the table below.

To open the dialog :

1. In the left panel of the *Roads* tab from the Tabular view, expand the required road.
2. Select the required pair of the horizontal and vertical alignments
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Road String*** dialog, opened at the *General* tab is displayed.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Horizontal Alignment Name* | Defines the current horizontal alignment name for the Road String. You can select other horizontal alignment from the list for the given road. |

| Field | Description |
|---|---|
| *Vertical Alignment Name* | Defines the current vertical alignment name for the Road String. You can select other vertical alignment from the list for the given road. |

# X-Sections Template Properties dialog

The *X-Sections Template* tab from the Tabular view displays a table containing two panels. The left panel displays X-Section template, the right panel displays the offsets of the selected X-Section template. Each panel has its own ***Properties*** dialog. See the descriptions in the appropriate sections:

- Properties dialog for X-Section template
- Properties dialog for X-Section Offset

## Properties dialog for X-Section template

The ***Properties: X-Section Template*** dialog allows you to configure the basic information about a X-Section template. Fields are described in the table below.

To open the dialog:

1. In the left panel of the *X-Section Templates* tab from the Tabular view, select the required X-Section template.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: X-Section Template*** dialog is displayed.

**Fields of the *Properties: X-Section Template* dialog**

| Field | Description |
|---|---|
| *Name* | Defines the X-Section template name. To edit the name, click on the highlighted filed and enter a new name. The X-Section template name is unique and the field cannot be empty. |
| *Cut Slope (1:n)* | Defines the horizontal increment of the slope for a unit of the vertical increment. The cut slope is used when the road surface is below the terrain. By default, cut slope equals 0 (units in percent). You can edit the parameter. |
| *Fill Slope (1:n)* | Defines the horizontal increment of the slope for a unit of the vertical increment. The fill slope is used when the road surface is above the terrain. By default, fill slope equals 0 (units in percent). You can edit the parameter. |

## Properties dialog for X-Section Offset

The ***Properties: X-Section Offset*** dialog allows you to configure the basic information about a X-Section offset. Fields are described in the table below.

To open the dialog:

1. In the left panel of the *X-Section Templates* tab from the Tabular view, select the required X-Section template.
2. In the left panel, select the required X-Section Offset.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: X-Section Offset*** dialog is displayed.

**Fields of the *Properties: X-Section Offset* dialog**

| Field | Description |
|---|---|
| *Name* | Defines the offset name of the X-Section offset. To edit the name, click on the highlighted filed and enter a new name. You can leave the field empty. |
| *Order* | Displays the order of the offset in the template. You can set any number from the list of offset number. |
| *Hz. Dist* | Defines the horizontal offset (in the current linear units) from the center line for the offset. You can edit the value. |
| *V Dist* | Defines the vertical offset from the horizontal plane for the offset. You can edit the value. When you enter this parameter, the Grade will be automatically calculated and displayed in the appropriate field. |
| *Grade* | Defines the ratio of horizontal offset and vertical offset multiplied by 100%. When you enter this parameter, the Vertical distance will be automatically calculated and displayed in the appropriate field. |
| *Hz. Offset from CL* | Defines the horizontal offset from the center line (in the current linear units) for the start point of the given offset. It is calculated using the corresponding values of the previous offsets and it is not editable. |
| *V. Offset from CL* | Defines the vertical offset from the horizontal plane for the start point of the offset. It is calculated using the corresponding values of the previous offsets and it is not editable. |

# Inverse Properties dialog

The *Inverse* tab from the Tabular view displays a table that lists the results of the inverse calculations. The Properties dialog for an inverse calculation displays its basic information.

To open the dialog:

1. In the *Inverse* tab from the Tabular view, select the required inverse calculation.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties*** dialog is displayed.

**Fields of *Properties* dialog for the Inverse**

| Field | Description |
|---|---|
| *From* | Displays the name of the start point (if the point has name) in the Inverse task. |
| *To* | Displays the name of the end point (if the point has name) in the Inverse task. |
| *Forward Azimuth* | The calculated value depends on the selected coordinate system. If the global coordinate system (*WGS Lat,Lon,Ell.H / Datum Lat,Lon,Ell.H / Datum Lat,Lon,Elevation*) is selected in the Status bar, the horizontal geodesic azimuth from the "From" point to the "To" point is displayed. For *Grid/Ground* coordinate system, selected in the Status Bar, grid/ground azimuth (bearing) from the "From" point to the "To" point is displayed. |

| Field | Description |
|---|---|
| *Backward Azimuth* | The calculated value depends on the selected coordinate system. If the global coordinate system (*WGS Lat,Lon,Ell.H / Datum Lat,Lon,Ell.H / Datum Lat,Lon,Elevation*) is selected in the Status bar, the horizontal geodesic azimuth from the "To" point to the "From" point is displayed. For *Grid/Ground* coordinate system, selected in the Status Bar, grid/ground azimuth (bearing) from the "To" point to the "From" point is displayed. |
| *Geodetic Distance* | Displays the length of the geodetic line (the shortest distance) between the two points on an ellipsoid in the current unit. |
| *Ground Distance* | The calculated value depends on whether the Grid-to-Ground transformation is activated or not. If Grid to Ground transformation is not activated, it will be the geodetic distance multiplied by the scale factor, which is automatically calculated taking into account the height of the first point. If Grid to Ground transformation is activated, the Ground Distance displays a grid distance multiplied by the scale factor calculated, taking into account the average job height. |
| *Grid Distance* | Displays the shortest distance between two points on a projection plane in the current unit. This value will be displayed when a "**Grid**" coordinate system is selected in the Status bar. |
| *Slop Distance* | Displays the 3D distance between the points, in current unit. |
| *Delev* | Displays the difference in orthometric heights, in current unit. This value will be displayed, if *Ground* or *Grid* or *Datum Lat, Lon, Elevation* is selected in the Status bar. |
| *Delta Ell. H* | Displays the difference in ellipsoidal heights, in current unit. This value will be displayed, if*WGS84 Lat, Lon, Ell.H* or *Datum Lat, Lon, Ell.H* is selected in the Status bar. |
| *dN* | Displays the difference in Norting coordinates, in current unit. This value will be displayed when a projection is defined in the Job Configuration. |
| *dE* | Displays the difference in Easting coordinates, in current unit. This value will be displayed when a projection is defined in the Job Configuration. |
| *Note* | Displays a user comment. To edit the note, click on the highlighted field and enter a user's comments. |

# Compare Surfaces Properties dialog

The *Compare Surfaces* tab from the Tabular view displays a table that lists the results of the inverse calculations. The ***Properties*** dialog for surface comparing displays its basic information.

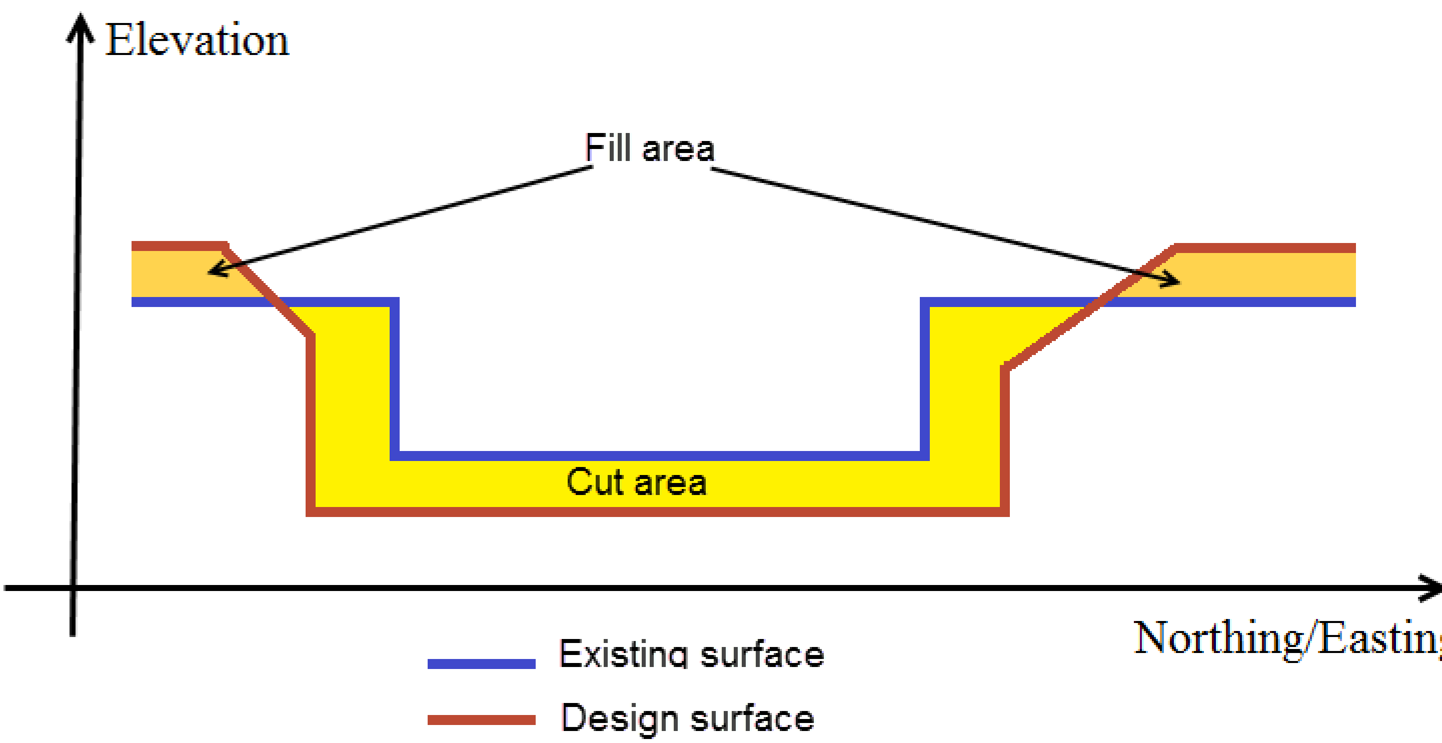
To open the dialog:

1. In the *Compare Surfaces* tab from the Tabular view, select the required comparison.
2. Right click and select **Properties** from the pop-up menu.

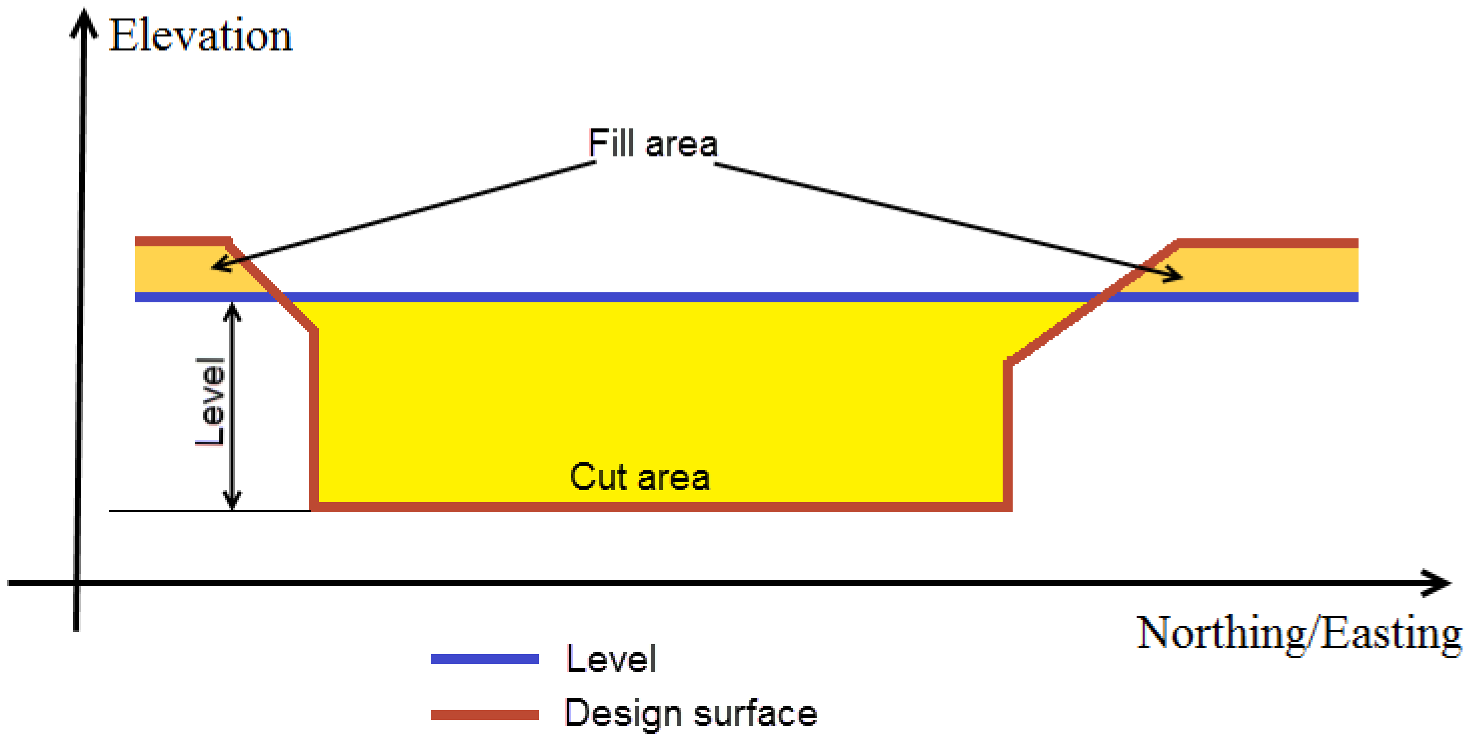
   The ***Properties*** dialog is displayed.

**Fields of *Properties* dialog for the surface comparing**

| Field | Description |
|---|---|
| *Design* | Displays the name of the first surface/road from comparison. |
| *Existing* | Displays the name of the second surface from comparison. |
| *Level* | Displays the level of the horizontal pane from comparison. |
| *Cut* | If two surfaces were compared — displays the cut volume to correct the existing surface to the design surface. See *Comparing two surfaces* picture below.<br>If a surface and a level were compared — displays the cut volume to correct the design surface to the specified level. See *Comparing surfaces and a level* picture below. |
| *Fill* | If two surfaces were compared — displays the fill volume to correct the existing surface to the design surface. See *Comparing two surfaces* picture below.<br>If a surface and a level were compared — displays the fill volume to correct the design surface to the specified level. See *Comparing a surface and a level* picture below. |
| *Area* | Displays the common area of two surfaces or a surface and a horizontal pane. |
| *Note* | Defines any additional notes about comparison. |




**Comparing two surfaces**




**Comparing surfaces and a level**

## Code properties dialog

The ***Properties*** dialog for a code allows you to configure the parameters of codes. It contains five tabs, described in the appropriate sections:

- "General tab" section below
- "Line tab" section on the facing page
- "Point tab" section on page 302
- "Area tab" section on page 302
- "Surface tab" section on page 303

To open the dialog:

1. In the *CAD* group of the *View* tab, click the **Codes** icon.

   The *Codes* view is displayed.
2. In the left panel, right click the required code and select **Properties** from the pop-up menu.

   The ***Properties: Code*** dialog is displayed.

### General tab

The *General* tab of the ***Properties*** dialog for a code allows you to configure the basic code information. Fields are described in the table below.

To open the tab:

1. In the *CAD* group of the *View* tab, click the **Codes** icon.

   The *Codes* view is displayed.
2. In the left panel, right click the required code and select **Properties** from the pop-up menu.

   The ***Properties: Code*** dialog is displayed.
3. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Name* | Displays the name of the code. You can edit the code's name, if the code is not used for an object of the job. |
| *Description* | Displays any additional text information about the code. |
| *Type* | In this field you can select the type of the code:<br>• Point — if you apply this type for a points of the job, you can use or not use the points in a surface.<br>• Line — if you apply this type for a lines of the job, you can use or not use the lines in a surface, and use or not use the lines as breakline in a surface.<br>• Area — if you apply this type for a areas of the job, you can use or not use the areas in a surface, use or not use the areas as breakline, and use or do not use the areas as exclusion area (hole) in a surface. |
| *Layer* | Displays the Layer where the code resides. The Layer sets the plotting style for the code. Every code has a non-empty Layer. In this field, you can select any Layer from the list of user-created layers.<br>By default the selected Layer sets the plotting style of the code and all plotting style (symbol and color for point; color, style and width for line; color, fill style and fill transparency for area) automatically are set to BYLAYER. You can change the plotting style. |

## Line tab

The *Line* tab of the ***Properties*** dialog for a code allows you to configure the plotting style for lines. Fields are described in the table below.

To open the tab:

1. In the *CAD* group of the *View* tab, click the **Codes** icon.

   The *Codes* view is displayed.
2. In the left panel, right click the required code and select **Properties** from the pop-up menu.

   The ***Properties: Code*** dialog is displayed.
3. Click the *Line* tab.

**Fields of the *Line* tab**

| Field | Description |
|---|---|
| *Line Color* | Displays the polyline color for Map View. By default the parameter is set to BYLAYER. You can choose any color from the list. |
| *Line Style* | Displays the polyline style (solid, dashed, dashed-and-doted, doted) for Map View. By default the parameter is set to BYLAYER. You can choose any style from the list. |
| *Line Width* | Displays the polyline width (from 1 to 10 pixels) for MapView. By default the parameter is set to BYLAYER. You can choose any width from the list. |

## Point tab

The *Point* tab of the ***Properties*** dialog for a code allows you to configure the plotting style for points. Fields are described in the table below.

To open the tab:

1. In the *CAD* group of the *View* tab, click the **Codes** icon.

   The *Codes* view is displayed.
2. In the left panel, right click the required code and select **Properties** from the pop-up menu.

   The ***Properties: Code*** dialog is displayed.
3. Click the *Point* tab.

**Fields of the *Point* tab**

| Field | Description |
|---|---|
| *Point Symbol* | Displays the point symbol in Map View. By default the parameter is set to BYLAYER. You can choose any symbol from the list. |
| *Point Color* | Displays the point color in Map View. By default the parameter is set to BYLAYER. You can choose any color from the list. |

## Area tab

The *Area* tab of the ***Properties*** dialog for a code allows you to configure the plotting style for ares. Fields are described in the table below.

To open the tab:

1. In the *CAD* group of the *View* tab, click the **Codes** icon.

   The *Codes* view is displayed.
2. In the left panel, right click the required code and select **Properties** from the pop-up menu.

   The ***Properties: Code*** dialog is displayed.
3. Click the *Area* tab.

**Fields of the *Area* tab**

| Field | Description |
|---|---|
| *Area Color* | Displays the color of the closed polyline (area) in Map View. By default the parameter is set to BYLAYER. You can choose any color from the list. |
| *Area Fill Style* | Displays the fill stile for closed polyline (area) in Map View. By default the parameter is set to BYLAYER. You can choose any fill style from the list. |
| *Fill Transparency* | Displays the transparency value for closed polyline (area) in 3D View. By default the parameter is set to BYLAYER. |

## Surface tab

The *Surface* tab of the ***Properties*** dialog for a code allows you to configure the plotting style for surfaces. Fields are described in the table below.

To open the tab:

1. In the *CAD* group of the *View* tab, click the **Codes** icon.

   The *Codes* view is displayed.
2. In the left panel, right click the required code and select **Properties** from the pop-up menu.

   The ***Properties: Code*** dialog is displayed.
3. Click the *Surface* tab.

**Fields of the *Surface* tab**

| Field | Description |
|---|---|
| *Use in Surface* | When ticked, the points, lines or areas with the code may be used in a surface.<br>When unticked, the points, lines or areas with the code cannot be used in a surface. |
| *Breakline* | When ticked, the lines or areas with the code may be used as breakline in a surface.<br>When unticked, the lines or areas with the given code cannot be as breakline in a surface. |
| *Exclusion Area* | When ticked, the areas with the code will be used as exclusion area (hole) in a surface.<br>When unticked, the areas with the code will not be as exclusion area (hole) in a surface. |

# Code Attribute properties dialog

The ***Properties*** dialog for a code attribute allows you to configure the basic parameters of code attributes. Fields of the dialog are described in the table below.

To open the dialog:

1. In the *CAD* group of the *View* tab, click the **Codes** icon.

   The *Codes* view is displayed.
2. In the left panel, select the required code

3. In the right panel, right click the required code attribute and select **Properties** from the pop-up menu.

   The ***Properties: Code Attribute*** dialog is displayed.

**Fields of the *Properties: Code Attribute* dialog**

| Field | Description |
|---|---|
| *Attribute Name* | Displays the name of the attribute. You can edit the attribute's name, if the corresponding code is not used for an object of the job. |
| *Default Value* | In this field you can enter or select from the list the default value for each attribute's type. You can edit the attribute's default values, if the corresponding code is not used for a object of the job. The field cannot be empty if you the *Required* checkbox is ticked. |
| *Type* | Displays the type of the attribute. You cannot edit the type for the created attribute. You can select one of the following types when creating a new attribute:<br>• Integer — any integer number<br>• Real Number — any real number<br>• Text — any alpha-numeric string that contains up to 255 characters<br>• Menu — you can select any attribute from a list. You can add and remove any value and text to/from the list<br>• Date/Time — the current date and time<br>• Boolean — you can select *True* or *False* values. |
| *Required* | When ticked, the attribute's value must be defined for code. |

# Layer properties dialog

The ***Properties*** dialog for a code allows you to configure the parameters of layers. It contains four tabs, described in the appropriate sections:

- "General tab" section below
- "Properties tab" section on the facing page
- "Area tab" section on page 306
- "Avoidance tab" section on page 306

To open the dialog:

1. In the *CAD* group of the *View* tab, click the **Layers** icon.

   The *Layer* view is displayed.
2. Right click the required Layer and select **Properties** from the pop-up menu.

   The ***Properties: Layer*** dialog is displayed.

## General tab

The *General* tab of the ***Properties*** dialog for a layer allows you to configure the basic layer information. Fields are described in the table below.

To open the tab:

1. In the *CAD* group of the *View* tab, click the **Layers** icon.

   The *Layer* view is displayed.
2. Right click the required Layer and select **Properties** from the pop-up menu.

   The ***Properties: Layer*** dialog is displayed.
3. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Name* | Displays the name of the layer. You can edit the layer's name for any layer, except the layer with zero name. |
| *Note* | Displays any additional text information about the layer. |
| *Breakline Type* | In this field you can select one of the following types:<br>• Auto — when creating a surface, the polyline/area with the given layer can be as boundary or breakline or exclusion,<br>• Breakline — when creating a surface, the polyline/area with the given layer can be only breakline,<br>• Boundary — when creating a surface, the polyline/area with the given layer can be only boundary,<br>• Exclusion — when creating a surface, the area with the given layer can be only exclusion area. |
| *Visible* | Defines the visibility of the layer. Layer is visible when checkbox is ticked. |

## Properties tab

The *Properties* tab of the ***Properties*** dialog for a layer allows you to configure the basic plot styles for a layer's objects. Fields are described in the table below.

To open the tab:

1. In the *CAD* group of the *View* tab, click the **Layers** icon.

   The *Layer* view is displayed.
2. Right click the required Layer and select **Properties** from the pop-up menu.

   The ***Properties: Layer*** dialog is displayed.
3. Click the *Properties* tab.

**Fields of the *Properties* tab**

| Field | Description |
|---|---|
| *Line Style* | Displays the polyline style (solid, dashed, dashed-and-doted, doted) for Map View. You can choose any style from the list. |
| *Line Width* | Displays the polyline width (from 1 to 10 pixels) for Map View. You can choose any width from the list. |
| *Color* | Displays the color for any objects with the given layer. You can choose any color from the list for displaying in Map View. |

| Field | Description |
| --- | --- |
| *Point Symbol* | Displays the point symbol in Map View. You can choose any symbol from the list. |

## Area tab

The *Area* tab of the ***Properties*** dialog for a layer allows you to configure the plot styles for a layer's areas. Fields are described in the table below.

To open the tab:

1. In the *CAD* group of the *View* tab, click the **Layers** icon.

   The *Layer* view is displayed.
2. Right click the required Layer and select **Properties** from the pop-up menu.

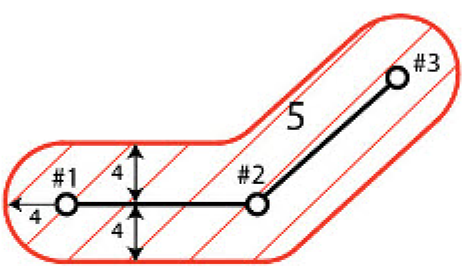
   The ***Properties: Layer*** dialog is displayed.
3. Click the *Area* tab.

**Fields of the *Area* tab**

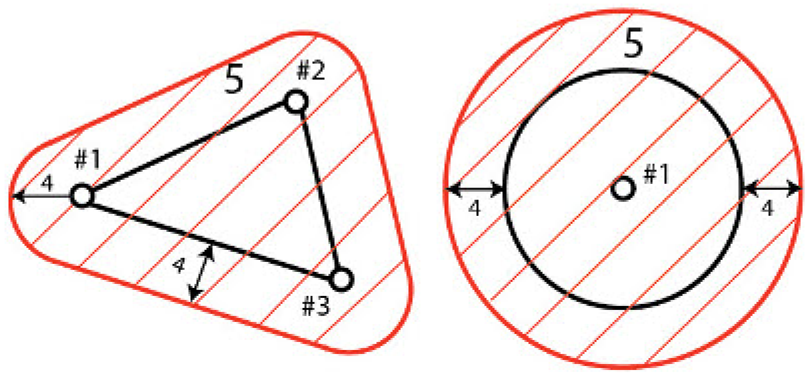
| Field | Description |
| --- | --- |
| *Area Fill Style* | Displays the fill style for closed polyline (area) in Map View. You can choose any fill style from the list. |
| *Fill Transparency* | Displays the transparency value for closed polyline (area) in 3D View. |

## Avoidance tab

The Avoidance feature is used in the machine control for alarming operator if the machine enter avoidance area; and in the field software to avoid dangerous areas. Pictures below represent avoidance areas. MAGNET Tools support this feature for import/export purposes.




**Avoidance area for a line**




**Avoidance area for polygon/surface in the horizontal plane**

LEGEND
#1; #2; #3 — points

4 — proximity,

5 — boundary and avoidance areas.

The *Avoidance* tab of the ***Properties*** dialog for a layer allows you to configure the layer for avoidance boundaries.

To open the tab:

1. In the *CAD* group of the *View* tab, click the **Layers** icon.

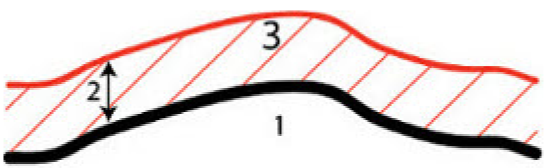
   The *Layer* view is displayed.
2. Right click the required Layer and select **Properties** from the pop-up menu.

   The ***Properties: Layer*** dialog is displayed.
3. Click the *Avoidance* tab.
4. Configure the parameters as you need. Fields are described in the table below.

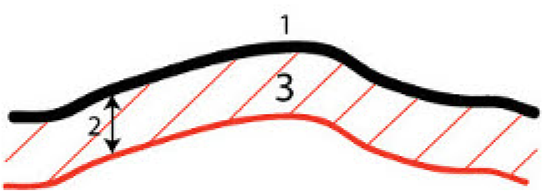
**Fields of the *Avoidance* tab**

| Field | Description |
|---|---|
| *Avoidance Mode* | Defines the mode of the avoidance option. Select the required radiobutton:<br>• *Off* — to turn the avoidance option off.<br>• *2D* — to work in the horizontal plane only.<br>• *3D* — to work in both horizontal and vertical planes |

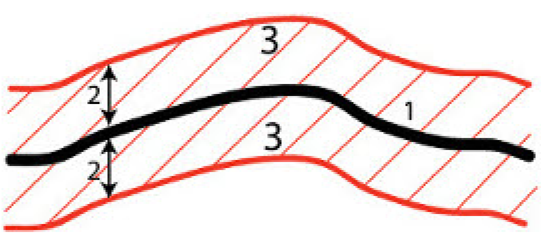
| Field | Description |
|---|---|
| *Avoidance Surface mode* | Defines the avoidance surface mode. Select the required option from the drop-down list:<br>• *Above* — the avoidance boundary will be placed above the surface. The alarm will be displayed if a measurement is performed within the avoidance boundary. See the "Above avoidance mode" picture below.<br>• *Below* — the avoidance boundary will be placed below the surface. The alarm will be displayed if a measurement is performed within the avoidance boundary. See the "Below avoidance mode" picture below.<br>• *Above/Below* — the avoidance boundary will be placed both above and below the surface. The alarm will be displayed if a measurement is performed within the avoidance boundary. See the "Above/Below avoidance mode" picture below.<br>• *Outside* — the avoidance boundary will be placed both above and below the surface. The alarm will be displayed if a measurement is performed outside of the avoidance boundary. See the "Outside avoidance mode" picture below. |
| *Avoidance Proximity* | Defines the size of the avoidance area. |



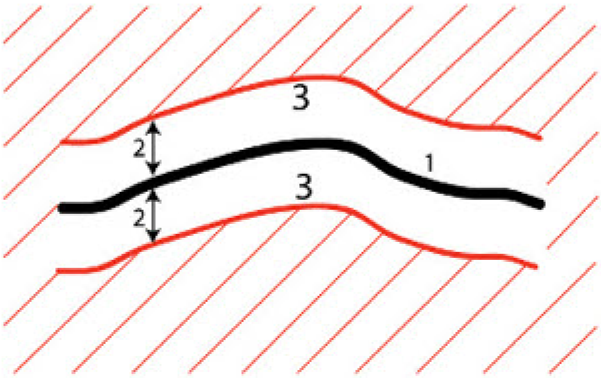

**Above avoidance mode**




**Below avoidance mode**




**Above/Below avoidance mode**




**Outside avoidance mode**

LEGEND
1 — surface

2 — proximity

3 — boundary area

# Text properties dialog

The ***Properties*** dialog for a text allows you to configure the parameters of text objects. It contains two tabs, described in the appropriate sections:

- "Text tab" section below
- "Location tab" section on the next page

To open the dialog:

1. Select the required text object either in the Map view; or at the *Text* tab from the tabular view.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Text*** dialog is displayed.

## Text tab

The *Text* tab of the ***Properties*** dialog for a text allows you to edit the basic properties of the text. Fields of the tab are described in the table below.

To open the tab:

1. Select the required text object either in the Map view; or at the *Text* tab from the tabular view.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Text*** dialog is displayed.
3. Click the *Text* tab.

**Fields of the *Text* tab**

| Field | Description |
|---|---|
| *Contents* | Defines the content of the text box. You can type any text here. |

| Field | Description |
|---|---|
| *Layer* | Defines the Layer in which the Text resides. The Layer sets the plotting style for the text. You can select any Layer from the list of layers available in the job. The field cannot be empty. |
| *Color* | Defines the text color for the Map view. If you set BYLAYER, the color of the text will be set automatically by layer settings. |
| *Angle* | Defines the angle rotation of the text box in degrees. By default, the values is zero, which means horizontal orientation of the text. |
| *Text Height* | Defines the height of the text in the current linear units. |
| *Font Name* | Defines the font for the text. You can select any font from the list of available fonts. |
| *Bold* | Tick it to make the font bold. |
| *Italic* | Tick it to make the font italic. |
| *Underline* | Tick it to draw the line under the text. |
| *Insertion Point* | Defines where the insertion point will be located on the text box. |
| *Draw Box* | Tick it to draw a frame around the text. |
| *Opaque* | Tick it to fill the text box with the background color; otherwise the text box is transparent. |

## Location tab

The *Location* tab of the ***Properties*** dialog for a text allows you to edit the location of the text. Fields of the tab are described in the table below.

To open the tab:

1. Select the required text object either in the Map view; or at the *Text* tab from the tabular view.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Text*** dialog is displayed.
3. Click the *Location* tab.

**Fields of the *Location* tab**

| Field | Description |
|---|---|
| *Start Point* | Defines the name of the start point of the text box. You can selected any existing point of the current job. |
| *Northing* | Defines the grid northing coordinate of the start point. |
| *Easting* | Defines the grid easting coordinate of the start point. |
| *Height* | Defines the grid elevation coordinate of the start point. |
| | |
| | |
| | |

# Class properties dialog

The ***Properties*** dialog for a TS measurement class allows you to configure the parameters of class. It contains two tabs, described in the appropriate sections:

- "General tab" section below
- "Parameters tab" section below

To open the dialog:

1. In the *Equipment* group of the *View* tab, click the **Classes View** icon.
2. Select the required class.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Class*** dialog is displayed.

## General tab

The *General* tab of the ***Properties*** dialog for a TS measurement class allows you to edit the basic properties of the class. Fields of the tab are described in the table below.

To open the tab:

1. In the *Equipment* group of the *View* tab, click the **Classes View** icon.
2. Select the required class.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Class*** dialog is displayed.
4. Click the *General* tab.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *Name* | Defines the name of the class. The class name is unique and the field cannot be empty. |
| *Note* | Defines any additional note about class. |

## Parameters tab

The *Parameters* tab of the ***Properties*** dialog for a TS measurement class allows you to edit the measurement characteristics of the class. Fields of the tab are described in the table below.

To open the tab:

1. In the *Equipment* group of the *View* tab, click the **Classes View** icon.
2. Select the required class.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Class*** dialog is displayed.
4. Click the *Parameters* tab.

**Fields of the *Parameters* tab**

| Field | Description |
|---|---|
| *Num Sets* | Defines the set number of horizontal angle (HA) measurements. You can select either direct, or single direct and reverse, or multiple direct and reverse measurements of HA. |
| *VA* | Defines when the vertical angle (VA) will be measured. You can select either vertical angle measurement for direct measurements only, or for first direct and reverse measurements, or for all direct and reverse measurements of HA. |
| *Dist* | Defines when the distance will be measured. You can select either do not measure the distance, or perform the distance measurement for first direct measurements only, or for first direct and reverse measurements, or for all direct or all direct and reverse measurements. |
| *Num Dist* | Defines the number of measurements for distance determination. You can select either one, or multiple measurements. Only the first distance measurement is used in position calculation.The other ones are just recorded. |
| *Hz* | Defines the tolerance value in the horizontal plane in current angular units. The field is available for one or more direct and reverse measurements of the HA. |
| *Hz (r+l)* | Defines the tolerance value of the oscillation of the direction in the horizontal plane in current angular units. The field is available for one or more direct and reverse measurements of the HA. |
| *Hz (r-l)* | Defines the tolerance value of the oscillation of the collimation error in the horizontal plane in current angular units. The field is available for one or more direct and reverse measurements of the HA. |
| *VA* | Defines the tolerance value in the vertical plane in current angular units. This field is available when VA is measured either for one direct and reverse measurements or for all direct and reverse measurements of HA. |
| *Distance* | Defines the tolerance value for the repeated distance measurements during one set. The field is available when the value of the Num Dist parameter is more than 1. |
| *Dist Sets Dev* | Defines the tolerance value for the repeated distance measurements during several sets. The field is available when the value in the filed Dist is either 1DR, or D, or RD. |

# Geoid properties dialog

To open the dialog, in the ***Geoid List*** table, select the required geiod, and select **Properties** from the context menu.

**Fields of the *Geoid properties* dialog**

| Field | Description |
|---|---|
| *Name* | Displays the geoid name |
| *Datum* | Displays the reference datum of the geoid. |

| Field | Description |
|---|---|
| *Path* | Displays the path to the geoid file location. |
| *Minimum Latitude* | Displays the minimum value of the latitude that limits the use of this model. |
| *Minimum Longitude* | Displays the minimum value of the longitude that limits the use of this model. |
| *Maximum Latitude* | Displays the maximum value of the latitude that limits the use of this model. |
| *Maximum Longitude* | Displays the maximum value of the longitude that limits the use of this model. |

# Datum properties dialog

To open the dialog:

1. In the *Information* group of the *Job* tab, click the **Job Configuration** icon.

   The ***Job configuration*** dialog is displayed.
2. Select the *Coordinate Systems* item.
3. In the *Datum* field, click **Custom**.

   The ***Custom Datums List*** is displayed.
4. Select the required datum.
5. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Datum*** dialog is displayed.

**Fields of the *Properties* dialog for a datum**

| Field | Description |
|---|---|
| *Name* | Displays the name of the custom datum. The datum name is unique and the field cannot be empty. |
| *Ellipsoid* | Displays the name of the ellipsoid used to create the datum. You can select any predefined ellipsoid from the list. |
| *DX* | Displays the value of shift along the X axis in meters, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *DY* | Displays the value of shift along the Y axis in meters, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *DZ* | Displays the value of shift along the Z axis in meters, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *RX* | Displays the value of the rotation angle between the X axes of the created datum and WGS84 in arc seconds. The default is 0. |
| *RY* | Displays the value of the rotation angle between the Y axes of the created datum and WGS84 in arc seconds. The default is 0. |
| *RZ* | Displays the value of the rotation angle between the Z axes of the created datum and WGS84 in arc seconds. The default is 0. |
| *Scale* | Displays the value of the scale factor in ppm, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *Note* | Displays any additional note about the datum. |

| Field | Description |
|---|---|
| *Alias* | Displays the name of the datum, all available projection(s) for the datum automatically will be available for the created custom datum. You can select any datum from the list. |

# Projection properties dialog

To open the dialog:

1. In the *Information* group of the *Job* tab, click the **Job Configuration** icon.

   The ***Job configuration*** dialog is displayed.
2. Select the *Coordinate Systems* item.
3. In the *Projection* field, click **Custom**.

   The ***Custom Projections List*** is displayed.
4. Select the required projection.
5. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Projection*** dialog is displayed.

**Fields of the *Properties* dialog for a projection**

| Field | Description |
|---|---|
| *Name* | Displays the name of thecustom projection. The projection name is unique and the field cannot be empty. |
| *Projection Type* | Defines the name of the projection type. The following options are available:<br>• Transverse-Mercator<br>• Lambert<br>• Double Stereographic<br>• Stereographic<br>• Oblique Mercator<br>• Albers Equal Area<br>• Cassini-Soldner<br>• Mercator<br>Every projection has its own set of original parameters. After selecting the type of projection, you can edit the parameters for this type. |
| *Region* | Displays the name of the region for which the given projection will be used. You can use the existing regions (Africa, Asia, Australia and New Zealand and so on) or enter a new name. If you enter a new name, the application creates a new folder with the entered name in the projection list. After clicking **OK** the custom projection will be saved in the folder. |
| *Notes* | Displays any additional note about the projection. |
| *Datum* | Displays the datum used for the projection. You can select any datum for the given projection. After selection the custom projection, the datum will be automatically set in the *Datum* drop-down list at the *Setup* tab of the *Coordinate Systems* item from the ***Job configuration*** dialog |

# Station Equations Set properties dialog

The ***Properties*** dialog for a Station Equations set allows you to view and edit name of a station equations set.

To open the dialog:

1. In the left panel of the *Station Equations* tab from the tabular view, select the required set.
2. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Station Equations Set*** dialog is displayed.

**Fields of the** *Properties: Station Equations Set* **dialog**

| Field | Description |
|---|---|
| *Name* | Defines the name of the station equations set. |

# Station Equation properties dialog

The ***Properties*** dialog for a Station Equation allows you to view and edit parameters of a station equation.

To open the dialog:

1. In the left panel of the *Station Equations* tab from the tabular view, select the required set.
2. In the right panel, select the required station equation.
3. Right click and select **Properties** from the pop-up menu.

   The ***Properties: Station Equation*** dialog is displayed.

**Fields of the** *Properties: Station Equation* **dialog**

| Field | Description |
|---|---|
| *Name* | Defines the name of the station equation. |
| *Back Station* | Defines stationing of the approaching segment, behind the spot, where station equation is applied |
| *Ahead Station* | Defines stationing of the departing segment, after the spot, where station equation is applied |

# Options Dialog

MAGNET Tools data views may be modified to fit your preferences. You may edit options of any view at any time by using the ***Options*** dialog.

To open the dialog, right click in the required view, and select the **Options** command from the pop-up menu.

For details see the following sections:

- "Tabular View Options dialog" section below
- "Roads View Options dialog" section below
- "Observations View Options dialog" section on the facing page
- "Map View Options dialog" section on page 319
- "3D View Options dialog" section on page 319
- "Occupation View Options dialog" section on page 320

## Tabular View Options dialog

The data fields for each tab of the Tabular view can be shown/hidden and re-arranged according to your preference. You can change the order and visibility of the tab’s fields in the ***Options*** dialog.

To open the dialog for the current tab, right click on any place of the tab, and select the **Options** command from the pop-up menu.

The dialog contains two lists for each pane of the tab. The *Available columns* list contains fields available for this tab, the *Selected columns* list contains fields, which will be displayed in the tab.

You can create your own set of columns by using:

- the >> and << buttons to include/remove the selected fields to the *Selected columns* list
- the **Move Up** and **Move Down** buttons to modify the order of the selected columns.

## Roads View Options dialog

The dialog contains six tabs for the various road components:

- *Display Horizontal Elements* tab
- *Display Vertical Elements* tab
- *Display Cross Sections* tab
- *Display Road Strings* tab
- *Display Road String Alignments* tab
- *Graphic Views* tab

To open the dialog, right click any place in the right pane of the *Roads* tab, and select the **Options** command from the pop-up menu.

The *Graphic View* tab allows you to configure the layout of the road elements in graphic views. Fields of this tab are described in the table below.

**Fields of the *Graphic Views* tab**

| Field | Description |
|---|---|
| *Show Grid* | Tick to display the coordinate grid |
| *Show station name on station* | Tick to display the station name for the station |
| *Show station name on cursor* | Tick to display the station name on the cursor position |
| *Show station name on status bar* | Tick to display the station name on the status bar. |

The rest of the tabs allow you to configure the table views of road elements. The data fields for each tab can be shown/hidden and re-arranged according to your preference.

Each tab contains two lists. The *Available columns* list contains fields available for a road element, the *Selected columns* list contains fields, which will be displayed in the appropriate table.

You can create your own set of columns by using:

- the >> and << buttons to include/remove the selected fields to the *Selected columns* list
- the **Move Up** and **Move Down** buttons to modify the order of the selected columns.

# Observations View Options dialog

The dialog contains four tabs where you can show or hide different elements in the Observations View. For more information about each tab, refer to the appropriate section:

- "Window tab" section below
- "Labels tab" section on the next page
- "Selection tab" section on the next page
- "QAQC tab" section on page 319

## Window tab

The *Window* tab of the ***Options*** dialogs for Map and Observation view allows you to configure base properties for the view layout.

**Fields of the *Widows* tab**

| Field | Description |
|---|---|
| *Show Grid* | Tick to display grid lines on the map. |
| *Show Legend* | Tick to display the ***Legend*** window describing the symbols used in the view.<br>*NOTE*<br>*This field appears only in the **Options** dialog for the Observation view.* |

| Field | Description |
|---|---|
| *Show Ellipses* | Tick to display Ellipses in the view. The plane errors are represented as ellipses with the semi-axes equal to Std e and Std n for the vector/point. The vertical error is represented as a segment with the length equal to Std u for the vector/point. See "Adjustment tab" section on page 222 for details.<br>*NOTE*<br>*This field appears only in the **Options** dialog for the Observation view.* |
| *Show background map* | Tick to display Background images in the view. |
| *Show scale bar* | Tick to display the ***Scale*** window with the scale info. |
| *Background color* | Defines the background color for the view. |
| *Open this window automatically when observation appear* | Tick it to open the Observation view automatically if the job contains observations or a new observation added to the job.<br>*NOTE*<br>*This field appears only in the **Options** dialog for the Observation view.* |

## Labels tab

The *Labels* tab of the ***Options*** dialogs for Map and Observation views allows you to define, which information should be displayed in the view.

The tab has two group boxes, defines the displayed information for static and kinematic points. Each of these group boxes is divided to three group boxes:

- *Show on map* — checkboxes in it define which information will be shown in Map and Observation views
- *Show on cursor* — checkboxes in it define which information will be shown on the cursor position
- *Show on status map* — checkboxes in it define which information will be shown on the status bar

Tick the required checkboxes to define which information will be displayed in each position for static and kinematic points.

## Selection tab

The *Selection* tab of the ***Options*** dialogs for Map and Observation views allows you to define, which information should be displayed in the view. Fields of the tab are described in the table below.

**Fields of the *Selection* tab**

| Field | Description |
|---|---|
| *Show distance* | Tick to display the length of the selecting the rectangle's diagonal in the Status bar,when the user drags a rectangle over the map in the Map View or Observation view. |
| *Show azimuth* | Tick to display an azimuth from the first point to the last point in the Status bar, when the user drags a rectangle over the map in the Map view or Observation view. |
| *Show dimensions* | Tick to display dimensions of the selecting rectangle along the Easting and Northing axis correspondingly in the Status bar, when the user drags a rectangle over the map in the Map view or Observation view. |

| Field | Description |
|---|---|
| *Show area size* | Tick to display an area of the rectangle in the Status bar, when the user drags a rectangle over the map in the Map View or Observation view. |

## QAQC tab

The *QAQC* tab of the ***Options*** dialog for the Observation view allows you to display the QAQC information. Field is described in the table below.

#### Fields of the *QAQC* tab

| Field | Description |
|---|---|
| *Show QAQC information in tool-tip* | Tick to display the QC message for the selected object that failed QC. When the user stops the mouse in the Observation view over that object the QC message for that object appears in the tooltip along with all other information about this object. |

# Map View Options dialog

The dialog contains three tabs where you can show or hide different elements in the Map View. For more information about each tab, refer to the appropriate section:

- "Window tab" section on page 317
- "Labels tab" section on the previous page
- "Selection tab" section on the previous page

# 3D View Options dialog

The dialog contains three following tabs where you can show or hide different elements in the 3D View. For more information about each tab, refer to the appropriate section:

- "Window tab" section below
- "Selection tab" section on the next page
- "Labels tab" section on the next page

## Window tab

The *Window* tab of the ***Options: 3D View*** dialog has settings for displaying or hiding the gird and settings allows to fill 3D objects in different ways. Fields of the tab are described in the table below.

#### Fields of the *Windows* tab

| Field | Description |
|---|---|
| *Fill mode* | Defines the filling mode for the 3D objects. You may select one of the followings:<br>• Wireframe<br>• Solid<br>• Wireframe & Solid |

| Field | Description |
|---|---|
| *Show Grid* | Defines the style for displaying the Grid. You may select one of the following options:<br>• None (turn off the Grid)<br>• Grey scale<br>• Color |
| *Background color* | Defines the background color for the 3D View. |
| *Show background images* | Tick to display Background images on the 3D view. Background images will be shown only on the surface. |

## Selection tab

The *Selection* tab of the ***Options: 3D View*** dialog allows you to configure displaying of the parameters for the selecting rectangle in the Status Bar. Fields are described in the table below.

**Fields of the *Selection* tab**

| Field | Description |
|---|---|
| *Show distance* | Tick to display the length of the selecting the rectangle diagonal in the Status bar, when the user drags a rectangle over the map on the 3D View. This option works only if all vertexes of the selecting rectangle are located inside the 3D object. |
| *Show azimuth* | Enable to display an azimuth of the selecting rectangle diagonal (from the first point to the last point)in the Status bar, when the user drags a rectangle over the map on the 3D View. |

## Labels tab

The *Labels* tab of the ***Options: 3D View*** dialog allows you to define, which information should be displayed in the view.

The tabs has three group boxes, defines the displayed information for points:

- *Show on map* — checkboxes in it define which information will be shown on map of 3D view
- *Show on cursor* — checkboxes in it define which information will be shown on the cursor position
- *Show on status map* — checkboxes in it define which information will be shown on the status bar

Tick the required checkboxes to define which information will be displayed in each position for static and kinematic points.

# Occupation View Options dialog

The dialog contains three following tabs where you can show or hide different elements in the 3D View. For more information about each tab, refer to the appropriate section:

## Show tab

The *Show* tab of the ***Options*** dialog for the Occupation view allows you to how or hide the coordinate grid and legend window.

**Fields of the *Show* tab**

| Field | Description |
|---|---|
| *Show grid* | Tick to display grid lines on the Occupation view. |
| *Show legend* | Tick to display the ***Legend*** window describing the symbols used in the view. |

## Occupation view tab

In the *Occupation* tab of the ***Options*** dialog for the Occupation view you can select the display mode of the Occupation View:

- *Show occupations by receivers* — the vertical axis of the occupation view graph represents the serial numbers of the receivers used for data collection.
- *Show occupations by points* — the vertical axis of the occupation view graph represents the names of the points where the data was collected.

## QAQC tab

The *QAQC* tab of the ***Options*** dialog for the Occupation view allows you to display the QAQC information. Fields are described in the table below.

**Fields of the *QAQC* tab**

| Field | Description |
|---|---|
| *Show QAQC information in tooltip* | Tick to display the QC message for the selected object that failed QC. When the user stops the mouse in the occupation view over that object the QC message for that object appears in the tooltip along with all other information about this object. |

# MAGNET Enterprise

The Enterprise option in the application which allows you to connect with the MAGNET Enterprise service to get the possibility to upload or download data to the project on the sever and communicate with the company members in the chat. Open the *Enterprise* tab of the MAGNET Tools ribbon run the Enterprise option.

To connect with the MAGNET Enterprise web server, click the **Logon** icon. For details see "Enterprise logon" section below.

To create a new Project Inbox and see all available Projects, click the **Connect to Project** icon. For details see "Enterprise: Connect to Project" section on the facing page.

To upload a file in the Project Inbox, click the **Upload files** icon. For details see "Enterprise: Uploading files" section on page 325.

To download a file from the Project Inbox, click the **Download files** icon. For details see "Enterprise: Download files" section on page 326.

To start chatting with the company members, click the **Chat** icon. For details see "Enterprise: Chat" section on page 324.

To automatically receive the coordinates of the measured point in the real time to the current job, click the **Real time** icon. For details see "Enterprise: Real time" section on page 326.

To change the connection option with Enterprise web server, click the **Options** icon. For details see "Enterprise: Options dilaog" section on page 325.

## Enterprise logon

In the ***Logon*** dialog you can enter login (e-mail) and password provided by the Enterprise administrator of your company or by dealer to connect to the Enterprise server.

To open the dialog, in the *Common* group of the *Enterprise* tab, click the **Logon** icon.

When the *Save login* checkbox is ticked, the login will be stored and you do not need to enter the login for the next session.

When the ***Save password*** checkbox is ticked, the password will be stored and you do not need to enter the password for the next session.

When the *Auto logon on startup* checkbox is ticked, the connection with the server will be set automatically after starting the application. The *Save login* and *Save password* must be ticked to use this option.

To start a connection, click **Logon**. After the connection is established:

- the **Logon** button changes into the **Logout** button,
- all fields and all checkboxes of the ***Logon*** dialog are disabled,
- all icons of the *Enterprise* tab are enabled.

To stop the connection, click *Logout*. After disconnecting with the Enterprise server:

- the Logout button changes into the Logon button,
- all fields and all checkboxes of the Logon window are enabled,
- all icons of the Enterprise option are disabled.

# Enterprise: Connect to Project

You can create a Project Inbox on the Enterprise service. Only after creating a project you can upload / download data to the project. You can create unlimited number of projects.

To create a project, enter a name in the New project field and click the Create button.

1. In the *Common* group of the *Enterprise* tab, click the **Connect to Project** icon.

   The ***Project*** dialog is displayed.
2. In the *New Project* editbox, type the name of the new project.
3. Click **Create**.

   The project is created.

In the Enterprise option of the application you can not assign additional user(s) to the Project Inbox(es).

An Administrator or Project Manager can assign additional user(s) to the project in the Enterprise web server.

The *Available* list displays all the projects to which you have access. In this filed you can select one project as the current project: highlight a desired project in the field and click the Connect button.

Before starting the Real Time logging, you have to connect to the same project, which was selected in the MAGNET Field job. Receiving of the measured point coordinates automatically is performed within one Project.

See also "Enterprise: Inboxes Structure" section below for more information about the Inbox.

## Enterprise: Inboxes Structure

Enterprise service allows you to store data in inboxes which have the following structure:

The first level is the Major inbox is Company. Each company has a Company Inbox. The company Administrator will create a MAGNET Enterprise company account. The Administrator will then add users to this company account. All users that are added will have access to the Company Inbox. The Administrator can set the different role for the added users.

*NOTES*
*These steps are performed on the Enterprise web server only (not in the Enterprise option of the application).*

*There are four roles for users in the Enterprise web server. The table displays the privileges are associated with the role:*

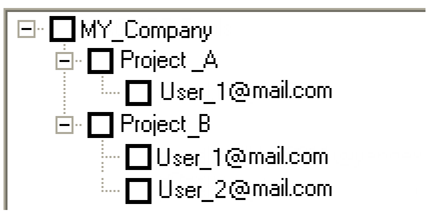
| Privileges | Administrator | Consultant | Project Manager | Project Team Member |
|---|---|---|---|---|
| Create a MAGNET Enterprise company account | YES | NO | NO | NO |
| Add / remove a user to the company account | YES | NO | NO | NO |
| Set a role for other users | YES | NO | NO | NO |
| Assign additional users to the Project Inbox(es) | YES | NO | NO | NO |
| Download data from all users Inboxes | YES | NO | YES | NO |
| View online / offline devices connected to the server | YES | YES | YES | NO |
| View available licenses | YES | NO | YES | NO |
| Set a notification for the added users | YES | YES | YES | YES |
| Create / edit / remove any Inbox, upload a new file to a personal Inbox | YES | YES | YES | YES |

| | | | | |
|---|---|---|---|---|
| Use the chat with the added users | YES | YES | YES | YES |
| View and edit My Profile | YES | YES | YES | YES |
| View and edit To Do List | YES | YES | YES | YES |
| View Map | YES | YES | YES | YES |
| View Weather | YES | YES | YES | YES |
| View and use Store | YES | NO | NO | NO |

The next level is a Project. You can define the project name in the Project Manager window. All your data can be stored in the Project inbox.

*NOTE*
*If a user creates a project in the application only that user is assigned to the project. An Administrator or Project Manager can then assign additional users to the project in the Enterprise web server.*

The third level of inbox is an User. For any role you can upload data to the personal Inbox or Inbox for which you was assigned. If your role is Administrator or Project Manager you can download from all users Inboxes and if your role is Project Team Member you can typically download only from their Inbox.




**Inbox hierarchy**

# Enterprise: Chat

In the Chat window you to send a text message to the selected user(s) of your company. Also you can receive a text message from any user of the company.

To open the dialog, in the *Common* group of the *Enterprise* tab, click **Chat** icon.

The *Create chat* table displays a list of the company users:

- the icon displays the user who is connected to the Enterprise server at the moment (online user),
- the icon displays the user who is not connected to the Enterprise server at the moment (offline user).

In this table you can select any user and create a chat for the user or a group of users. Check one or few users and click **Create chat**. The application creates a *Chat* tab in the dialog.

The **Create chat** button is enabled when the following conditions are met:

- a user or group of user are checked in the Attendants field,
- the connection with the server is established.

The Chat tab contains three fields:

- left field displays a list of the users in the chat. You cannot add/remove a user from the list.
- top right field displays the text message that was sent and messages about presence status of the user ("...is online" or "...is offline").
- bottom right field displays the entered message. Click **Send** or use the *Ctrl* + *Enter* keyboard shortcut to post the message to the chat.

*NOTE*
*You can send a text message to both online user or offline user. The online user will immediately receive the message, the offline user will receive the message after establishing the connection with the server.*

*NOTE*
*You can create unlimited number of chats with different sets of the users.*

# Enterprise: Options dilaog

In the dialog you can edit your account (e-mail and password) and options of connection with the Enterprise server.

To open the dialog, in the *Common* group of the *Enterprise* tab, click **Options** icon.

When the *Auto logon on startup* checkbox is tiked, the connection with the server will be set automatically after starting the application.

When the *Restore connection on disconnect* checkbox is ticked, the application will automatically try to restore the broken connection.

When the *Connect to last connected project at startup* checkbox is ticked, the application will automatically connect with the project which was selected for the previous connection with the Enterprise server.

When the *Show inboxes only for connected project* checkbox is ticked, the right panel of the ***Upload files*** dialog and the left panel of the ***Download files*** dialog will display the connected project only. This checkbox has the same functionality as the *Show inboxes for connected project only* checkbox from the ***Download files*** and ***Upload files*** dialogs.

Click **OK** to save the configured options and close the dialog.

# Enterprise: Uploading files

In the ***Upload files*** dialog you can upload selected files to the server.

To open the dialog, in the *Files* group of the *Enterprise* tab, click **Upload files** icon.

In the left panel of the window you can select the required files: click **Add** and select files in the **Open** dialog.

To delete a file from the left panel, select the files and click **Remove**.

In the right panel select the folder where you want to store the files. Click **Upload** to start uploading selected files to the selected Inboxes. The ***Progress*** window displays the uploading to the server in progress.

The **Upload** button is enabled when the following conditions are met:

- in the left panel files are selected,
- in the right panel Inboxes are checked,
- the connection with the server is established

*NOTE*
*When the "Show inboxes for connected project only" checkbox is ticked, the right panel of the* ***Upload files*** *dilaog displays the connected project. You can connect with any project, by using the* **Connect to Project** *and* **Real time** *icons.* *See "Enterprise: Connect to Project" section on page 323 and "Enterprise: Real time" section on the next page for details.*

# Enterprise: Download files

In the ***Download files*** dialog you can download a file from the server to the computer.

To open the dialog, in the *Files* group of the *Enterprise* tab, click **Download files** icon.

In the left panel of the dialog you can select the corresponding Inbox. The right panel of the dialog displays the files located in the Inbox. Check the desired files.

Click **Select** and navigate to the required folder in the computer where the files will be saved . The *Target directory* field displays the path to the folder for saving the downloaded files.

Click **Download** to start downloading selected files to the selected Inboxes. The ***Progress*** window displays downloading from the server to the computer in progress.

The **Download** button is enabled when the following conditions are met:

- in the left panel a folder is selected,
- in the right panel files are checked,
- the desired folder in the computer is selected
- the connection with the server is established

TIP
If your role is Project Team Member you can typically download only from your Project Inbox and from the Project Inbox of other user(s) where your account was assigned by the Enterprise administrator of your company.

TIP
If your role is Administrator or Project Manager you can download from all company users Inboxes.

*NOTE*
*When the "Show inboxes for connected project only" checkbox is ticked, the left panel of the* ***Download files*** *dialog displays only the connected project. You can connect with any project, by using the* **Connect to Project** *and* **Real time** *icons. See "Enterprise: Connect to Project" section on page 323 and "Enterprise: Real time" section below for details.*

:

# Enterprise: Real time

In the ***Real time*** dialog you can automatically receive the coordinates(not raw data and observations) of measured or added points from MAGNET Field in real time. The measured / added points will automatically send from the MAGNET Field to the MAGNET Enterprise and then send to the current job of the application. The *Points* tab displays the points.

To open the dialog, in the *Realtime* group of the *Enterprise* tab, click **Real time** icon.

To perform the real time import from MAGNET Field to the application job, two conditions must be met:

- MAGNET Field user and you have to belong to the same company,
- MAGNET Field user and you have to be connected to the same project.

In the *Project* field select the required project. If you select the Project with which the connection was established in the ***Connect to Project*** dilaog the **Connect** button is disabled. If you select a Project for which you did not set a connection, click **Connect** to establish the connection with the project. After connecting to the project, the **Connect** button is disabled.

If a user from the MAGNET Field side has a connection with the project, the *Sessions* table displays the user name, device name and ID of the device connected to the MAGNET Enterprise. Each line in the *Sessions* table displayed the connected device to the project.

To update information in the *Sessions* table, click **Refresh**.

Select a session and click **Start**. It starts uploading data to the MAGNET Enterprise from the receiver/controller, where MAGNET Field runs. To finish the session, click **Stop**.

After sending the measured/added points to the application current job, the *Points* tab will display the points in the WGS-84 or a Ground coordinate systems.

# How To

This chapter contains a set of short recommendations which help you quickly perform useful operations in the software. The following topics are available:



## Adding Custom Antenna Type

Each antenna type has unique phase center parameters (for L1 and L2 frequencies, respectively) obtained through either NGS calibration or TPS calibration. These parameters are viewable, but not editable in the ***Antennas List*** window. See "Antenna List" section on page 207 for details.

However, you can add user-defined antenna types to the antennas list, as well to display, to edit, and to remove antennas from the antennas list.

The custom antenna is stored in the user's folder and is saved after updating the version of the software. You can add a new antenna type to the antennas list in the following ways:

- By using the **Custom** button at the *Antenna* tab of the ***Properties*** dialog for a GPS Occupation. See "Antenna tab" section on page 230 for details.
  1. Right click in the GPS Occupations tab of the tabular view
  2. At the *Antenna* tab of the ***Properties*** dialog for a GPS Occupation, click **Custom**.

     The ***Custom Antennas List*** dialog is displayed. It contains custom antennas which were previously entered.
  3. Click **Add**.

     The ***New Custom Antenna*** dialog is displayed.
  4. Configure the parameters as you need. See description of tabs below.

5. When finished, click **OK**.

   The new custom antenna is added.

- By using the **Custom** button at the *Base Antenna* tab or *Rover Antenna* tab of the ***Properties*** dialog for a GPS observation. See "Base Antenna tab" section on page 243 or "Rover Antenna tab" section on page 244 for details.
  1. At the *Base Antenna* tab or *Rover Antenna* of the ***Properties*** dialog for a GPS Observation, click **Custom**.

     The ***Custom Antennas List*** dialog is displayed. It contains custom antennas which were previously entered.
  2. Click **Add**.

     The ***New Custom Antenna*** dialog is displayed.
  3. Configure the parameters as you need. See description of tabs below.
  4. When finished, click **OK**.

     The new custom antenna is added.
- At the ***Antennas List*** window. See "Antenna List" section on page 207 for details.
  1. Right click in the ***Antennas List*** window.
  2. Select **New Custom Antenna** from the pop-up menu.

     The ***Custom Antennas List*** dialog is displayed. It contains custom antennas which were previously entered.
  3. Click **Add**.

     The ***New Custom Antenna*** dialog is displayed.
  4. Configure the parameters as you need. See of tabs below.
  5. When finished, click **OK**.

     The new custom antenna is added.

The ***New Custom Antenna*** dialog has three tabs, described in the appropriate sections:

- "General tab" section below
- "Parameters tab" section on the next page
- "PCV tab" section on page 331

After entering all needed parameters in the tabs, click the OK button to store the antenna parameters. You can see the antenna name in

## General tab

The *General* tab of the ***New Custom Antenna*** dialog allows you to configure the basic parameters of the custom antenna. Fields are described in the table below.

**Fields of the *General* tab**

| Field | Description |
|---|---|
| *NGS Name* | Defines the standard NGS (http://www.ngs.noaa.gov/ANTCAL/) or TPS antenna name. This name displays in the 'Antenna number and type' line of the RINEX observation file and in the corresponding line of the TPS raw data file. |
| *Name* | Defines the antenna name used in the software interface. |
| *Manufacturer* | Defines the antenna manufacturer. |

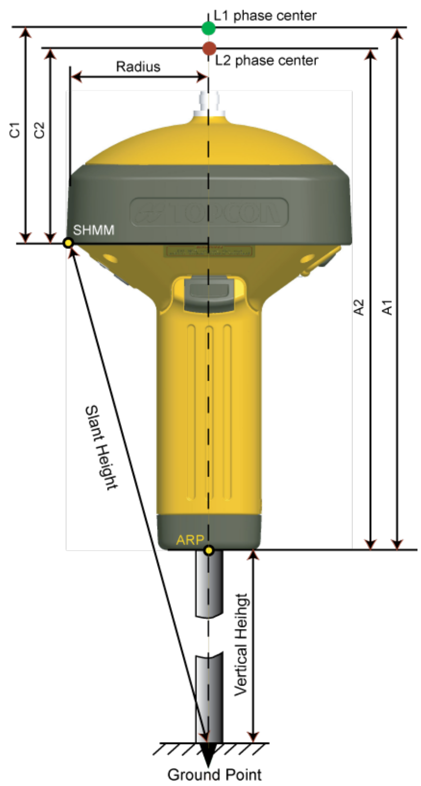
| Field | Description |
|---|---|
| *Note* | Defines any additional information for the selected antenna. For NGS calibration this field contains a part number of the antenna. For TPS calibration this filed contains "TPS Calibration". |
| *Antenna calibration set* | Defines the type of antenna calibration. The absolute calibration is a default setting. You can select only the absolute calibration for the custom antenna. The NGS and TPS calibration contains the absolute and relative calibrations:<br>• Relative — the antenna offsets and phase center variations are computed with respect to the AOAD/M_T antenna<br>• Absolute — the recalculated relative calibration that takes into account the absolute values for AOAD/M_T antenna. |

## Parameters tab

The *Parameters* tab of the ***New Custom Antenna*** dialog allows you to configure parameters of your custom antenna. Fields of the are described in the table below. See picture below for details.

**Fields of the *Parameters* tab**

| Field | Description |
|---|---|
| *Radius* | Defines the antenna's radius in millimeters. |
| *L1 Base Offset (A1)* | Defines the vertical offset measured from ARP (Antenna Reference Point) to the phase center for GPS frequency L1 in millimeters. |
| *L2 Base Offset (A2)* | Defines the vertical offset measured from ARP (Antenna Reference Point) to the phase center for GPS frequency L2 in millimeters. |
| *L1 Plane Offset (C1)* | Defines the vertical offset measured from the antenna slant height measure mark (SHMM) to the phase center for GPS frequency L1 in millimeters. |
| *L2 Plane Offset (C2)* | Defines the vertical offset measured from the antenna slant height measure mark (SHMM) to the phase center for GPS frequency L2 in millimeters. |
| *L1 Easting Offset (E1)* | Defines the easting offset of the phase center for GPS frequency L1 from the ARP (Antenna Reference Point) in the horizontal plane in millimeters. |
| *L2 Easting Offset (E2)* | Defines the easting offset of the phase center for GPS frequency L2 from the ARP (Antenna Reference Point) in the horizontal plane in millimeters. |
| *L1 Northing Offset (N1)* | Defines the norting offset of the phase center for GPS frequency L1 from the ARP (Antenna Reference Point) in the horizontal plane in millimeters. |
| *L2 Northing Offset (N2)* | Defines the norting offset of the phase center for GPS frequency L2 from the ARP (Antenna Reference Point) in the horizontal plane in millimeters. |
| *Measured Height Method* | Defines the method used to measure the antenna height. You can measure the antenna height in two ways:<br>• Vertical — measuring from the ground point to the antenna reference point (ARP) located on the bottom of the receiver.<br>• Slant — measuring from the ground point to the antenna slant height measure mark (SHMM). |




**Antenna parameters**

## PCV tab

The *PCV* tab of the ***New Custom Antenna*** dialog allows you to configure antenna phase center variations. Fields of the tab are described in the table below.

**Fields of the *PCV* tab**

| Field | Description |
|---|---|
| *PCV, GPS L1* | Defines the correction values (in millimeters) for L1 phase center. |
| *PCV, GPS L2* | Defines the correction values (in millimeters) for L2 phase center. |

# Adding TS Instrument Type

Each Total Station has unique parameters. These parameters are viewable, but not editable in the ***TS Instruments*** window. See "TS Instruments" section on page 209.

However, you are able to add a user-defined instrument types to the *TS Instruments* list, to display, to edit and to remove the instrument from the window. The custom instrument is stored in the user's folder and is saved after updating the version of the software. You can add a new instrument type at the *Instrument Type* tab of the ***Properties*** dialog for the left panel of the *TS Obs* tab. See "Instrument Type tab" section on page 248 for details.

To add a new custom TS instrument:

1. Right click in the left panel of the *TS Obs* tab from the Tabular view.
2. Select **Properties** from the pop-up menu.
3. The ***Properties*** dialog for a TS Occupation is displayed.
4. Click the *Instrument Type* tab.

5. Click **Custom**.

   The ***Custom TS Instrument List*** dialog is displayed. It contains custom TS instruments which were previously entered.
6. Click **Add**.

   The ***New Custom TS Instrument*** dialog is displayed.
7. Configure the parameters as you need. See of tabs below.
8. When finished, click **OK**.

   The new custom TS instrument is added.

The ***New Custom TS Instrument*** dialog has two tabs, described in the appropriate sections:

- "General tab" section below
- "Parameters tab" section below

## General tab

The *General* tab of the ***New Custom TS Instrument*** dialog allows you to configure the basic parameters of the instrument. Fields are described in the table below.

#### Fields of the *General* tab

| Field | Description |
|---|---|
| *Name* | Defines the unique name of the device. |
| *Manufacturer* | Defines the instrument manufacturer. |
| *Note* | Defines any additional notes for the selected instrument. |

## Parameters tab

The *Parameters* tab of the ***New Custom Antenna*** dialog allows you to configure parameters of your custom antenna. Fields of the are described in the table below. See picture below for details.

#### Fields of the *Parameters* tab

| Field | Description |
|---|---|
| *EDM* | Defines the value of the first component for the calculation of the distance determination error when using this device. The distance determination error of the instrument is calculated by the formula: $\sqrt{EDM^2 + PPM^2 * Distance * 10^{-6}}$ |
| *PPM* | Defines the value of the second component for the calculation of the distance determination error when using this device. The distance determination error of the instrument is calculated by the formula: $\sqrt{EDM^2 + PPM^2 * Distance * 10^{-6}}$ |
| *Vert. Accuracy* | Defines the error of the vertical angle measurement, in seconds. |
| *Horz. Accuracy* | Defines the error of the horizontal angle measurement, in seconds. |

| Field | Description |
|---|---|
| *Max. Distance* | Defines the maximum range for this device. |

# Adding custom datum to the datum list

You can create your own custom datum in the current job and then use this datum for other jobs. For creating a custom datum the application uses the Helmert Transformation Strict Formula . The "Custom datum to WGS-84" transformation direction is used in the algorithm of creating a new custom datum.

To add a custom datum:

1. In the *Information* group of the *Job* tab, click the **Job Configuration** icon.

   The ***Job configuration*** dialog is displayed.
2. In the left panel, select the *Coordinate Systems* item.
3. In the right panel, open the *Setup* tab.
4. In the *Datum* field, click **Custom**.

   The ***Custom Datums List*** dialog is displayed. It contains custom datums which were previously entered.
5. Click **Add**.

   The ***New Custom Datum*** dialog is displayed.
6. Configure the parameters as you need. Fields are described in the table below.
7. Click **OK**.

   The custom datum is created.

**Fields of the *General* tab of the *New Custom Datum* dialog**

| Field | Description |
|---|---|
| *Name* | Defines the name of the custom datum. The datum name is unique and the field cannot be empty. |
| *Ellipsoid* | Defines the name of the ellipsoid used to create the datum. You can select any predefined ellipsoid from the list. |
| *DX* | Defines the value of shift along the X axis in meters, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *DY* | Defines the value of shift along the Y axis in meters, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *DZ* | Defines the value of shift along the Z axis in meters, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *RX* | Displays the value of the rotation angle between the X axes of the created datum and WGS84 in arc seconds. The default is 0. |
| *RY* | Displays the value of the rotation angle between the Y axes of the created datum and WGS84 in arc seconds. The default is 0. |
| *RZ* | Displays the value of the rotation angle between the Z axes of the created datum and WGS84 in arc seconds. The default is 0. |
| *Scale* | Defines the value of the scale factor in ppm, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |

| Field | Description |
| --- | --- |
| *Note* | Defines any additional note about the datum. |
| *Alias* | When you select a datum from the list, all available projection(s) for the selected datum automatically will be available for the created custom datum. |

These parameters (shifts, rotations, and scale) specify a coordinate transformation from the newly created reference datum to WGS84 using the following equation:

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{WGS-84} = \begin{bmatrix} DX \\ DY \\ DZ \end{bmatrix} + (1 + Scale \quad 10^{-6}) \begin{bmatrix} 1 & RZ & -RY \\ -RZ & 1 & RX \\ RY & -RX & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{custom - d}$$

## Adding custom projection to the projection list

You can create your own custom projection in the current job and then use this projection for other jobs.

To add a custom projection:

1. In the *Information* group of the *Job* tab, click the **Job Configuration** icon.

   The ***Job configuration*** dialog is displayed.
2. In the left panel, select the *Coordinate Systems* item.
3. In the right panel, open the *Setup* tab.
4. In the *Projection* field, click **Custom**.

   The ***Custom Projections List*** dialog is displayed. It contains custom projections which were previously entered.
5. Click **Add**.

   The ***New Custom Projection*** dialog is displayed.
6. Configure the parameters as you need. Fields are described in the table below.
7. Click **OK**.

   The custom projection is created.

#### Fields of the *General* tab of the *New Custom Projection* dialog

| Field | Description |
| --- | --- |
| *Name* | Defines the name of the custom projection. The projection name is unique and the field cannot be empty. |

| Field | Description |
|---|---|
| *Projection Type* | Defines the name of the projection type. The following options are available:<br>• Transverse-Mercator<br>• Lambert<br>• Double Stereographic<br>• Stereographic<br>• Oblique Mercator<br>• Albers Equal Area<br>• Cassini-Soldner<br>• Mercator<br>Every projection has its own set of original parameters. After selecting the type of projection, you can edit the parameters for this type. |
| *Region* | Defines the name of the region for which the projection will be used. You can use the existing regions (like Europe, Australia, etc.) or enter a new name. If you enter a new name, the application creates a new folder with the entered name in the projection list. The custom projection will be saved in this folder. |
| *Note* | Defines any additional note about the datum. |
| *Datum* | Defines the datum used for the projection. You can select any datum for the given projection. After selection the custom projection, the datum will be automatically set in the *Datum* drop-down list at the *Setup* tab of the *Coordinate Systems* item from the ***Job configuration*** dialog |

# Adding geoid to the job

To add a required geoid to the Geoid list of the MAGNET Tools:

1. In the *Coordinate Systems* group of the *Process* tab, click the **Geoids** icon.

   The ***Geoid List*** dialog is displayed.
2. Click **Add**.

   The ***Open*** dialog is displayed.
3. From the *Format name* drop-down list, select the required type of the geoid file.
4. Navigate to the required file and open it.

   The geoid is added to the geoid list.

You may also use the **Geoid List** button at the *Setup* tab of the *Coordinate Systems* item from the ***Job Configuration*** dialog to access the ***Geoid List*** dialog.

## Geoid List dialog

The dialog contains the table, which list the available geoids:

**Fields of the *Geoid properties* dialog**

| Field | Description |
|---|---|
| *Icon* | Displays the symbol of the geoid. If a geoid file is found in the corresponding folder and it can be used for calculation, the icon is . If a geoid file is not found in the corresponding folder to use for calculation, the icon is . |
| *Name* | Displays the geoid name |
| *Datum* | Displays the reference datum of the geoid. |
| *Path* | Displays the path to the geoid file location. |
| *Minimum Latitude* | Displays the minimum value of the latitude that limits the use of this model. |
| *Minimum Longitude* | Displays the minimum value of the longitude that limits the use of this model. |
| *Maximum Latitude* | Displays the maximum value of the latitude that limits the use of this model. |
| *Maximum Longitude* | Displays the maximum value of the longitude that limits the use of this model. |

**Buttons of the *Geoid properties* dialog**

| Button | Description |
|---|---|
| **Add** | Click it to add a geoid to the list. See "Adding geoid to the job" section on the previous page for details. |
| **Remove** | Click it to remove a geoid from the list. |
| **Export** | Click it to convert a selected geoid to the Topcon Geoid (**.gff*) file format. |

# Creating background map for work area

If the you have a digital image in one of the following formats: JPEG (*.jpg), Bitmap (*.bmp) or TIFF (*.tif), to georeference the image using MAGNET Tools in the desired coordinate system, you need to have the picture points in the desired coordinate system.

> *NOTE*
> *The georeferenced image — an image for which the relationship between pixel coordinates and real datum/grid/ground/local coordinates is established.*

The minimal number of picture points needed to calculate parameters between the image and real coordinate systems depends on the calculation method:

- Translation method — requires at least two points. In this case, MAGNET Tools calculates:
  - the offsets of the origin of coordinates along two axes (E and N or Latitude and Longitude)
  - the average of the scale values

    If you add three or more picture points for this method, MAGNET Tools will also calculate the plane residuals for each picture point and display these values graphically on the image and in the tabular form on the control point list.
- Translation with Rotation method — requires at least three points. In this case, MAGNET Tools calculates:

- the offsets of the origin of coordinates along two axes (E and N or Latitude and Longitude)
- the average of the scale values
- an angle of image rotation

  If you add four or more picture points, MAGNET Tools will calculate the plane residuals for each picture point and will display these values graphically on the image and in the tabular form on the control point list.

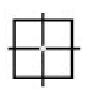
To georeference an image in the MAGNET Tools:

1. At the Status bar, select the required coordinate system, MAGNET Tools will calculate the correlation between this coordinate system and the image coordinate system.
2. In the *Spatial* group of the *View* tab, click the **Background images** icon.

   The ***Background images dialog*** is displayed.
3. Click **Add Image**.

   The ***Add Image*** dialog is displayed.
4. If needed, select the required file type from the *Format name* drop-down list.
5. Navigate to the required file and open it.

   If the image is not georeferenced, MAGNET Tools automatically opens the ***Set Georeference*** dialog. The dialog displays the image in the pixel coordinate system.
6. At the toolbar, click .

   The ***Georeference options*** dialog is displayed.
7. From the *Georeference Method* drop-down list, select the required method. See the description of methods above.
8. From the *Labels* color drop-down list, select the color for labels, which will be placed on the picture during georeference process.
9. Click **OK**.
10. At the toolbar, click **Add Point**.
11. The cursor changes into .
12. Identify and left-click the required point on the image using a photographic sketch of ground point.

    The ***Add georeference point*** dialog is displayed.
13. Define the label and coordinate of the geo-point in the appropriate editboxed, or select an existing point from the *Point* list.
14. Cilck **OK**.

    MAGNET Tools automatically marks the point on the image and it to the table for the marked point.
15. Repeat for all required points. If needed to delete a point, select it in the table and click **Delete Point(s)**.
16. When finished adding points, click **Calculate** to determine the relationship between pixel coordinates and real datum/grid/ground /local coordinates.

    The dialog displays the image in the current coordinate system.
17. Click **Save and Close**.

    The ***Save*** dialog is displayed.
18. Save the file as you need. MAGNET Tools creates two files:

- The transformed image in the same format as the source.
- ESRI World File Format

To add a georeferenced image to the Map view and Observation view:

1. In the *Spatial* group of the *View* tab, click the **Background images** icon.

   The ***Background images dialog*** is displayed.
2. From the *Available images* table, select the required image.
3. Click >>.

   The image is added to the *Images used in this job* table.
4. Click **Close**.

To remove a georeferenced image from the Map view and Observation view:

1. In the *Spatial* group of the *View* tab, click the **Background images** icon.

   The ***Background images dialog*** is displayed.
2. From the *Images used in this job* table, select the required image.
3. Click <<.

   The image is removed from the *Images used in this job* table.
4. Click **Close**.

To convert an image to another coordinate system:

1. In the *Spatial* group of the *View* tab, click the **Background images** icon.

   The ***Background images dialog*** is displayed.
2. From the *Available images* table, select the required image.
3. Click **Convert Image**.

   The ***Save*** dialog is displayed.
4. Click Advanced Options.
5. Select the required linear and angular units; and the coordinate type from the appropriate drop-down lists.
6. Save the file as you need. MAGNET Tools creates two files:
   - The transformed image in the same format as the source.
   - ESRI World File Format

## Background Images dialog

In the dialog you can:

- see all available images for the current job
- add any georeferenced image to the list of the available images for the current job
- select from the list an image to display in the current job
- convert an existing image to any coordinate system
- georeference an image — see Creating background map for work area for details.

  NOTE

  A georeferenced image is an image for which the relationship between pixel coordinates and real datum/-grid/ground /local coordinates is established.

The dialog contains two tables: *Available images* and *Images used in this job*. Fields of the tables are described in the tables below.

**Fields of the *Available images* table**

| Field | Description |
|---|---|
| *File Name* | Displays a file's name of the available raster or vector image in the job. In this field the following symbols can be applied:<br>— available raster image<br>— available vector image |
| *Path* | Displays the path to the image file on the computer disk drive, local area network, or storage media. |
| *Type* | Displays the image type. It can be vector and raster image file. |
| *Coordinate System* | Displays the coordinate system of the image file. |
| *Linear unit* | Displays the linear units of the image file. |
| *Angular unit* | Displays the angular units of the image file. |
| *Top left corner - X* | Displays x-coordinate of top-left corner of the image in the coordinate system of the image file. |
| *Top left corner - Y* | Displays y-coordinate of top-left corner of the image in the coordinate system of the image file. |

**Fields of the *Images used in this job* table**

| Field | Description |
|---|---|
| *File Name* | Displays a file's name of the available raster or vector image in the job. In this field the following symbols can be applied:<br>— raster image in the job's current coordinate system. This image can be shown in the Observation View and Map View<br>— vector image in the job's current coordinate system. This image can be shown in the Observation View and Map View<br>— raster image in a coordinate system different from the job's current coordinate system. This image cannot be shown in the Observation View and Map View<br>— vector image in a coordinate system different from the job's current coordinate system. This image cannot be shown in the Observation View and Map View |
| *Path* | Displays the path to the image file on the computer disk drive, local area network, or storage media. |
| *Type* | Displays the image type. It can be vector and raster image file. |
| *Coordinate System* | Displays the coordinate system of the image file. |

**Buttons of the *Background images* dialog**

| Field | Description |
|---|---|
| **Add Image** | Click it to add the image to the list of available images. See Creating background map for work area for details. |
| **Remove Image** | Click it to delete selected background images from the left table. |
| **Convert Image** | Click it to transform the selected image to any coordinate system. See Creating background map for work area for details. |

# Creating custom report

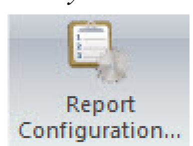
Report customizing allows you to create your own type of report to include or exclude certain information from already generated reports. For example let us create a report for adjusted GPS network that contains the following items:

- the coordinates of network points in the datum and current grid coordinate system with standard deviations for the horizontal and vertical planes after adjustment,
- the adjustment results for the network.

To create a report for adjusted GPS network:

1. In the *Report* group of the *Report* tab, click the **Report Configuration** icon.

   The ***Report Configuration*** dialog is displayed.
2. Click **New report**.
3. Type the name for the new report and press *Enter*.
4. In the *Report item templates* list, select the *Point Summary* item and click >> to add it to the *Included report items* list. This template contains the coordinates of network points
5. In the *Included report items* list, select the *Point Summary* item and click **Options**.

1) To configure a customized report, click the icon 

in the Report group.

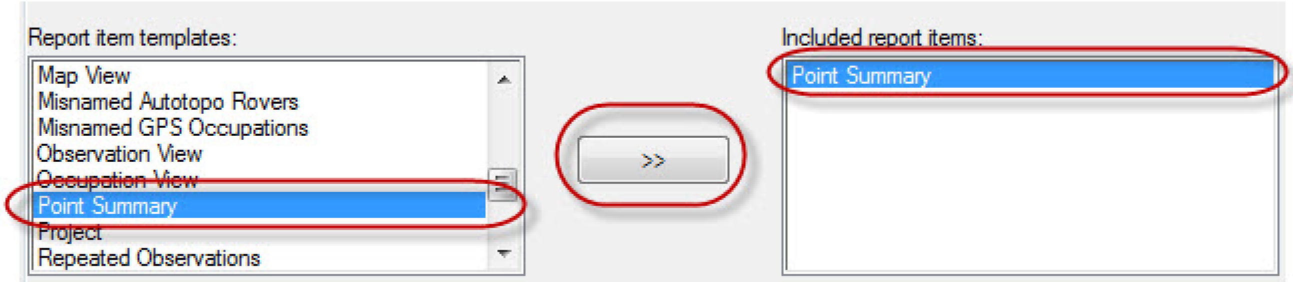
The Report Configuration window contains:
- The list of the available reports. You see the installed by default types of reports (the types of reports created by a Topcon programmer and included in the MAGNET Tools installation) and custom type reports (the types of reports created by user).
**Note:** You can delete default and custom types reports from the window.
- The set of editable templates for creating a custom report.

2) To create a new report, click the button 

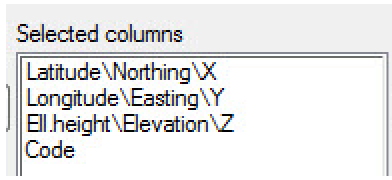
and enter the desired name of your report in the new icon 

. The Included report items panel is empty. You need to add a desired templates to this panel from Report item templates panel.

3) The 'Point Summary' template contains the coordinates of network points. Select the template in the left panel and click the double arrows button to copy this item to the right panel:

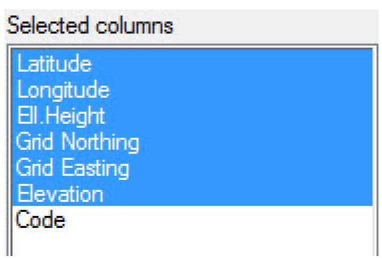



4) Click the button Options to edit this report. In the General tab of the Options: Point Report Options you can select the desired component for the report. By default the right panel of the window contains coordinates in Latitude\Longtitude\El. height or Northing\Easting\Elevation or X/Y/Z form:

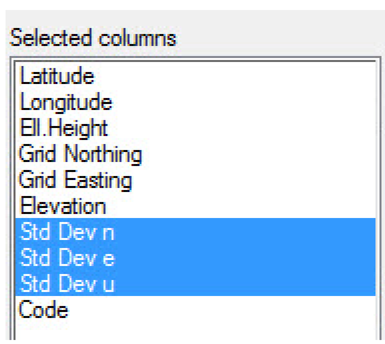



This description means that the report will display the coordinate type which is set in the Status Bar. For example, if the Grid is set in the Status Bar - the report will display only Northing\Easting\Elevation coordinates.

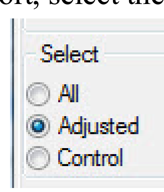
5) Your new report has to contain two independent sets of coordinates: in the datum and in the current grid coordinate system. You need to remove (using the button <<) the default items from the report (in the right panel) and copy the separate components of grid and datum coordinate systems from the left panel to the right panel (using the button >>):




6) Using this technique, add the standard deviations for the horizontal and vertical planes:



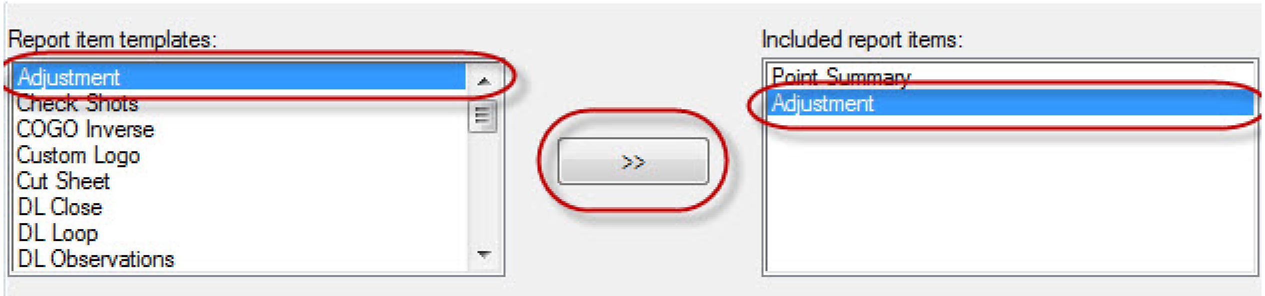

7) To show only adjusted points in the report, select the corresponding point's type:



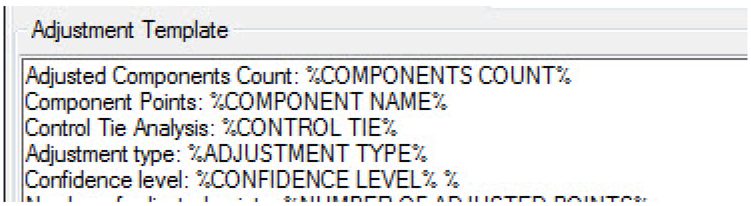
8) Click the button to save the selected components of the adjusted point report and to close the window.

Click

9) The 'Adjustment' template contains the adjustment results for the given network. Select the template in the left panel and click the double arrows button to copy this item to the right panel:



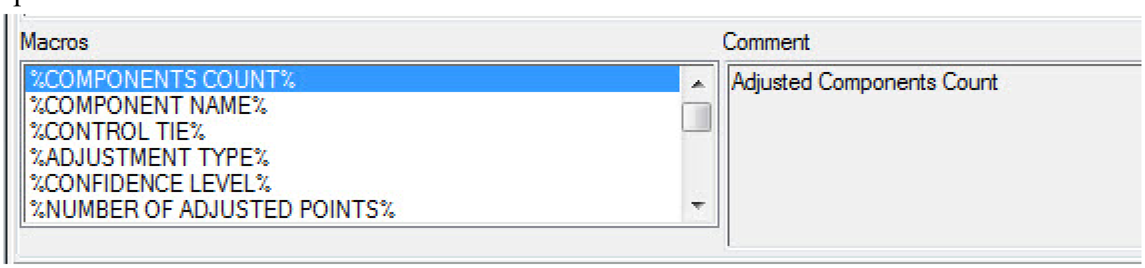

10) Click the button Options to edit this report. The General tab of the Options: Adjustment Report Options window displays the Adjustment template panel. By default, the Adjustment template panel contains the list of macros with corresponding comments. You can edit this template: delete the lines, update the comments.




11) To restore the original set of the macros in the Adjustment template panel, click the button Reset.

12) To save own set of the macros in the Adjustment template panel, click the button Apply.

13) To see the full list of the macros, click the button Macros. After clicking the button two panels are displayed. The Marcos panel contains the list of all available macros for Adjustment template, the Comment panel contains the comment for each macro. You cannot edit the macros and comment in these panels:



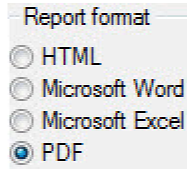

To copy any macro to the Adjustment template panel, double-click any macro in the Macros panel.

14) To save any change in the Adjustment template panel and close the Options: Adjustment Report Options window click the button OK.

15) To close the Options: Adjustment Report Options window without saving any changes, click the button Cancel.

**Note:** MAGNET Tools has three templates with macros: Adjustment, Localization and Project.

16) Select the desired format for your report. MAGNET Tools allows you to select either HTML or Microsoft Word or Microsoft Excel or PDF file format. Let us select PDF:




17) If you want to check what your created report displays, click the button Execute in the Report Configuration window:

Point Summary

| Name | Grid Northing (USft) | Grid Easting (USft) | Elevation (USft) | Latitude | Longitude | Ell.Height (USft) | Elevation (Datum) (USft) | Code |
|---|---|---|---|---|---|---|---|---|
| CP2 | 14570482,238 | 1084541,710 | 921,835 | 40°06'11,08713"N | 82°59'16,18873"W | 921,835 | 921,835 | |
| CP4 | 14570678,630 | 1084973,716 | 920,834 | 40°06'13,12291"N | 82°59'10,68680"W | 920,834 | 920,834 | |
| CP5 | 14570076,053 | 1085283,750 | 919,049 | 40°06'07,23775"N | 82°59'06,52464"W | 919,049 | 919,049 | |
| CP6 | 14569882,437 | 1084844,606 | 919,595 | 40°06'05,22789"N | 82°59'12,11911"W | 919,595 | 919,595 | |

Adjustment

Control Tie Analysis: success
Adjustment type: Plane + Height, Minimal constraint
Confidence level: 95 %
Number of adjusted points: 5
Number of plane control points: 1
Number of used GPS vectors: 21
Number of rejected GPS vectors by plane: 1
A posteriori plane or 3D UWE: 2,939904 , Bounds: ( 0,7557864 , 1,243529 )
Number of height control points: 1
Number of rejected GPS vectors by height: 1
A posteriori height UWE: 5,229586 , Bounds: ( 0,657172 , 1,342805 )

18) To save the whole report, close the Report Configuration window. After that the report's list will display your created report.

# Drawing Contour Lines for surface

You can plot contour lines for an existing surface. The Map View and 3D View display these counter lines.

> TIP
> Contour lines are lines joining the surface's points with equal elevation.

You can use contour lines to:

- visualize the relief of the surface
- detect and correct the surface created.

> *NOTE*
> *MAGNET Tools creates contour lines only for surfaces which do not have a focus point.*

To plot contour lines using MAGNET Tools, do the following:

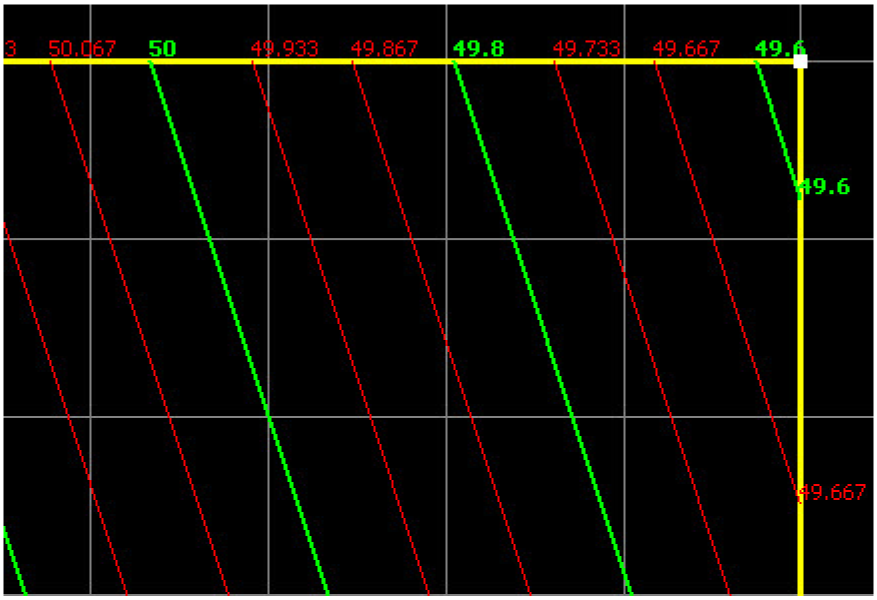
1. In the *Spatial* group of the *View* tab, click the **Contour Lines** icon.

   The ***Contour Lines*** dialog is displayed.
2. From the *Surfaces* list, select the required surface.
3. Tick the *Enable contour lines for the surface* checkbox.
4. Review the contour lines parameters. If needed, change them. Fields are described in the table below.
5. Click **OK**.

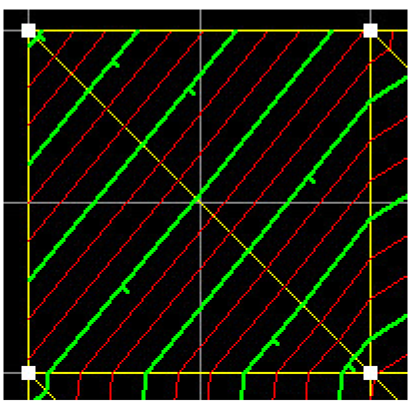
**Fields of the *Contour Lines* dialog**

| Field | Description |
|---|---|
| *Enable contour lines for the surface* | When ticked, the contour lines will be calculated and plotted for the selected surface. |
| **Major lines** | |
| *Interval* | Defines a contour interval between major lines in current job linear units. By default, the interval for the major contour lines is calculated taking into account the maximum and minimum elevations of the job points. |
| *Layer* | Defines the layer for major contour lines. The layer can not be empty. Type the name of the new layer, or select an existing one from the drop-down list. The layer will be automatically created. |
| *Line Style* | Defines the plotting style for major contour lines. |
| *Line Width* | Defines the width for major contour lines. You can select the width value from the drop-down list from 1pt to 10pt.<br>By default, the major lines has the width 2 pt. |
| *Line Color* | Defines the color for major contour lines. You can select the color from the drop-down list. |
| **Minor Lines** | |
| *Interval* | Defines a contour interval between minor lines in current linear units. By default, the interval for minor lines is calculated as the contour interval for major lines divided by 5. |
| *Minors per major* | Defines the number of minor contour lines between two major contour lines. By default, this value is set to 5. |
| *Layer* | Defines the layer for minor contour lines. The layer can not be empty. Type the name of the new layer, or select an existing one from the drop-down list. The layer will be automatically created. |
| *Line Style* | Defines the plotting style for minor contour lines. |
| *Line Width* | Defines the width for minor contour lines. You can select the width value from the drop-down list from 1pt to 10pt.<br>By default, the minor lines has the width 1 pt. |
| *Line Color* | Defines the color for minor contour lines. You can select the color from the drop-down list. |
| *Show height* | Defines the visibility of elevation labels for major or for major and minor lines of the surface in the Map View. |
| *Show hachure* | Defines the visibility of the hachures for major or for major and minor lines of the surface in the Map View. The hachures are used to show the orientation of the slope (they show the slope downwards). |

| Field | Description |
|---|---|
| *Fill levels* | When ticked, the gradient fill (a color spectrum from red to blue) will be calculated and plotted for the selected surface. The number of colors depends on the contour interval for minor contour lines and the maximum and minimum elevation of the job points. Any color is editable. Click … for the desired color, then select a custom color in the ***Color*** dialog. |




**A surface with displaying the value of elevation for major lines in the Map view**



**A surface with displaying the hachures for major lines in the Map view**

# Editing and viewing MAGNET Field Offsets in the Job

MAGNET Field allows you to determine the coordinates of an inaccessible point using the measured point(s) and distance and angle offsets. MAGNET Field job can contain offsets data from GPS points and offsets from TS points.

When you perform a survey with GPS receiver, MAGNET Field will allow use the following offset types:

- Offset Line
- Azimuth & Offsets

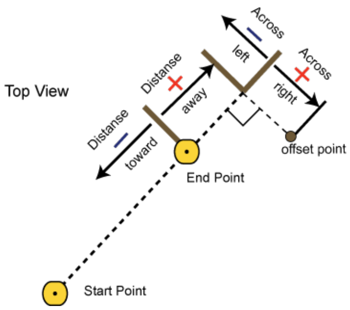
When you performs a survey with Total Station, MAGNET Field allows the following offset types:

- Horizontal angle offset
- Horizontal/Vertical Angle Offset
- Distance offset
- Hidden Point
- Two Lines Intersection
- Lines and corner
- Line and Offset
- Plane and corner

See sections below for details.

## Offset Line

Determination of the horizontal and vertical (3D) coordinates of an inaccessible point, using two points and additional distance offsets' measurements. Offset point lies on the perpendicular to the line “Start Point - End Point”. This offset can be performed from both existing points and measured points.



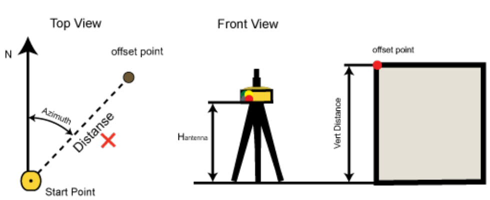

**Offset Line**

After importing the MAGNET Field job with Offset Line data into the current MAGNET Topcon job, you can see the *Offset* tab in the ***Properties*** dialog for the point. The offset point has the icon. See "Offset tab" section on page 226 for details.

You can edit the offset values in this tab. To obtain the coordinates of the offset point, save the entered values by clicking **OK** and then click **Compute Coordinates**.

## Azimuth & Offsets

Determination of the horizontal and vertical (3D) coordinates of an inaccessible point, using one measured point and distance and angle measurements from this point to the offset point. This offset can be performed from both existing point and measured point.




**Azimuth & Offsets**

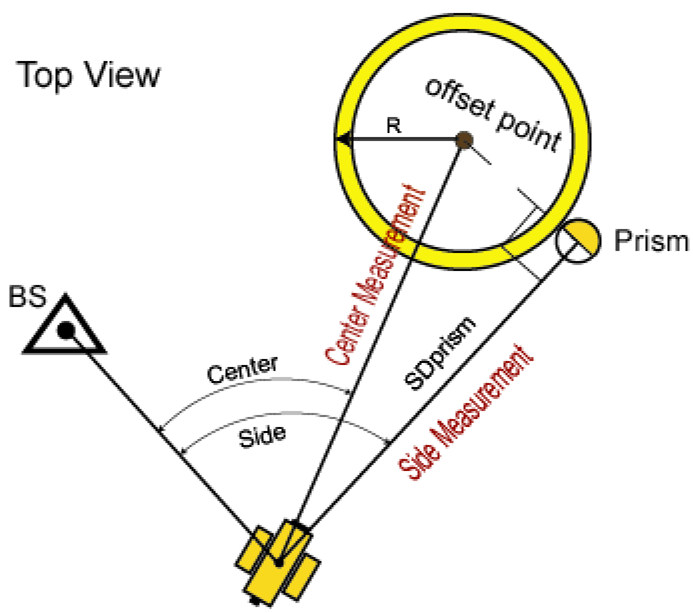
After importing the MAGNET Field job with Azimuth & Offsets data into the current MAGNET Tools job, you can see this offset in:

- the *Offset* tab in the ***Properties***dialog for the corresponding GPS occupation, if the offset was performed from a measured point. The Original Name of this GPS occupation is "Start Point". The offset point calculated from the GPS occupation and the linear and angular offsets has the icon. See "Offset tab" section on page 232 for details.
- the *Offset* tab in the ***Properties*** dialog for the point, if the offset was performed from an existing point. The offset point calculated from the existed point and the linear and angular offsets has the icon. See "Offset tab" section on page 226 for details.

You can edit the offset values in these tabs. To obtain the coordinates of the offset point, save the entered values by clicking **OK** and then click **Compute Coordinates**.

## Horizontal Angle Offset

Determination of the horizontal (2D) coordinates of an inaccessible center of pipe / tree / pillar using distance and angle measurements.




#### Horizontal Angle Offset

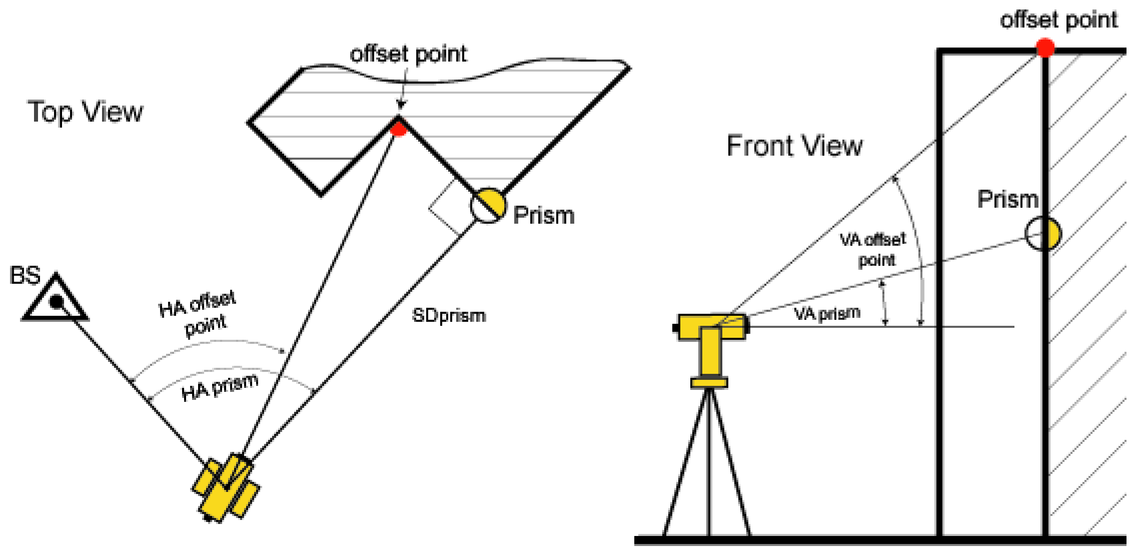
After importing the MAGNET Field job with Horizontal Angle Offset data into the current MAGNET Tools job, the right panel of the *TS Obs* tab displays two measurements performed for calculating this offset point. In this case MAGNET Tools applies the same Point to name for *Side* and *Center* type measurements:

| Point From | Point To | Horizontal Circle | Slope Distance | Type |
|---|---|---|---|---|
| A | Offset Point | 35 12 33 | 150.55 | Side |
| A | Offset Point | 35 10 11 | | Center |

You cannot edit the offset values in MAGNET Tools job.

## Horizontal/Vertical Angle Offset

Determination of the horizontal and vertical (3D) coordinates of an inaccessible point using distance and angle measurements.




**Horizontal /Vertical Angle Offset**

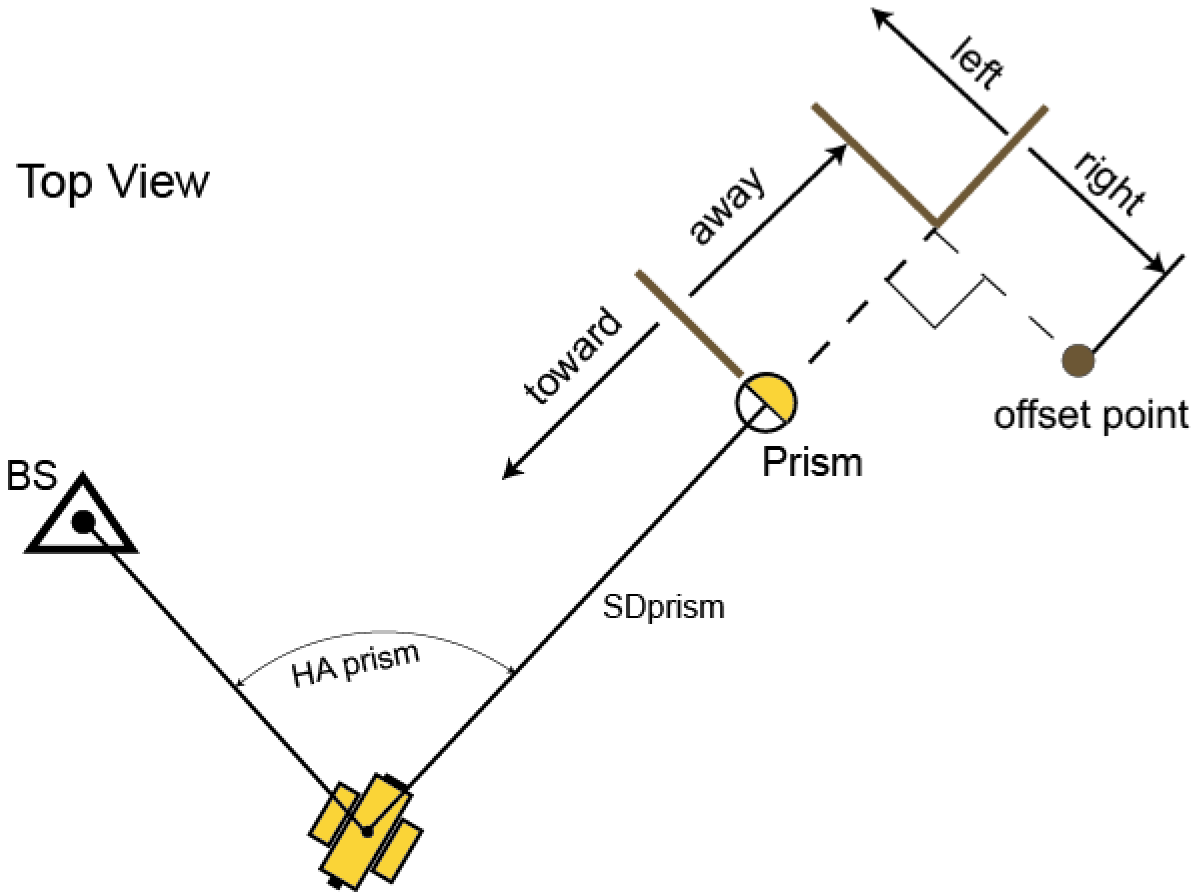
After importing the MAGNET Field job with Horizontal/Vertical Angle Offset data into the current MAGNET Tools job, the right panel of the *TS Obs* tab displays two measurements performed for calculating this offset point. In this case MAGNET Tools job applies the same Point to name for *Vertical* and *Horz. Vertical* type measurements:

| Point From | Point To | Horizontal Circle | Slop Distance | Zenith Angle | Type |
|---|---|---|---|---|---|
| A | Offset Point | 45 12 34.000 | 100 | 91 12 16.000 | Vertical |
| A | Offset Point | 46 10 15.000 | | 84 15 12.000 | Horz. Vertical |

You cannot edit the offset values in MAGNET Tools job.

## Distance offset

Determination of the horizontal and vertical (3D) coordinates of an inaccessible point using distance and angle measurements, and additional distance offsets measurements, for example made by the tape.




**Distance Offset**

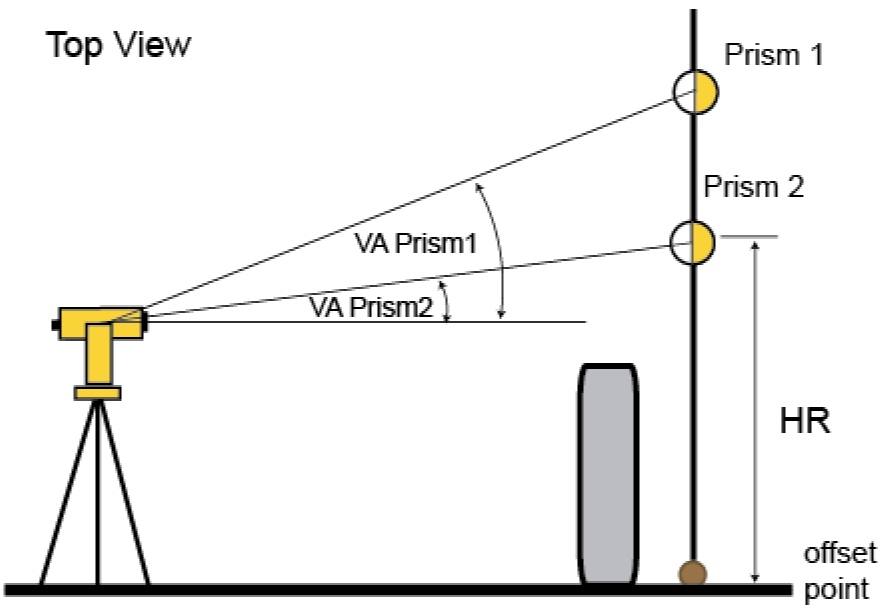
After importing the MAGNET Field job with Distance Offset data into the current MAGNET Tools job, the right panel of the *TS Obs* tab and the *Offset* tab of the ***Properties*** dialog for TS occupation displays all entered offset values for calculating the offset point coordinates:

| Point From | Point To | Type | Offset Along (m) | Offset dHt (m) | Offset Across (m) | Offset Type |
|---|---|---|---|---|---|---|
| A | Offset Point | SS | 2.34 | 0.56 | -1.12 | From Observation Line |

You can edit the offset values in the *TS Obs* tab and the *Offset* tab for the given TS occupation. See "Offset tab" section on page 248 for details. To obtain the coordinates of the offset point, click **Compute Coordinates**.

## Hidden Point

Determination of the horizontal and vertical (3D) coordinates of an inaccessible point using distance and angle measurements to two prisms located on the rod.




**Hidden Point**

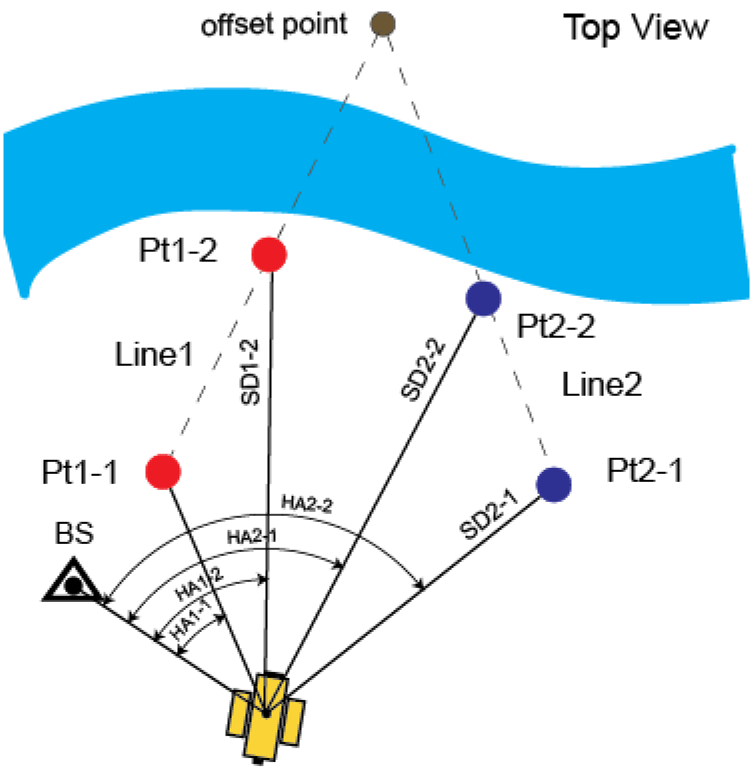
After importing the MAGNET Field job with Hidden Point data into the current MAGNET Tools job, the right panel of the TS Obs tab displays all measurements performed for calculating this offset point. In this case MAGNET Tools job applies the same Point to name for *Missing Pt*type measurements:

| Point From | Point To | Horizontal Circle | Slop Distance | Zenith Angle | Type |
|---|---|---|---|---|---|
| A | Offset Point | 45 00 00.000 | 100.00 | 90 00 00.000 | Missing Pt. |
| A | Offset Point | 45 10 15.000 | 101.00 | 91 00 00.000 | Missing Pt. |

You cannot edit the offset values in MAGNET Tools job.

## Two Lines Intersection

Determination of the horizontal and vertical (3D) coordinates of an inaccessible point, as intersection of two auxiliary lines. The user creates these lines (by two points) and performs distance and angle measurements of the line's points.




**Two Line Intersection**

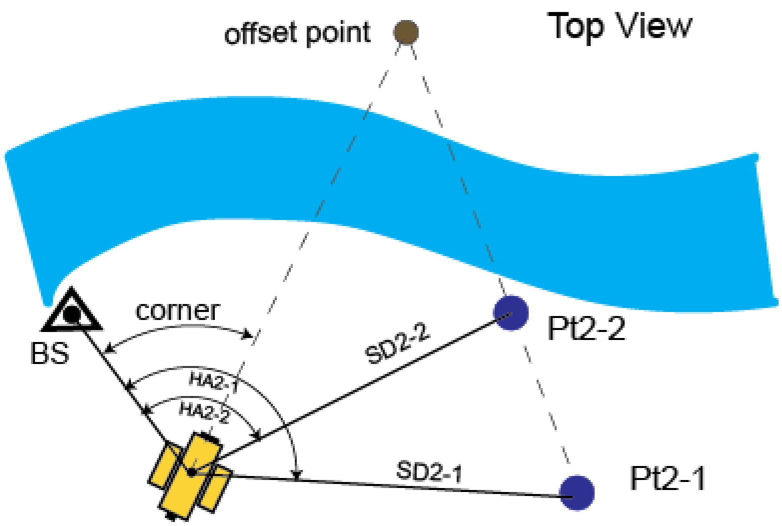
After importing the MAGNET Field job with Two Line Intersection data into the current MAGNET Tools job, the right panel of the TS Obs tab displays all measurements performed for calculating the offset point. In this case MAGNET Tools applies the same Point to name for *Line* type measurements:

| Point From | Point To | Horizontal Circle | Slop Distance | Zenith Angle | Type |
|---|---|---|---|---|---|
| A | Offset Point | 45 00 00.000 | 100.00 | 91 00 00.000 | Line |
| A | Offset Point | 62 00 00.000 | 140.00 | 92 00 00.000 | Line |
| A | Offset Point | 130 00 00.00 | 110.00 | 91 00 00.000 | Line |
| A | Offset Point | 102 00 00.00 | 129.00 | 93 00 00.000 | Line |

You cannot edit the offset values in MAGNET Tools job.

## Lines and Corner

Determination of the horizontal and vertical (3D) coordinates of an inaccessible point, as intersection an auxiliary line and a plane. The user creates a line (by two points) and a vertical plane passing through the offset point.




Lines and Corner

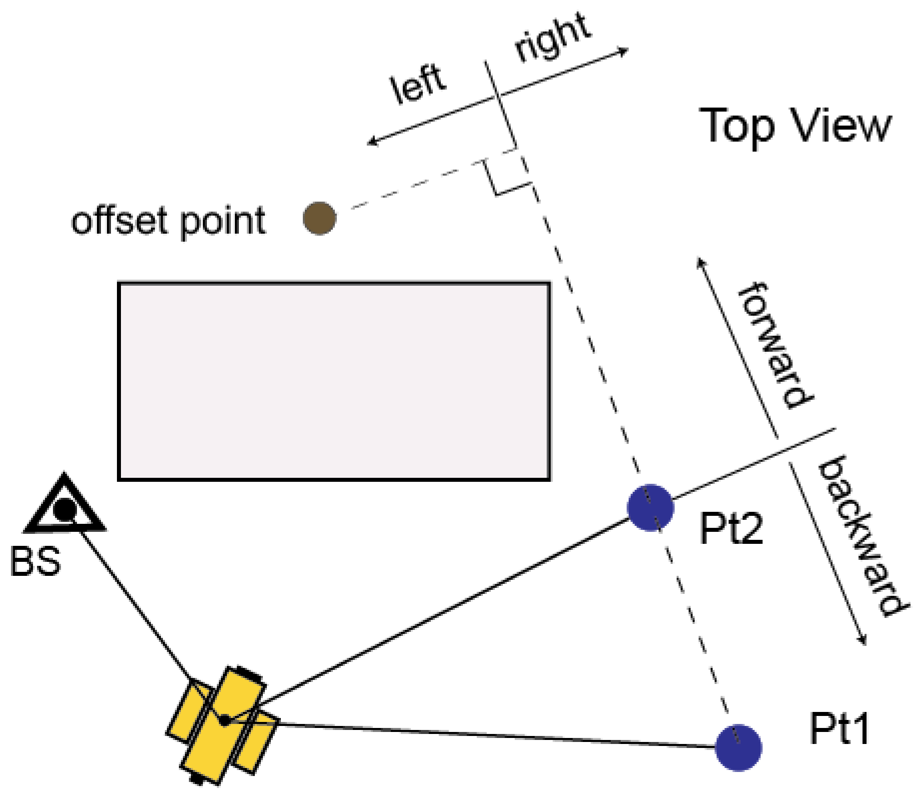
After importing the MAGNET Field job with Lines and Corner data into the current MAGNET Tools job, the right panel of the TS Obs tab displays all measurements performed for calculating the offset point. In this case MAGNET Tools applies the same Point to name for *Line* and *Corner* type measurements:

| Point From | Point To | Horizontal Circle | Slop Distance | Zenith Angle | Type |
|---|---|---|---|---|---|
| A | Offset Point | 78 00 00.000 | 110.00 | 91 00 00.000 | Line |
| A | Offset Point | 59 00 00.000 | 78.00 | 92 00 00.000 | Line |
| A | Offset Point | 37 00 00.000 | | 93 00 00.000 | Corner |

You cannot edit the offset values in MAGNET Tools job.

## Line and Offset

Determination of the horizontal and vertical (3D) coordinates of an inaccessible point, using an auxiliary line and additional distance offsets measurements, for example made by the tape. The user creates a line (by two points), then performs distance and angle measurements of the line's points and distance measurements (from this line) to the offset point.




**Lines and Offset**

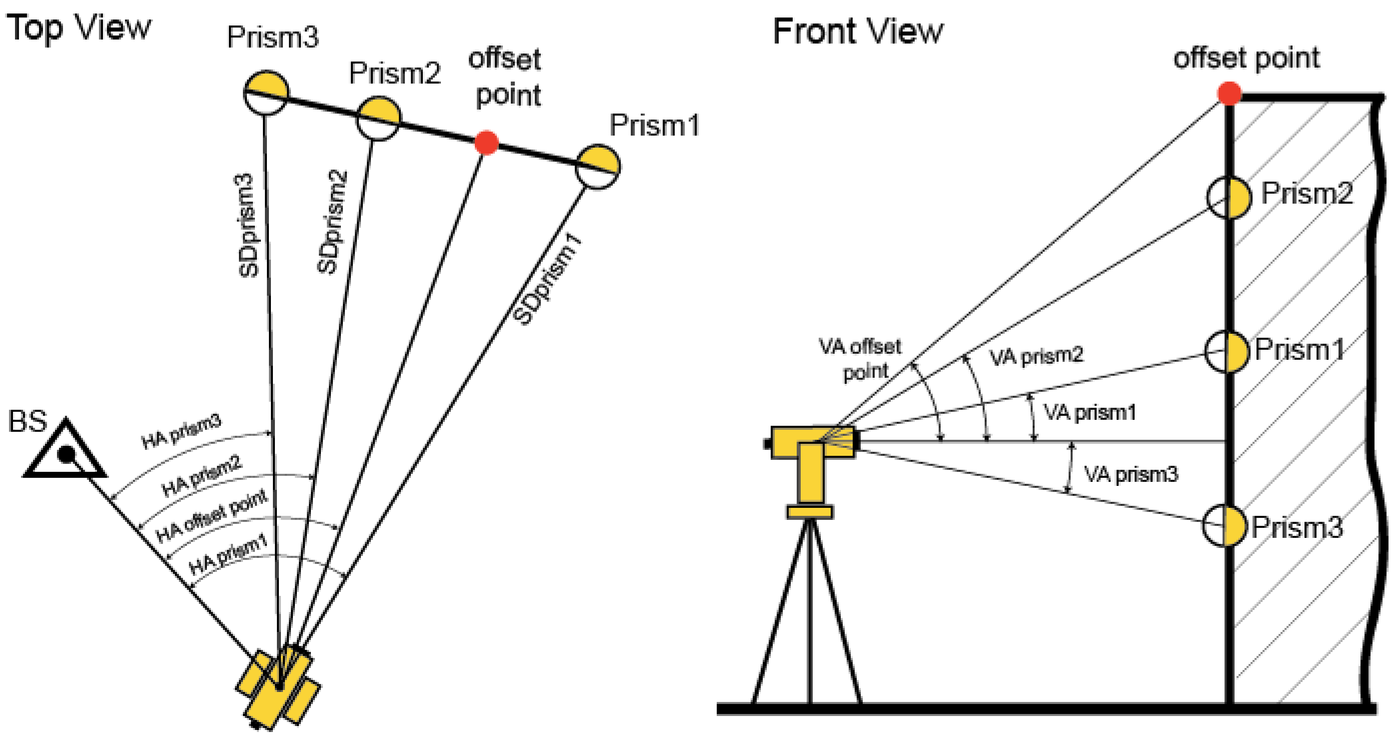
After importing the MAGNET Field job with Lines and Offset data into the current MAGNET Tools job, the right panel of the TS Obs tab displays all measurements performed for calculating the offset point. In this case MAGNET Tools applies the same Point to name for *Line* type measurement, and displays the additional distance offsets measurements for the last *Line* measurement :

| Point From | Point To | Horizontal Circle | Slope Distance (m) | Zenith Angle | Type | Offset Along (m) | Offset dHt (m) | Offset Across (m) |
|---|---|---|---|---|---|---|---|---|
| A | Offset Point | 78 00 00.000 | 110.00 | 91 00 00.000 | Line | | | |
| A | Offset Point | 59 00 00.000 | 78.00 | 92 00 00.000 | Line | 2.34 | 1.11 | -3.45 |

You can edit the offset values in the *TS Obs* tab and the *Offset* tab for the TS occupation. To obtain the coordinates of the offset point, click **Compute Coordinates**. See "TS Obs tab" section on page 148 and "Offset tab" section on page 248 for details.

## Plane and Corner

Determination of the horizontal and vertical (3D) coordinates of an inaccessible point, as intersection of a line of site and a plane defined by three points. The user creates three auxiliary points, then performs distance and angle measurements to these points, and angle measurements to the offset point.




**Plane and Corner**

After importing the MAGNET Field job with Plane and Corner data into the current MAGNET Tools job, the right panel of the TS Obs tab displays all measurements performed for calculating the offset point. In this case MAGNET Tools applies the same Point to name for *Plane*and *Corner* type measurements:

| Point From | Point To | Horizontal Circle | Slop Distance | Zenith Angle | Type |
|---|---|---|---|---|---|
| A | Offset_Point | 80 00 00.000 | 200.40 | 29 00 00.000 | Plane |
| A | Offset_Point | 82 00 00.000 | 253.00 | 28 00 00.000 | Plane |
| A | Offset_Point | 101 00 00.00 | 256.00 | 27 00 00.000 | Plane |
| A | Offset_Point | 105 00 00.00 | | 30 00 00.000 | Corner |

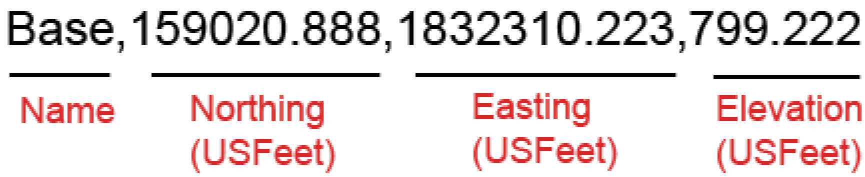
You cannot edit the offset values in MAGNET Tools job.

# Importing control points to a job

The application allows importing a text coordinate file that does not contain information about the coordinate system and linear units. The file contains ONLY the values of coordinates. To import the point coordinates in the corresponding coordinate system, you have to:

- know this coordinate system or projection,
- set this coordinate system / projection as current before importing.

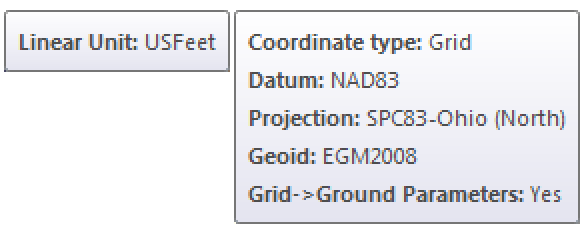
As an example, let us import the coordinate file in SPC-83 grid system, zone Ohio (North) for NAD83 datum, where grid coordinates are in US Feet and comma delimiter is used in the format:




To import control points to a job:

1. Open or create a job.
2. In the *Exchange* group of the *Job* tab, click the **Import** icon.

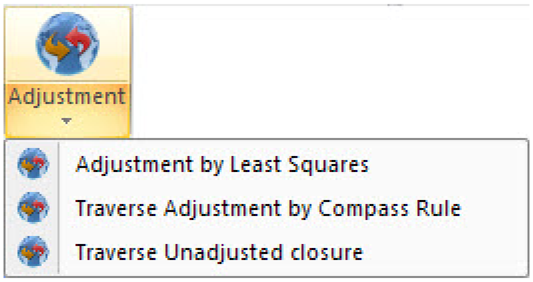
   The ***Import*** dialog is displayed.
3. In the *Format name* drop-down list, expand the *Coordinates* item and select the *Name,N,E,Z,Code* item.
4. Click *Advanced options*.
5. From the *Linear unit* drop-down list, select USFeet.
6. From the *Coordinate type* drop-down list, select Grid.
7. From the *Projection* drop-down list, select USA/SPC83/Ohia(North).
8. From the *Datum* drop-down list, select NAD83.
9. From the *Point Control* drop-down list, select Control.
10. Navigate to the required file and open it.
11. The Points tab will display the points coordinates for the following settings in the Status Bar:




## Performing Adjustment

MAGNET Tools allows you to perform inner or constraint adjustment of TS, GPS, and DL observations, jointly or separately. Adjustment of the network - is a final procedure for obtaining coordinates of the network points from the Fixed control points in the pre-defined coordinate system. Only after adjustment of the network, which consists of closed figures, it is possible to obtain not statistical evaluations but realistic errors of the points coordinates of the given network.

To run the adjustment, in the *Adjustment* group of the *Process* tab, click the **Adjustment** icon. The Least Squares method of adjustment is used by default for adjustment of any network. Also, for TS networks, you can select the traverse adjustment by Compass Rule or Traverse Unadjusted closure methods after clicking on the arrow under the **Adjustment** icon. See "Adjustment Types" section on page 360 for details.

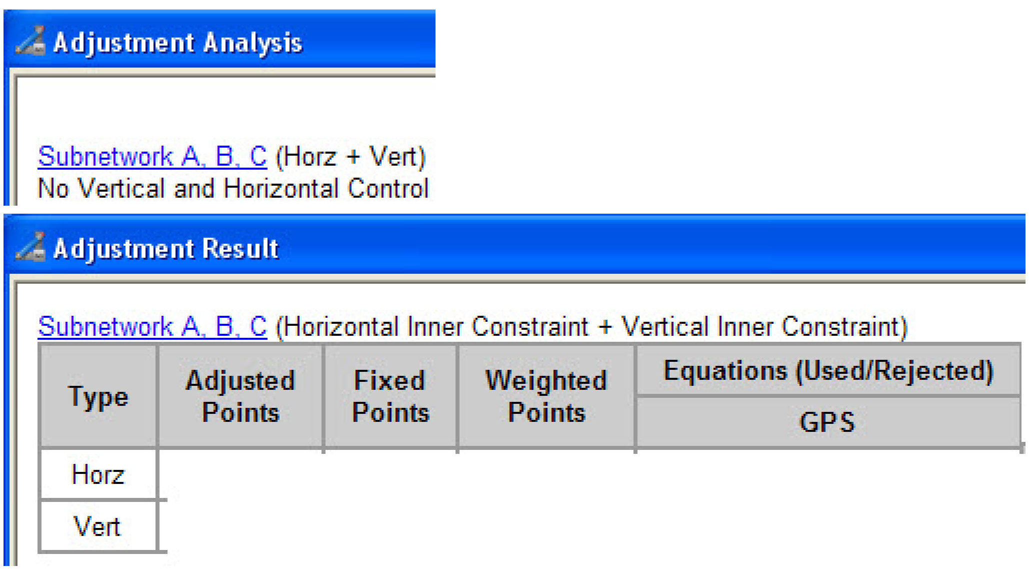



*Inner constraint adjustment* - adjustment is performed in the horizontal or vertical plane from an arbitrary point (selected by MAGNET Tools). *Constraint adjustment* - adjustment is performed in the plane, in which you fixed a point of the job.

The basic information about adjustment in MAGNET Tools:

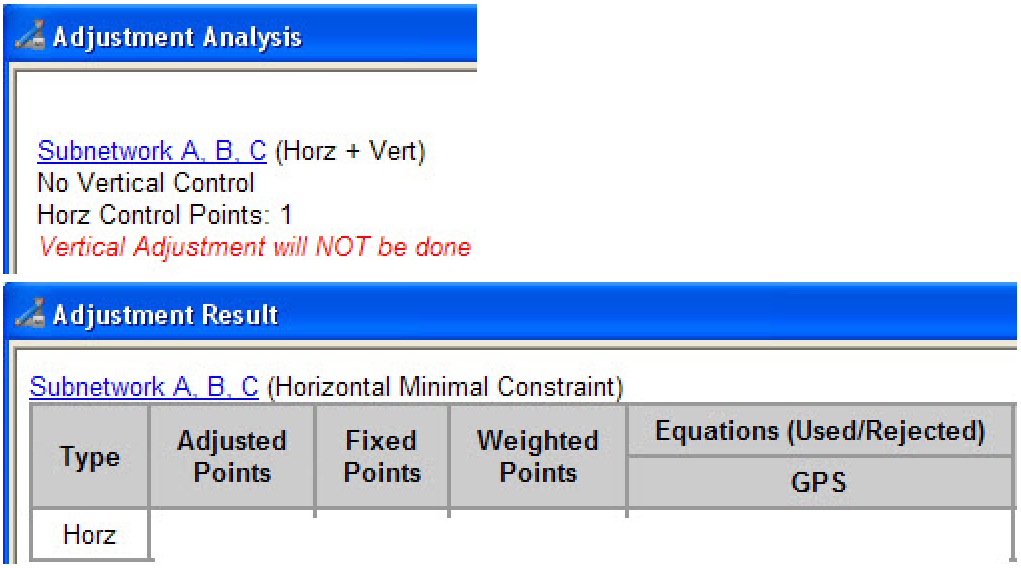
You can select the dimension of the network adjustment. Use the *Adjust Dimension* drop-down list, at the *General* tab of the *Adjustment* item from the ***Job Configuration*** dialog. See "General tab" section on page 100 for details. By default, this set to AUTO. This setting means that the type of control points will define the dimension of the adjustment (for GPS observations with baseline length less than 200 km):

- If a control point(s) is not selected, the plane and vertical adjustments (2D+1D) are separately performed from an arbitrary point.



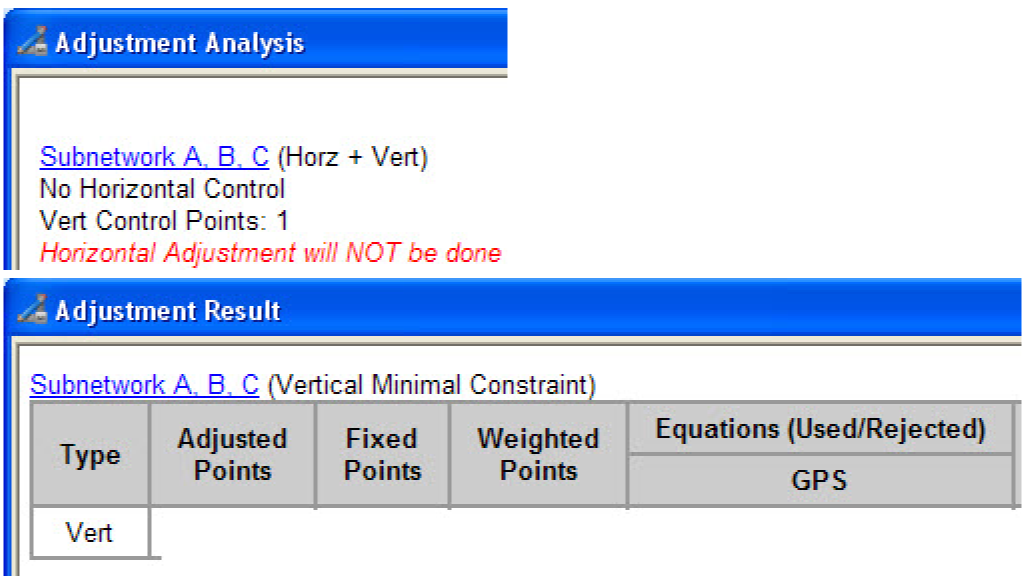

**Diagnostic results before and after adjustment**

- If a control point(s) is fixed only in the horizontal plane, only the horizontal adjustment (2D) is performed. The vertical adjustment are not performed.



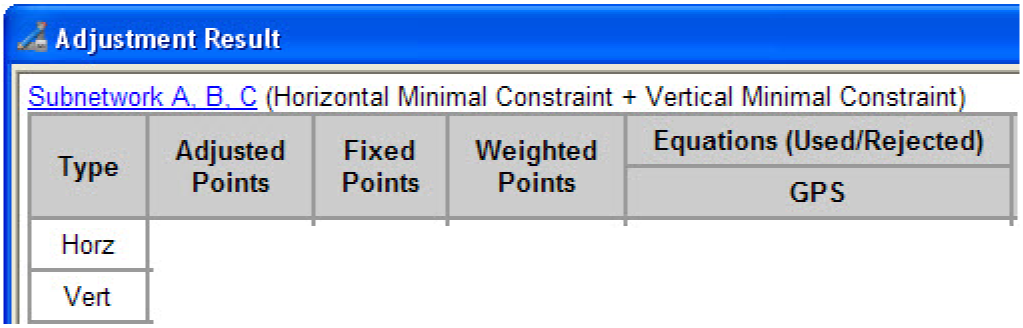

**Diagnostic results before and after adjustment**

- If a control point(s) is fixed only in the vertical plane, only the vertical adjustment (1D) is performed. The horizontal adjustment are not performed.



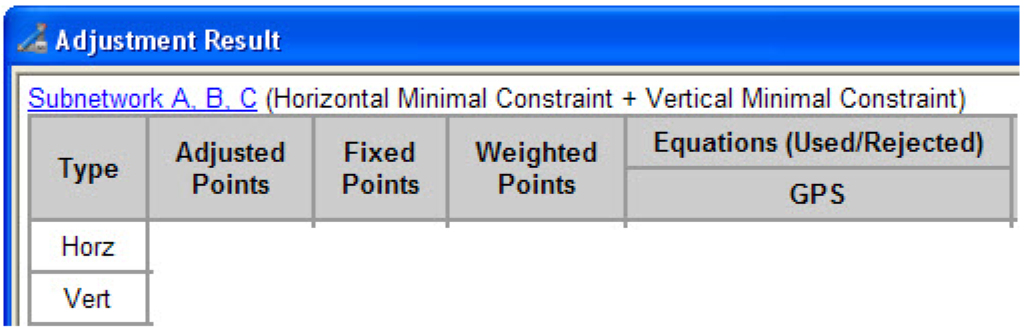

**Diagnostic results before and after adjustment**

- If a control point(s) is fixed in both planes, the adjustment (2D+1D) will be separately done for both planes, respectively.




**Diagnostic results after adjustment**

When a job contains one or more GPS observations with the vector length more than 200 km, the adjustment is simultaneously performed in 3D space for all GPS observations.




**Diagnostic results after adjustment**

You can select the current criterion for rejecting of the bad observations. Use the *Rejection Criterion* group box, at the *General* tab of the Adjustment item from the ***Job Configuration*** dialog. See "General tab" section on page 100 for details. It has two options:

- *By Quality Control* — the application will reject the following network components from the adjustment with residuals worse than the values set at the *Quality Control* item of the ***Job configuration*** dialog. See "Point Precisions tab" section on page 118 for details. These residuals are calculated in the process of adjustment for the closed figures and/or for repeated observations in the network:
  - all plane components of the GPS observations and distances and/or horizontal angles of the TS observations for the plane adjustment,
  - all height components of the GPS observations and vertical angles of the TS observations for the vertical adjustment.
- *Tau Criterion* — the application will reject the following network components from adjustment with a Tau value more than Tau_critical. These residuals are calculated in the process of adjustment for the closed figures and/or for repeated observations in the network:
  - all plane components of the GPS observations and distances and/or horizontal angles of the TS observations for the plane adjustment,
  - all height components of the GPS observations and vertical angles of the TS observations for the vertical adjustment.

  The formula for calculating Tau: Tau = (RES) / δRes,

  where (RES) - designates the residual calculated for the corresponding component of the observation,

  δRes - the RMS residual error.

*NOTE*
*The value of Tau_critical depends on the number of degrees of freedom and the selected level of confidence in the Confidence Level field .*

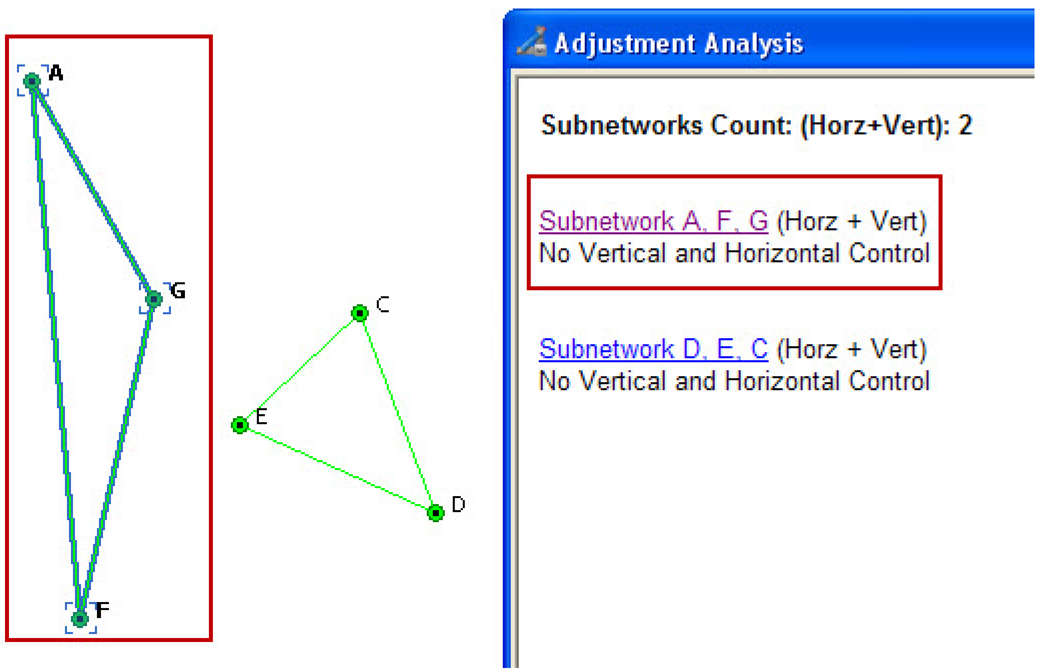
Before adjustment of a network, GPS\TS\DL point coordinates are re-computed using corresponding observations and analysis of the given network is carried out.

Adjustments of GPS observations will use the selected datum. Adjustments of TS and DL observations will use the sphere of the mean Earth radius. All of these adjustments will take into account the parameters of the geoid in the current job.

While analyzing, the network testing is interrupted and the ***Adjustment Analysis*** dialog will display. This dialog shows information about the tests being executed and possible issues with the data that could prevent accurate network adjustment. In this dialog you can:

- continue the adjustment without any changes of data by clicking **Continue**.
- stop the adjustment by clicking **Cancel**.
- to view the preliminary computed coordinates by clicking the **Save Preliminary Coordinates**.

Also clicking the hyperlink in the window, the network or subnetwork in the Observation View automatically is highlighted. See the picture below.




If you change a data of the job after starting of the adjustment (for example delete a point ), the Adjustment Analysis window will contain the **Restart** button. To perform the adjustment of the updated network, you need click the button and an analysis of them will be done again.

After the adjustment is completed, the ***Adjustment Result*** dialog will display. This dialog shows the final results of adjustment:

- the type of the network adjustment.
- the quantity of the adjusted points.
- the quantity of the fixed points and weighted points.
- the quantity of the used and rejected observations.
- errors of unit weight (UWE) and UWE bounds. See "What is UWE" section on the next page for details.

- the list of the rejected observations (if the observations are exist).
- the list of the points, which did not pass the Quality Control test.

The *Points* tab of the Tabular view, displays the standard deviation of the northing/easting/height coordinates for the adjusted point. The adjusted point has the / symbol.

## Adjustment Types

In MAGNET Tools you can select the following adjustment method:

- Least Squares — statistical method for providing a best fit for survey point positions, and detecting and automatic rejecting error measurements (blunders) by minimizing the sum of the squares of measurement residuals. This type is used by default for adjustment of GPS, TS and DL networks
- Compass Rule — this method assumes that the precision in angles or directions is equivalent of the precision in distances. This method works for closed TS traverses or TS traverses between two fixed control points
- Unadjusted closure — calculates the TS network coordinates from the original station coordinates without estimating the accuracy. If the network has duplicate measurements, only one measurement will be used to compute the coordinates

## What is UWE

UWE is a coefficient which displays how the precision of GPS observations (vectors) in the network (closed figure) changes after adjustment with respect to the precision obtained after processing the GPS observations. If you got UWE close to 1, the average precision of each GPS observation after adjustment is not worse than the average precision after processing. Using UWE , you can calculate the precision of the vectors after adjustment:

$$Precision\_of\_Vector\_after\_Adjustment = UWE * \mathrm{Average\_Precision\_of\_Vector\_after\_Processing}$$

UWE bounds are the min/max values of UWE for the given network with a successful result of adjustment (only for closed figure(s)).

> *NOTE*
> *The most reliable results of the network adjustment are obtained when UWE is within the bounds. Therefore, the centimeter precision of the network points can be archived only when the UWE value does not exceed the upper bound.*

# Performing Grid to Ground Transformation

The application supports two methods for setting the relation between *Grid* and *Ground* coordinate systems. One method performs scaling and rotation relative to some point of the network or job, other method performs scaling and rotation relative to the origin of the Grid coordinate system.

To use any of these methods:

1. In the *Information* group of the *Job* tab, click the **Job configuration** icon.

   The ***Job Configuration*** dialog is displayed.
2. In the left panel, select the *Coordinate Systems* item.
3. From the *Projection* drop-down list, select the required projection. The link with some Ground coordinate system will be found through it.
4. Tick the *Grid->Ground* checkbox and click **...** to the right from it.

The ***Grid->Ground*** dialog is displayed.

5. Define the transformation method:
   - If the you know the coordinates of a point in both coordinate systems (Grid and Ground) and also rotation of these systems — select *Ground Origin* radiobutton. See "Creating a ground projection relative to a point" section on page 365 for details.
   - If you know the value of the scale factor between grid and ground coordinate systems or the average height of the network, then to find the relation between Grid to Ground coordinate systems — select the *Parameters* radiobutton. See "Creating a ground projection relative to origin of a grid system" section on page 366 for details.

## Grid->Ground dialog

The ***Grid->Ground*** dialog allows you to configure the transformation method of the grid->ground coordinate transformation.

To configure the grid->ground transfromation:

1. In the *Information* group of the *Job* tab, click the **Job Configuration** icon.

   The ***Job configuration*** dialog is displayed.
2. In the left panel, select the *Coordinate Systems* item.
3. In the right panel select the *Setup* tab.
4. From the *Project* drop-down list, select the required projection.
5. Tick the *Grid->Ground* checkbox and click **...** to the right from it.

   The ***Grid->Ground*** dialog is displayed.
6. Define the transformation method, by selecting the appropriate radiobutton:
   - *Ground Origin* – the method performs scaling and rotation relative to some point of the job.
   - *Parameters* – the method performs scaling and rotation relative to the origin of the Grid coordinate system.

   *NOTE*

   *Depending of the transformation method, the dialog displays different set of transformation parameters.*
7. Configure the transformation parameters as you need. Fields are described in the tables below.
8. Click **OK**.

**Fields of the *Grid->Ground* dialog for the *Ground Origin* method**

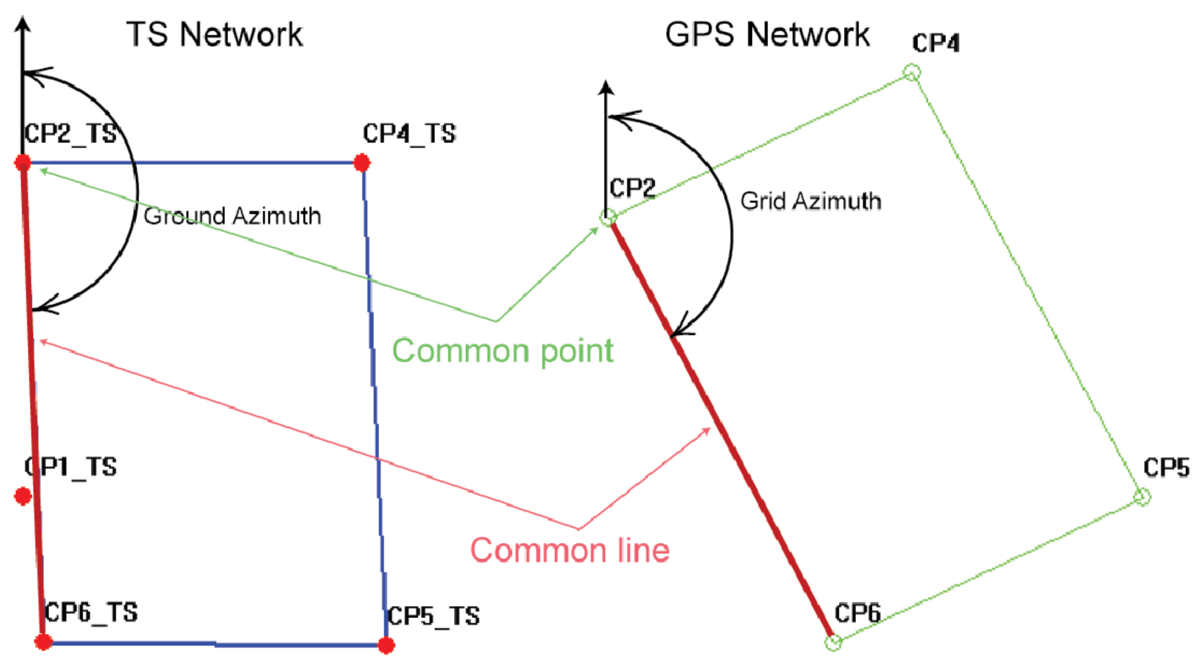
| Field | Description |
|---|---|
| *Ground Origin* | Select the radiobutton to use the Ground Origing transformation method. It performs scaling and rotation relative to some point of the job.<br>See "Creating a ground projection relative to a point" section on page 365 for details. |
| *Origin Point* | Defines the name of the original point in the Grid coordinate system. Select the required point from the drop-down list. |
| *Northing (m)* | Defines the North coordinate of the origin point.<br>This field is filled in automatically of you have selected the origin point in the *Origin Point* drop-down list.If needed, you may change the value. |

| Field | Description |
|---|---|
| *Easting (m)* | Defines the East coordinate of the origin point.<br>This field is filled in automatically of you have selected the origin point in the *Origin Point* drop-down list. If needed, you may change the value. |
| *Ground Azimuth* | Defines the ground azimuth of a line (common for Grid and Ground networks) between two points which have coordinates in the Ground coordinate system. See picture below.<br>If you know the value, you may specify it in editbox; or you may use the **Compute** button to select the line points (in the Ground coordinate system) to calculate the azimuth. See "Calculating Ground Azimuth" section below for details. |
| *Grid Azimuth* | Defines the grid azimuth of a line (common for Grid and Ground networks) between two points which have coordinates in the Grid coordinate system. See picture below.<br>If you know the value, you may specify it in editbox; or you may use the **Compute** button to select the line points (in the Grid coordinate system) to calculate the azimuth. See "Calculating Grid Azimuth" section below for details. |
| *Scale Factor* | Defines the Combined Scale Factor for the current original point.<br>The value is automatically calculated by the MAGNET Tools, basing on the specified *Origin point*. If needed, change the value. |

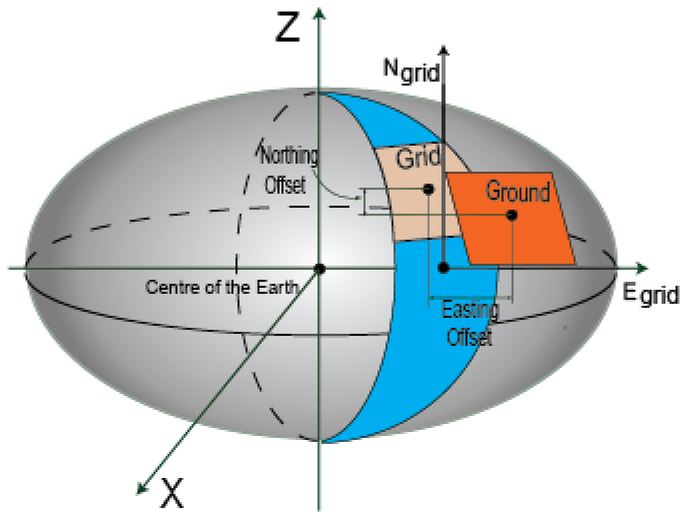
**Fields of the *Grid->Ground* dialog for the *Parameters* method**

| Field | Description |
|---|---|
| *Parameters* | Select to use the Parameters transformation method. It performs calculating plane ground coordinates by scaling, offsetting, and rotation of grid coordinates. If a rotation angle is present between these coordinate systems, the application can rotate the ground coordinate system relative to the origin of the Grid coordinate system (centre of the projection).<br>See "Creating a ground projection relative to origin of a grid system" section on page 366 for details. |
| *Scale Factor (list)* | Defines the current type of the Grid to Ground transformation. Select either *Scale Factor* or *Average Job Height* from the drop-down list, depending which information you have. |
| *Average Job Height (m)* | Defines the average height of the network (job). You can edit the value when *Average Job Heigh* is selected in the *Scale Factor* drop-down list.<br>*NOTE*<br>*Combined Scale Factor = Vertical scale factor / Horizontal Scale Factor;*<br>*Vertical scale factor = 1 + **Average Job Height** / Mean_Earth_Radius.* |
| *Scale Factor (editbox)* | Defines the Combined Scale Factor. You can edit the value when *Scale Factor* is selected in the *Scale Factor* drop-down list.<br>*NOTE*<br>***Combined Scale Factor** = Vertical scale factor / Horizontal Scale Factor;*<br>*Vertical scale factor = 1 + Average Job Height / Mean_Earth_Radius.* |

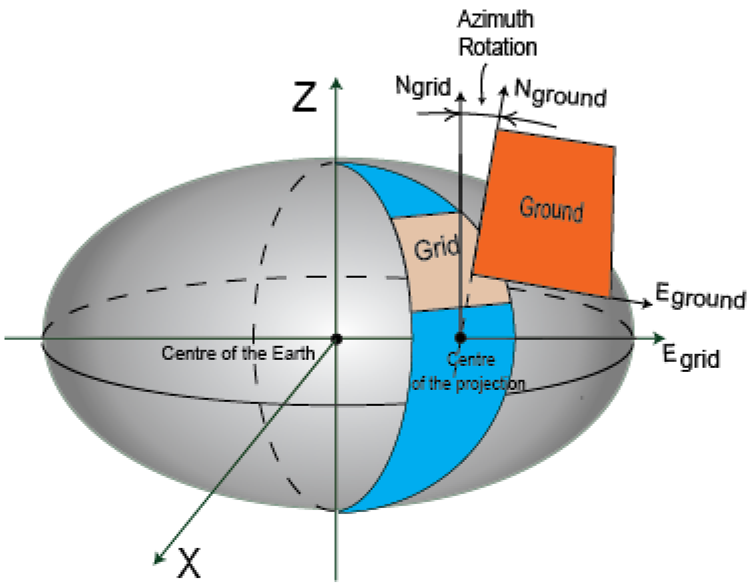
| Field | Description |
|---|---|
| *Mapping Scale* | Defines the Mapping or Horizontal Scale Factor. You can edit the value when *Average Job Height* is selected in the *Scale Factor type* list.<br>*NOTE*<br>*Combined Scale Factor = Vertical scale factor / **Horizontal Scale Factor**;*<br>*Vertical scale factor = 1 + Average Job Height / Mean_Earth_Radius.* |
| *Northing Offset* | Defines the Northing Offset of the Ground coordinate system from the selected Grid coordinate system. You can edit the value. See picture below for details.<br>The final northing coordinate in the Ground will be calculated as follow:<br>$N_{GROUND} = N_{GRID} + Northing\ Offset$ |
| *Easting Offset* | Defines the Easting Offset of the Ground coordinate system from the selected Grid coordinate system. You can edit the value. See picture below for details.<br>The final easting coordinate in the Ground will be calculated as follows:<br>$E_{GROUND} = E_{GRID} + Easting\ Offset$ |
| *Azimuth Rotation* | Defines the rotation angle between the Grid and Ground coordinate systems. The application rotates the ground coordinate system relative to the origin of the Grid coordinate system (see picture). You can edit the value. |




**Calculating Azimuth**




**Northing and Easting offsets**




**Azimuth rotation**

## Calculating Azimuth

To calculate ground/grid azimuth:

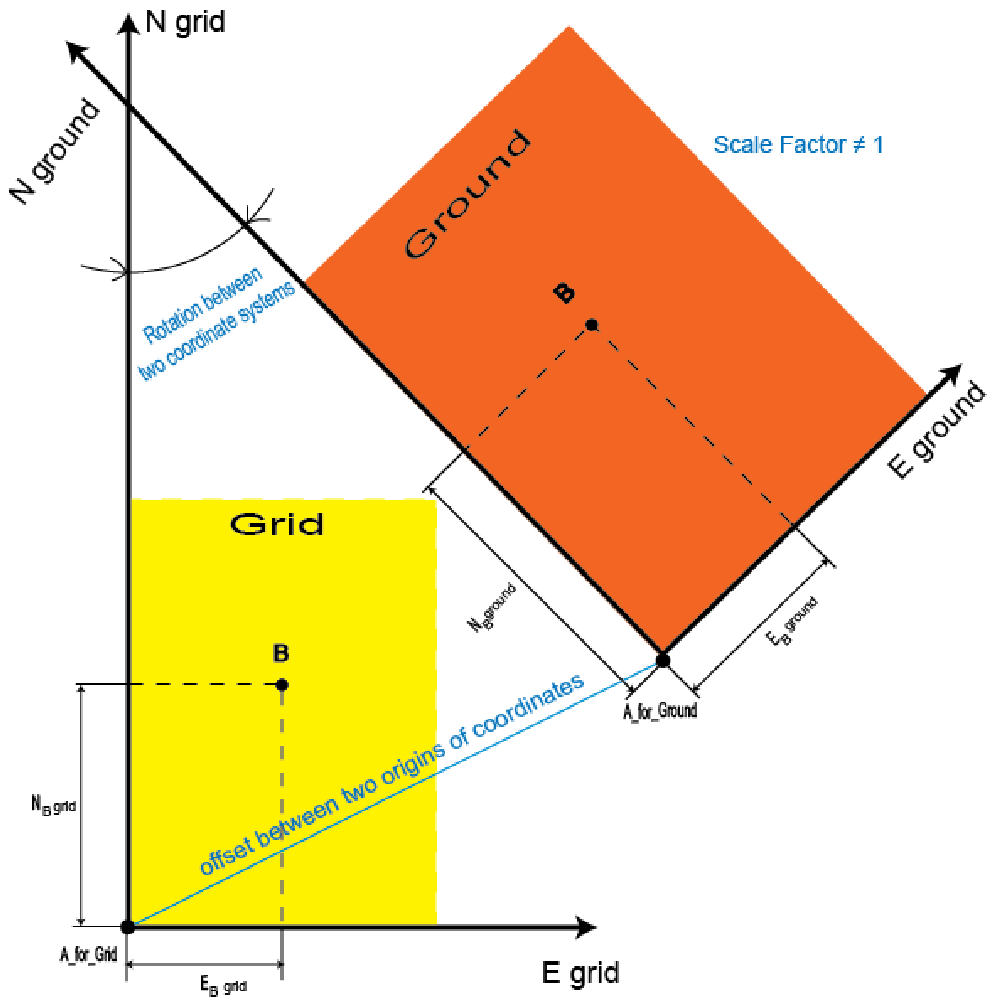
1. At the *Setup* tab of the *Coordinate Systems* item from the ***Job configuration*** dialog, select the "Grid" item from the *Coordinate type* drop-down list.
2. In the *Grid->Ground* field, click **...**.

   The ***Grid->Ground*** dialog is displayed.
3. In the *Ground Azimuth* or *Grid Azimuth* field, click **Compute**.

   The ***Compute Azimuth*** dialog is displayed.
4. Select the from and to points from the appropriate drop-down lists.
5. In needed, in the *Add to Azimuth* editbox, type the additional value for azimuth
6. In the *Azimuth* field, review the result if needed, correct the input.
7. Click **OK**.

## Creating a ground projection relative to a point

This method calculates an offset vector in the horizontal plane between coordinates of a point (let's call this point as the origin point) in the grid and ground coordinate systems and, using this offset, computes the ground coordinates from the grid coordinates. If a rotation angle is present between these coordinate systems, the application can rotate a grid or ground coordinate system relative to this point. Also application takes into account a scale factor between these coordinate systems:




After determining the relation between both coordinate systems, the application will recalculate ground coordinates from the grid coordinate system and vice versa.

Initial configuration:

- In the ***Job Configuration*** dialog, the desired grid projection is set in the *Projection* drop-down list.
- In the ***Job Configuration*** dialog, the Grid coordinate system is set in the *Coordinate* type drop-down list.
- In the ***Grid->Ground*** dialog, the *Ground Origin* radiobutton is selected.

In the ***Grid->Ground*** dialog, do the following:

1. From the *Origin Point* drop-down list, select the origin point in the Grid coordinate system.

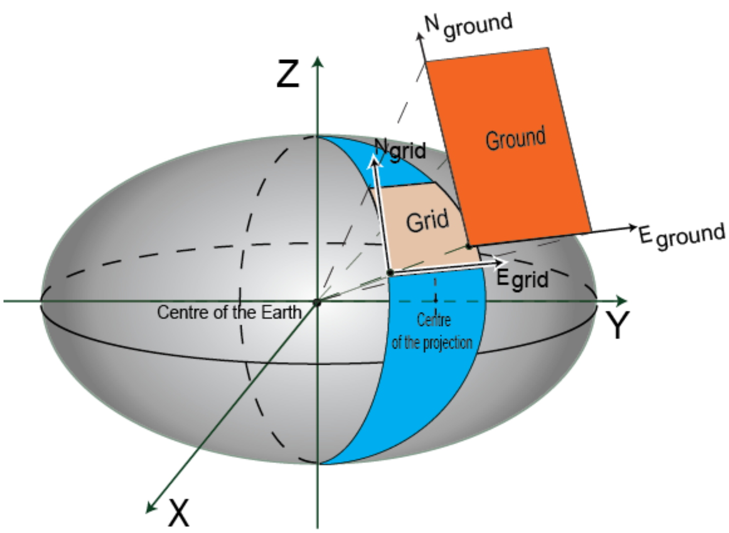
   The MAGNET Tools calculates the Combined Scale Factor, and displays it in the *Scale Factor* editbox. You can edit the value.

2. In the *Northing (m)* and *Easting (m)* editboxes, specify the Grid coordinates of the original point in the horizontal plane only.
3. To take into account the rotation between two networks in this transformation, you may specify one of following information:
   - In the *Ground Azimuth* editbox, type the required ground azimuth value; or click **Compute** to automatically calculate it. See "Grid->Ground dialog" section on page 361 for details.
   - In the *Projection Azimuth* editbox, type the required ground azimuth value; or click **Compute** to automatically calculate it.
4. Click **OK**.

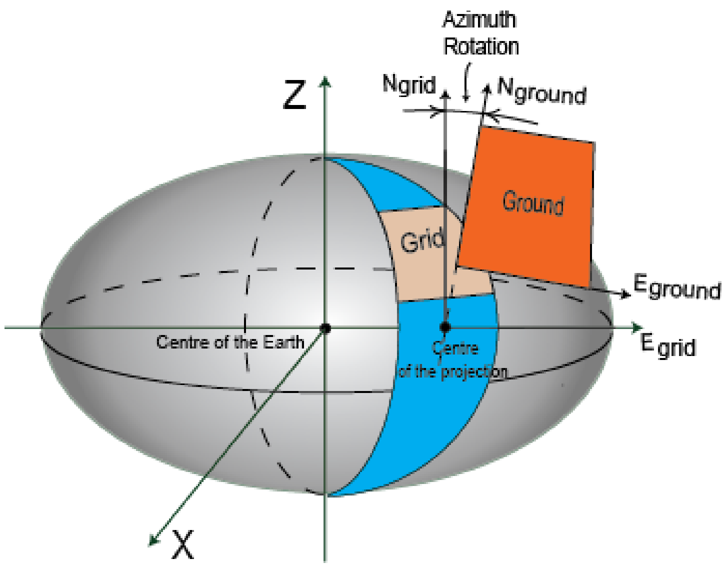
   The application assigns grid coordinates of the origin point to the ground coordinates of this point, rotates, scales the network. The applications allows you to perform both grid to ground transformation and ground to grid transformation of the job points. The Observation View and Points tab display both networks in the Ground and Grid coordinate systems.

## Creating a ground projection relative to origin of a grid system

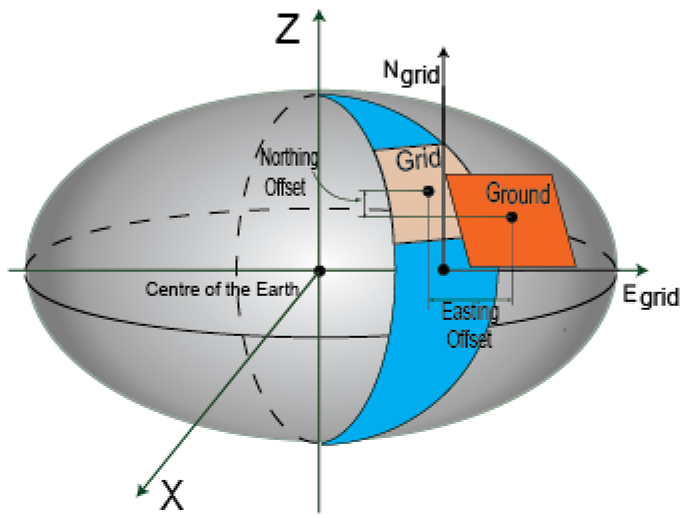
This method calculates plane ground coordinates by scaling, offsetting, and rotation of grid coordinates. If a rotation angle is present between these coordinate systems, the application can rotate the ground coordinate system relative to the origin of the Grid coordinate system (centre of the projection).




**Creating Ground by only scaling Grid**




**Creating Ground by only rotation Grid**




**Creating Ground by only shifting Grid**

After determining the relation between both coordinate systems, the application will recalculate ground coordinates from the grid coordinate system and vice versa.

Initial sets configuration:

- In the ***Job Configuration*** dialog, the desired grid projection is set in the *Projection* drop-down list.
- In the ***Job Configuration*** dialog, the Grid coordinate system is set in the Coordinate type drop-down list.
- In the ***Grid->Ground*** dialog, the *Parameters* radiobutton is selected.

In the ***Grid->Ground*** dialog, do the following:

1. From the *Scale Factor* drop-down list, select one of the following, depending which is known:
   - *Scale Factor*—if the scale factor is know. If so, type the required value in the *Scale Factor* editbox.
   - *Avg Job Height*—if the average job height is known. If so, type the required value in the *Avg Job Height (m)* editbox. The Scale Factor will be automatically calculated and used in the transformation: Scale_Factor = (1+ Avg.Job Height/Mean_Earth_Radius), where Mean_Earth_Radius=6371000.0 m

2. In the *Azimuth Roation* editbox, specify the angle of rotation.

   The application performs rotation of the Ground relative to the origin of the Grid coordinate system.
3. In the *Northing Offset* and *Easting Offset* editboxes, type the required offsets to shift the Ground system from the selected Grid type in the desired plane. The final coordinates will be calculated as:

$$N_{GROUND} = N_{GRID} + Northing\ Offset$$

$$E_{GROUND} = E_{GRID} + Easting\ Offset$$

4. Click **OK**.

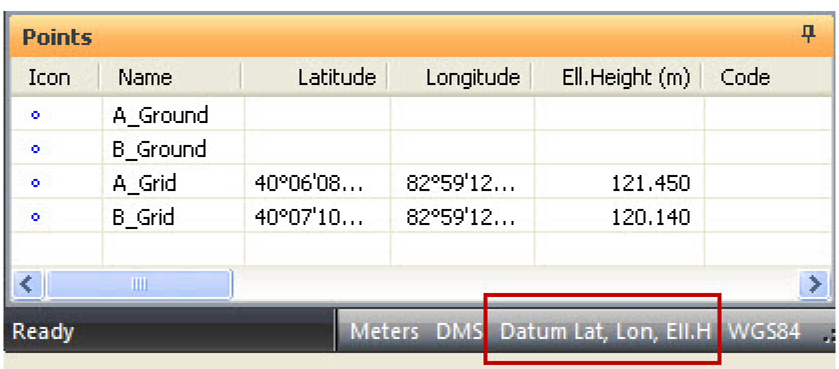
   The application shifts, rotates, scales the network. The applications allows you to perform both grid to ground transformation and ground to grid transformation of the job points. The Observation View and *Points* tab display both networks in the Ground and Grid coordinate systems.

## Performing Localization

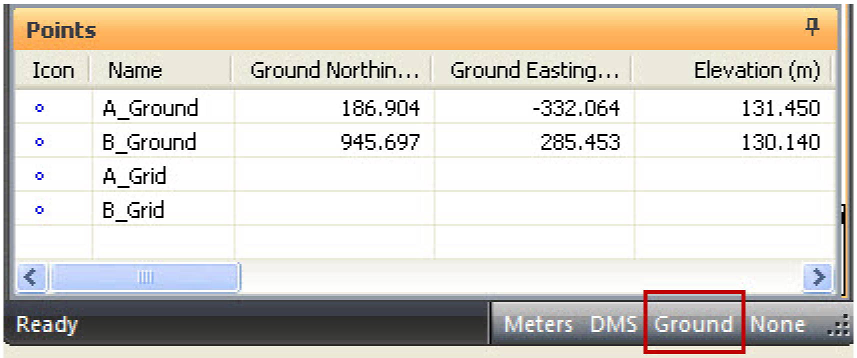
Localization in the application is calculation of transformation parameters between any datum or any grid and ground coordinate systems to determine the point coordinates in the given coordinate system. To perform localization you has to have two independent sets of coordinates for the same point or some points in the job.

> *NOTE*
> *Two sets of coordinates are independent if there is no relation between them.*

When you select **Grid** or **Datum** in the Status bar, the *Points* tab of the Tabular view, will display the coordinates of the points in either the grid or the datum coordinate system:




When you select **Ground** in the Status bar, the*Points* tab of the Tabular view will display the coordinates of the points in the Ground coordinate system only:




To start localization using these two sets of coordinates

1. In the *Coordinate Systems* group of the *Process* tab, click the **Localization** icon.

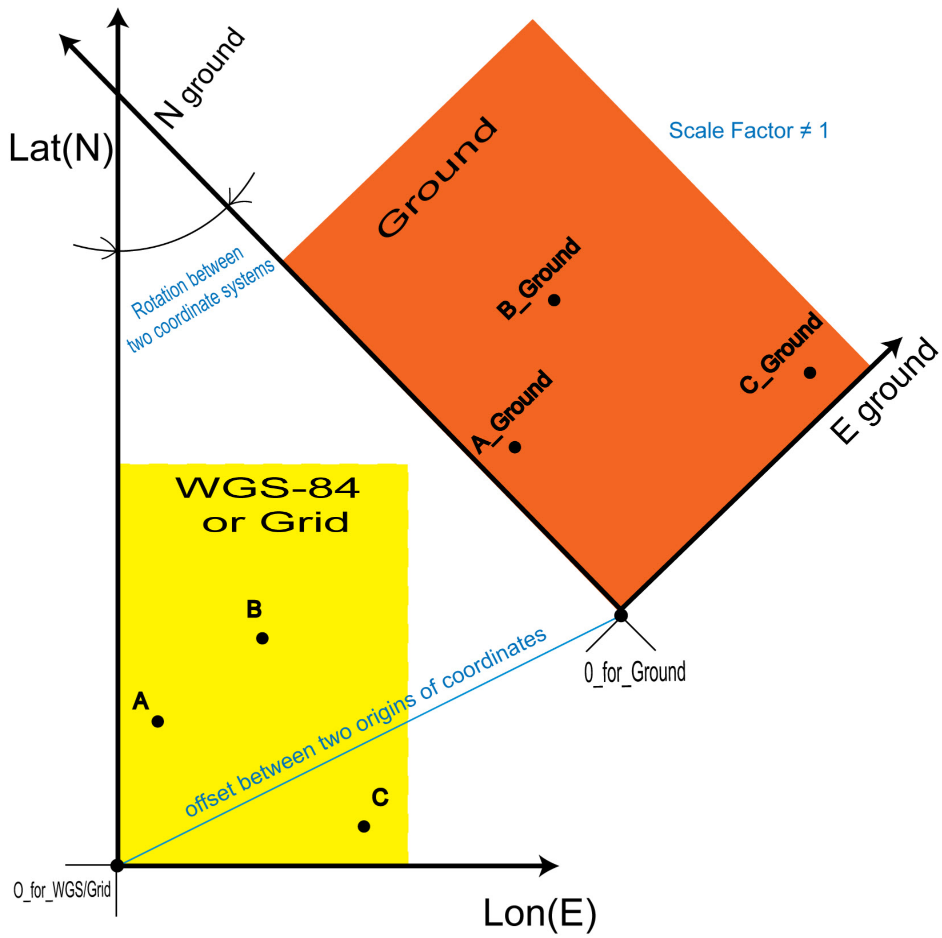
   The ***Localization*** dialog is displayed. See "Localization dialog" section on page 372 for details.
2. Click **Add Point**.
3. In the *WGS Point* and *Local Point* columns, select a localization point.
4. In the *Use* column, select the type of the localization for the points.

   *NOTE*

   *In MAGNET Tools horizontal localization and vertical localization are performed separately.*
5. Add at least three pair of points.
6. Click **Compute parameters**.

   MAGNET Tools calculates the following seven parameters to use them for transformation of all the job points:

   - Four parameters in the horizontal plane:
     - offset vector (DX, DY) in the horizontal plane between the origins of the coordinate systems
     - rotation angle between the **Grid**/ **Datum** and **Ground**coordinate systems
     - scale between the **Grid**/ **Datum** and **Ground**coordinate systems
   - Three parameters in the vertical plane:
     - vertical offset between the Grid/ Datum and Groundcoordinate systems (H0)
     - the North component of the vertical deflection (Deflection North)
     - the East component of the vertical deflection (Deflection East)




If a geoid is present in the job, the application will use this geoid to calculate orthometric elevations.

> *NOTE*
> *We recommend using a geoid for calculating orthometric elevations. Calculating orthometric elevations without a geoid for points in* ***Ground*** *coordinate system can lead to errors in orthometric elevations.*

The application allows you to select the following ways for the plane localization:

- using only the stereographic projection on WGS-84,
- using only the stereographic projection on any datum,
- using any predefined or created projection

If you perform a task of transformation of WGS-84 coordinates into Ground coordinates for a network where the maximum distance between the local points is less than 5 kilometers, you can use the simplest localization.

To do this type of localization, do not select any projection or datum in the *Setup* tab of the *Coordinate Systems* item from the ***Job configuration*** dialog. The *Localize to* list will contain only WGS-84 coordinate system. In this case the plane localization will use only the stereographic projection on WGS-84 datum.

If you know which datum is used for the local coordinate system, you can use this datum in localization.

To do this type of localization, select the desired datum in the *Datum* list at the *Setup* tab of the *Coordinate Systems* item from the ***Job configuration*** dialog. The *Localize to* list will contain WGS-84 and the selected datum:

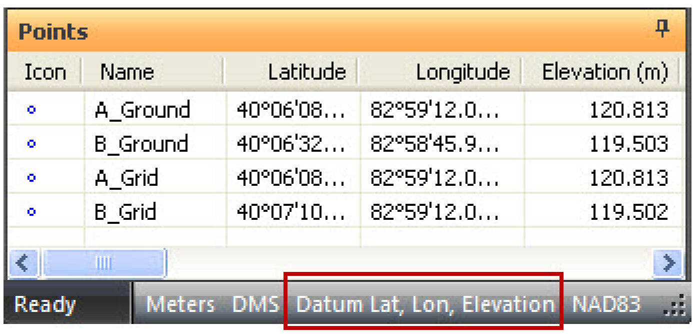
If you select the local datum, the plane localization will use the stereographic projection on the selected datum.

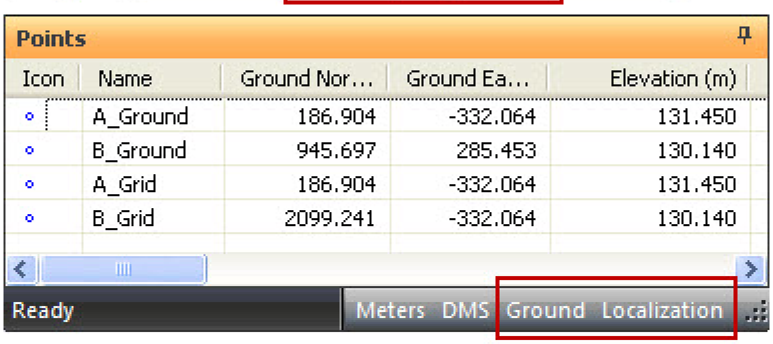
If you know which projection is used for the local coordinate system, you can use this projection in localization. To do this type of localization, select the desired projection in the *Projection* list at the *Setup* tab of the *Coordinate Systems* item from the ***Job configuration*** dialog.

If you select the desired projection as the current coordinate system in the Status bar or the *Coordinate type* list at the *Setup* tab of the *Coordinate Systems* item from the ***Job configuration*** dialog, the *Localize to* list will contain WGS-84 datum, datum for the selected projection and the projection itself:

In this case this projection and corresponding datum will be used in the process of calculation of localization parameters. Such approach to the calculation of the localization parameters between two coordinate systems is more rigorous method, than using the stereographic projection for a unknown local projection. This way allows increasing the distance between localization points (up to some hundred of kilometers depending on the type of the projection) without loss in transformation precision.

After selecting the desired projection/datum for the local system, click**Compute parameters** to calculate the localization parameters. The calculated parameters will be displayed on the right panel of the ***Localization*** dialog. These parameters will be used to convert Grid/Datum coordinates into local coordinates, and vice versa. The *Points* tab of the Tabular view will display the coordinates of the points in Ground and Grid/Datum coordinate systems:




To perform localization you can select one, two, three and more pairs of the localization points. For each case the application will calculate a different set of transformation parameters and residuals. The table displays which parameters are calculated in the process of localization, some parameters can be set to zero depending on the used number of the localization pairs of points.

| PARAMETERS | ONE PAIR | TWO PAIRS | THREE PAIRS | FOUR PAIRS |
|---|---|---|---|---|
| **DX,DY**- horizontal offset between two coordinate systems | CALC | CALC | CALC | CALC |
| **H0** - vertical offset between two coordinate systems | CALC | CALC | CALC | CALC |
| **Scale** - combined Scale factor | CALC | CALC | CALC | CALC |
| **Rotation** - rotation between two coordinate systems | 0 | CALC | CALC | CALC |

| | | | | |
|---|---|---|---|---|
| **Deflection North, Deflection East**- Deflection components | 0 | 0 | CALC | CALC |
| **N Residual, E Residual** - residuals on the horizontal plane | 0 | 0 | CALC | CALC |
| **Ht Residual** - residuals on the vertical plane | 0 | CALC | 0 | CALC |

***NOTE***
***We do not recommend using ONE point localization, when both coordinate systems have non-zero rotation angle. In this case the accuracy of transformation can be incorrect.***

## Localization dialog

**Fields of the left panel of the *Localization* dialog**

| Field | Description |
|---|---|
| *WGS Point* | Displays a list of points from the **Grid**/ **Datum** set of coordinates which are used in the localization.<br>To add a point to the column, click **Add Point** and select the required point from the list of all points of the job.<br>To remove a point from the column, select the required point in the column and click **Remove Point**. |
| *Local Point* | Displays a list of points from the **Ground** set of coordinates which are used in the localization.<br>To add a point to the column, click **Add Point** and select the required point from the list of all points of the job.<br>To remove a point from the column, select the required point in the column and click **Remove Point**. |
| *Use* | Displays the type of the localization for the given pair of points.<br>• Horizontal and Vertical — the pair is used in the horizontal localization and the vertical localization<br>• Horizontal — the pair is used in the horizontal localization<br>• Vertical — the pair is used in the vertical localization<br>• None — the pair is not used in the localization |
| *N Residual* | Displays the Northing residual for the localization point after computing the transformation parameters. The value will be calculated when three and more pairs of points are used in the localization. |
| *E Residual* | Displays the Easting residual for the localization point after computing the transformation parameters. The value will be calculated when three and more pairs of points are used in the localization. |
| *Ht Residual* | Displays the residual on the vertical plane for the localization point after computing the transformation parameters. The value will be calculated when two or more than three pairs of points are used in the localization. |

| Field | Description |
|---|---|
| *Localize to* | Displays the list which can contain the following datum and projection:<br>• WGS-84<br>• a datum which was selected from the *Datum* drop-down list of the *Setup* tab for the *Coordinate System* item from the ***Job configuration*** dialog<br>• a projection which was selected from the *Projection* drop-down list of the *Setup* tab for the *Coordinate System* item from the ***Job configuration*** dialog<br>If you select WGS-84 from the list, the plane localization will use only the stereographic projection on the WGS-84 datum.<br>If you select a datum from the list, the plane localization will use the stereographic projection on the selected datum.<br>If you select a projection from the list, this projection and corresponding datum will be used in the process of calculation of localization parameters. Such approach to the calculation of the localization parameters between two coordinate systems is more rigorous method, than using the stereographic projection for a unknown local projection. This way allows increasing the distance between localization points (up to some hundred of kilometers depending on the type of the projection) without loss in transformation precision. |
| *Origin Point* | In the list you can select one of the following:<br>• *Calculate Center point* (default setting) — the geometrical center of pairs of points, which is used in localization, becomes the center of the default map projection<br>• *First point from Localization List* — the first pair of points, which is used in the localization, becomes the center of default map projection. |

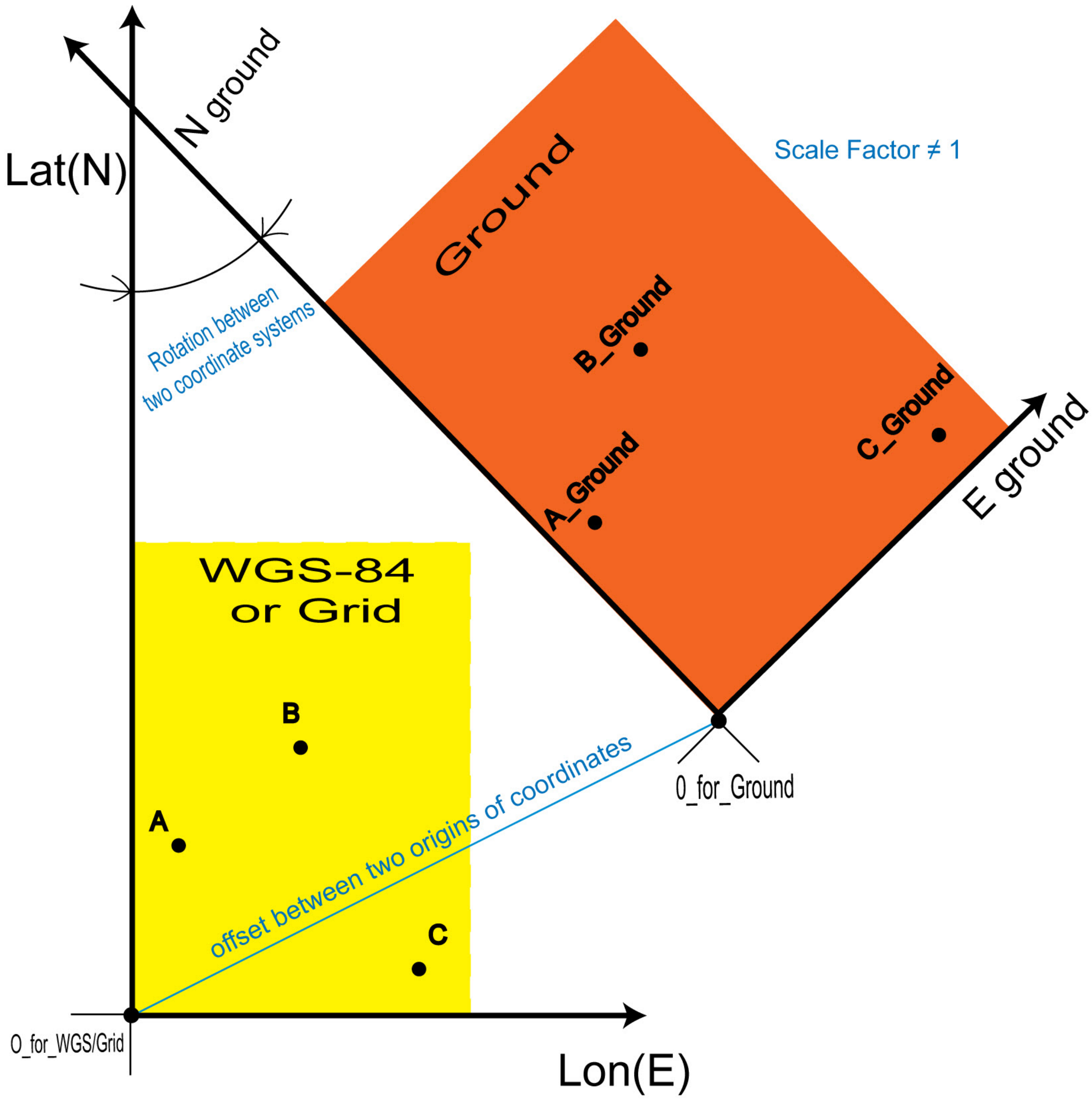
**Fields of the right panel of the *Localization* dialog**

| Field | Description |
|---|---|
| *DX* | Displays the projection of the offset vector in the horizontal plane between the origins of coordinate systems on the X axis. |
| *DY* | Displays the projection of the offset vector in the horizontal plane between the origins of coordinate systems on the Y axis. |
| *Rotation* | Displays the rotation angle between the **Grid**/ **Datum** and **Ground**coordinate systems. |
| *Scale* | Displays the scale factor between the **Grid**/ **Datum** and **Ground**coordinate systems. |
| *H0* | Displays the vertical offset between the **Grid**/ **Datum** and **Ground**coordinate systems. |
| *Deflection North* | Displays the North component of the vertical deflection. |
| *Deflection East* | Displays the East component of the vertical deflection. |

| Field | Description |
|---|---|
| *Origin Lat* | Displays the latitude coordinate of the first localization point from the **Grid**/ **Datum** set in the coordinate system which is selected in the *Localize to* drop-down list. |
| *Origin Lon* | Displays the longitude coordinate of the first localization point from the **Grid**/ **Datum** set in the coordinate system which is selected in the *Localize to* drop-down list. |
| *Origin Ell. H* | Displays the ellipsoidal (geodetic) height of the first localization point from the **Grid**/ **Datum** set in the coordinate system which is selected in the *Localize to* drop-down list. |
| *Origin Northing* | Displays the northing coordinate of the first localization point from the **Ground** set in Ground coordinate system. |
| *Origin Easting* | Displays the easting coordinate of the first localization point from the **Ground** set in Ground coordinate system. |
| *Origin H* | Displays the orthometric height of the first localization point from the **Ground** set in Ground coordinate system. |
| *Keep Scale 1.000* | When ticked, the scale factor is set to one and is not calculated when calculating of the transformation parameters. When untiked (default settings), the scale factor will be calculated when calculating of the transformation parameters. |
| *Apply legacy method* | For the horizontal localization MAGNET Tools supports two methods of calculation of the localization parameters, i.e. *Rotation*, *Scale*, *DX* and *DY*:<br>• Default method - a separate calculation of the localization parameters. This mode is applying in the MAGNET Tools and MAGNET Field from version 2.0.<br>• Legacy method - a combined calculation of the localization parameters. This mode was applied in the MAGNET Tools and MAGNET Field up to version 1.2.and all versions of Topcon Tools and TopSURV. Also this mode is applied in the current version of the Pocket 3D and 3D-Office.<br>When ticked, the Legacy method is set. When untiked (default settings), the Default method is set.<br>When you import Topcon 3D Localization file (*.gc3) into the opened job and select the legacy method (in the Advanced options field), the Legacy method is set automatically in the Localization dialog. |
| *Projection* | Displays the name of the projection to which the previous localization was performed. The field is empty in the following cases:<br>• the localization is not performed yet,<br>• the localization was performed using a stereographic projection on WGS-84 or on any datum. |
| *Datum* | Displays the name of the datum to which localization was performed. |

**Buttons of the *Localization* dialog**

| Field | Description |
|---|---|
| **Add Point** | Click it to add a localization point to the ***Localization*** dialog.<br>After clicking the list of all points will appear in the *WGS Point* column. Select a point from the **Grid**/ **Datum** set first, then in the *Local Point* column, select the corresponding point from the **Ground** set. |
| **Remove Point** | To remove a localization point from the ***Localization*** dialog, select a point and click the button. |
| **Compute parameters** | Click to start the localization. Before this make sure that the columns *WGS Point* and *Local Point* are not empty and contain the points from the independent sets. |
| **Close** | Click to close the dialog. |



# Performing Datum Transformation

The Datum Transformation option allows you to:

- determine an unknown datum parameters with respect to the WGS84 datum
- redefine the parameters of the existing datum with respect to the WGS84 for a local area.

For the datum transformation you has to have two sets of coordinates for three or more points:

- one set in the WGS-84 coordinate system
- other set in unknown (new) coordinate system

Let us assume that the file with points in WGS-84 coordinate system has format "Name, WGS84_Lat, WGS84_ Lon,WGS84_Ell.H". But the file with points in unknown (new) coordinate system is in the known Grid coordinate system (format ""Name, N, E, Ell.H""). To perform the datum transformation, using the files, take the following steps:

1. Create a new job.
2. In the *Information* group of the *Job* tab, click the **Job Configuration** icon.

   The ***Job Configuration*** dialog is displayed.
3. Select the *Setup* tab of the *Coordinate Systems* item.
4. From the *Coordinate type* drop-down list, select "WGS84 Lat,Lon,Ell.H.".
5. Import the file with points in WGS-84 coordinate system to the job.
6. The *Points* tab from the Tabular view displays all imported points:

   | Icon | Name | WG... | W... | WGS84 Ell.... |
   |---|---|---|---|---|
   | | 105 | 51°... | 4°... | 58.200 |
   | | 104 | 51°... | 4°... | 58.200 |
   | | 102 | 51°... | 4°... | 58.200 |
   | | 101 | 51°... | 4°... | 58.200 |
   | | 103 | 51°... | 4°... | 58.200 |
   | | 100 | 51°... | 4°... | 58.202 |

7. In the *Information* group of the *Job* tab, click the **Job Configuration** icon.

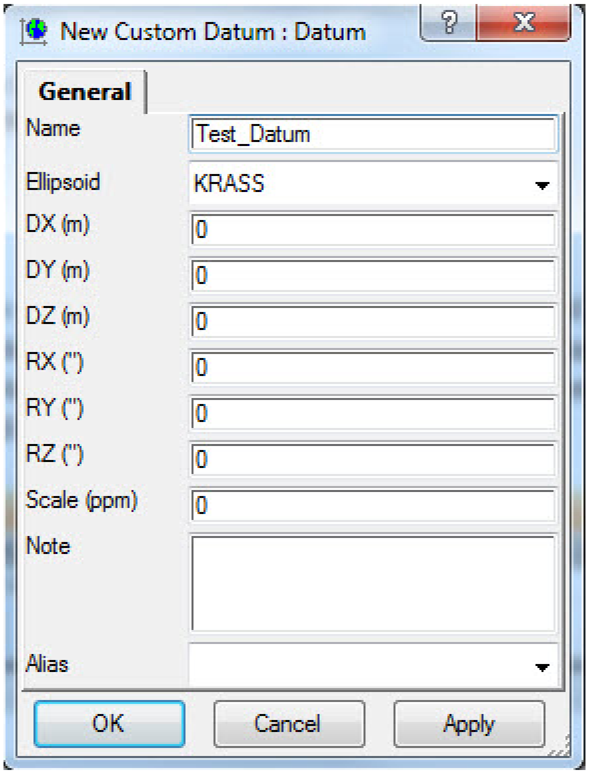
   The ***Job Configuration*** dialog is displayed.
8. Select the *Setup* tab of the *Coordinate Systems* item.
9. In the *Datum* field, click **Custom**.

   The ***Custom Datums List*** dialog is displayed.
10. Click **Add**.

    The ***New Custom Datum*** dialog is displayed.
11. Configure the datum parameters as you need. Fields are described in the table below.

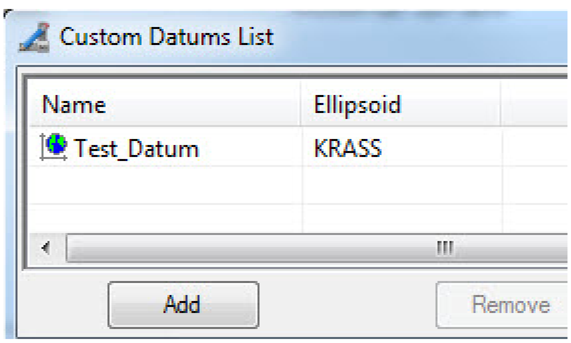
    *NOTE*

    *For a new local datum, whose parameters are calculated, a reference ellipsoid should be defined.*




12. Click **OK**.

    The newly created datum is displayed in the ***Custom Datums List*** dialog.



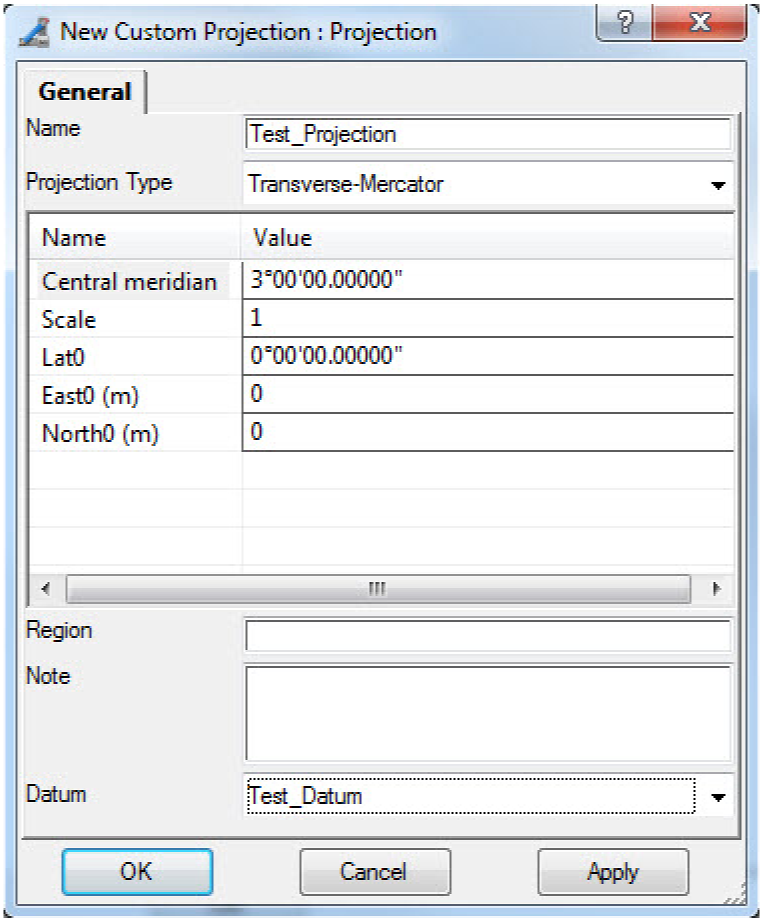

13. Close the ***Custom Datums List*** dialog.
14. In the *Projection* field at the *Setup* tab, click **Custom**.

    The ***Custom Projections List*** dialog is displayed.
15. Click **Add**.

    The ***New Custom Projection*** dialog is displayed.
16. Configure the projection parameters as you need. Fields are described in the table below.

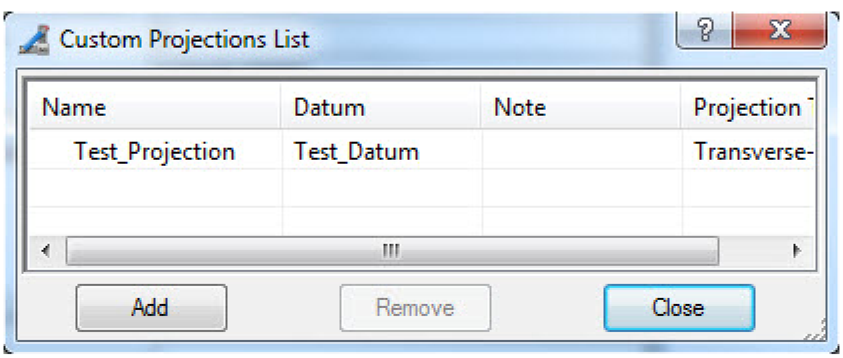
    *NOTE*

    *For a new local projection the corresponding "Central meridian" should be defined.*

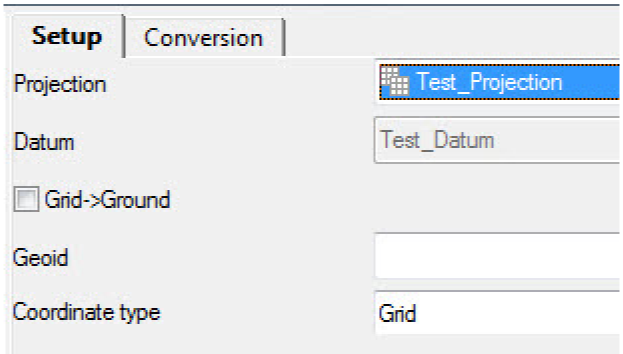



17. Click **OK**.

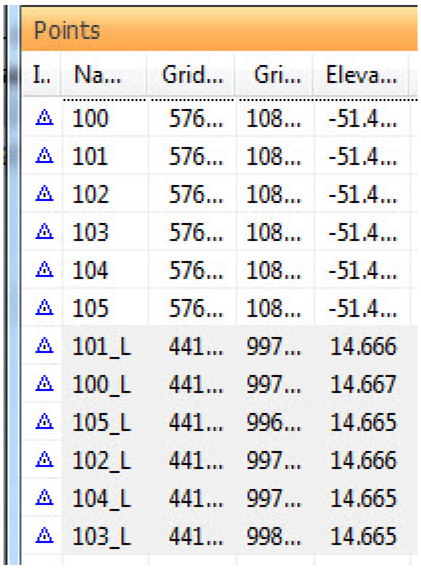
    The newly created projection is displayed in the ***Custom Projections List*** dialog.




18. Close the ***Custom Projections List*** dialog.
19. From the *Coordinate type* drop-down list, select "Grid".
20. From the *Projection* drop-down list, select the newly created projection.




21. Import the file with points in Grid coordinate system to the job.
22. The *Points* tab from the Tabular view displays all imported points:


Points

| I.. | Na... | Grid... | Gri... | Eleva... |
|---|---|---|---|---|
| | 100 | 576... | 108... | -51.4... |
| | 101 | 576... | 108... | -51.4... |
| | 102 | 576... | 108... | -51.4... |
| | 103 | 576... | 108... | -51.4... |
| | 104 | 576... | 108... | -51.4... |
| | 105 | 576... | 108... | -51.4... |
| | 101_L | 441... | 997... | 14.666 |
| | 100_L | 441... | 997... | 14.667 |
| | 105_L | 441... | 996... | 14.665 |
| | 102_L | 441... | 997... | 14.666 |
| | 104_L | 441... | 997... | 14.665 |
| | 103_L | 441... | 998... | 14.665 |

NOTE

In comparison with the localization, where two sets of coordinates (Datum/Grid and Ground ) are independent and do not have a predefined relation between two coordinate systems, for datum transformation both sets of coordinates have relation between them. After importing these sets to a job, MAGNET Tools will display coordinates of all points in each coordinate system.

23. In the *Coordinate Systems* group of the *Process* tab, click the **Datum Transformation** icon, to start datum transformation using these two sets of coordinates.
24. The ***Datum Transformation*** dialog is displayed.
25. Click **Add Point**.
26. Select required points from the *WGS Point* and *Local Point* drop-down lists. You need to select <u>three or more pairs</u>.
27. Click **Compute Parameters**.

    MAGNET Tools will calculate the following seven parameters to transfer coordinates from the WGS-84 coordinate system into the new datum, and visa-versa.

    - Three values of shift along the X/Y/Z axis from the created datum to WGS-84 in meters. They will be displayed in the *DX*, *DY* and *DZ* fields.
    - Three values of rotation angle between the X/Y/Z axis of the created datum and WGS-84 in arc seconds. They will be displayed in the *RX*, *RY* and *RZ* fields.

- The value of the scale in ppm, which specifies a coordinate transformation from the created datum to WGS84. It will be displayed in the *Scale* field.

Also MAGNET Tools computes residuals for the corresponding axes and displays them in the *N Residual*, *E Residual*, and *U Residual* fields and total values of the residuals, which is displayed in the *Total RMS* field.

28. To save the calculated transformation parameters, click **Save**. If the datum exists in the MAGNET Tools datum list, the warning message will appear:
    - click **Yes**, to save the overwrite new parameters for this datum name
    - click **No**, to save the new parameters under a new datum name.

**Fields of the *General* tab of the *New Custom Datum* dialog**

| Field | Description |
| --- | --- |
| *Name* | Defines the name of the custom datum. The datum name is unique and the field cannot be empty. |
| *Ellipsoid* | Defines the name of the ellipsoid used to create the datum. You can select any predefined ellipsoid from the list. |
| *DX* | Defines the value of shift along the X axis in meters, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *DY* | Defines the value of shift along the Y axis in meters, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *DZ* | Defines the value of shift along the Z axis in meters, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *RX* | Displays the value of the rotation angle between the X axes of the created datum and WGS84 in arc seconds. The default is 0. |
| *RY* | Displays the value of the rotation angle between the Y axes of the created datum and WGS84 in arc seconds. The default is 0. |
| *RZ* | Displays the value of the rotation angle between the Z axes of the created datum and WGS84 in arc seconds. The default is 0. |
| *Scale* | Defines the value of the scale factor in ppm, which specifies a coordinate transformation from the created datum to WGS84. The default is 0. |
| *Note* | Defines any additional note about the datum. |
| *Alias* | When you select a datum from the list, all available projection(s) for the selected datum automatically will be available for the created custom datum. |

**Fields of the *General* tab of the *New Custom Projection* dialog**

| Field | Description |
| --- | --- |
| *Name* | Defines the name of the custom projection. The projection name is unique and the field cannot be empty. |

| Field | Description |
|---|---|
| *Projection Type* | Defines the name of the projection type. The following options are available:<br>• Transverse-Mercator<br>• Lambert<br>• Double Stereographic<br>• Stereographic<br>• Oblique Mercator<br>• Albers Equal Area<br>• Cassini-Soldner<br>• Mercator<br>Every projection has its own set of original parameters. After selecting the type of projection, you can edit the parameters for this type. |
| *Region* | Defines the name of the region for which the projection will be used. You can use the existing regions (like Europe, Australia, etc.) or enter a new name. If you enter a new name, the application creates a new folder with the entered name in the projection list. The custom projection will be saved in this folder. |
| *Note* | Defines any additional note about the datum. |
| *Datum* | Defines the datum used for the projection. You can select any datum for the given projection. After selection the custom projection, the datum will be automatically set in the *Datum* drop-down list at the *Setup* tab of the *Coordinate Systems* item from the ***Job configuration*** dialog |

## Datum Transformation dialog

#### Fields of the left panel of the *Datum Transformation* dialog

| Field | Description |
|---|---|
| *WGS Point* | Displays a list of points from the WGS-84 datum set of coordinates which are used in the datum transformation.<br>To add a point to the column, click **Add Point**and select the required point from the list of all points of the job.<br>To remove a point from the column, select the desired point in the column and click **Remove Point**. |
| *Local Point* | Displays a list of points from unknown (new) datum set of coordinates which are used in the datum transformation.<br>To add a point to the column, click **Add Point**and select the required point from the list of all points of the job.<br>To remove a point from the column, select the desired point in the column and click **Remove Point**. |
| *N Residual* | Display the northing residual for the pair point after computing the transformation parameters. |

| Field | Description |
|---|---|
| *E Residual* | Display the easting residual for the pair point after computing the transformation parameters. |
| *U Residual* | Display the vertical residual for the pair point after computing the transformation parameters. |
| *Total RMS* | Displays total values of the residuals calculated as: $\sqrt{(N\_Residual)^2 + (E\_Residual)^2 + (U\_Residual)^2}$ |

**Fields of the right panel of the *Datum Transformation* dialog**

| Field | Description |
|---|---|
| *Ellipsoid* | Display the name of the ellipsoid used to create the datum. You can select any predefined ellipsoid from the list. |
| *DX* | Display the value of shift along the X axis in meters, which specifies a coordinate transformation from the created datum to WGS84. |
| *DY* | Display the value of shift along the Y axis in meters, which specifies a coordinate transformation from the created datum to WGS84. |
| *DZ* | Display the value of shift along the Z axis in meters, which specifies a coordinate transformation from the created datum to WGS84. |
| *RX* | Display the value of the rotation angle between the X axes of the created datum and WGS84 in arcseconds. |
| *RY* | Display the value of the rotation angle between the Y axes of the created datum and WGS84 in arcseconds. |
| *RZ* | Display the value of the rotation angle between the Z axes of the created datum and WGS84 in arcseconds. |
| *Scale* | Display the value of the scale factor in ppm, which specifies coordinate transformation from the created datum to WGS84. |

**Buttons of the *Datum Transformation* dialog**

| Field | Description |
|---|---|
| **Add Point** | Click the button to add a point to the datum transformation to the ***Datum Transformation*** dialog. After clicking the button, the list of all points will appear in the *WGS Point* column. Select a point from the WGS-84 datum set, then in the *Local Point* column select the corresponding point from an unknown (new) datum set. |
| **Remove Point** | To remove a point from the ***Datum Transformation*** dialog, select a point and click the button. |
| **Compute parameters** | Click it to start the datum transformation. Before this make sure that the *WGS Point* and *Local Point* columns contain tree or more points from the corresponding sets. |

| Field | Description |
|---|---|
| **Save** | To save the calculated transformation parameters for the datum in the ***Datum Transformation*** dialog, click the button. If the datum exists in the MAGNET Tools datum list, a warning message will appear.<br>• click **Yes** to save the new parameters for this datum name<br>• click **No** to save the new parameters for a new datum name. After that Save datum window appears. |
| **Close** | Click it to close the dialog |

# Creating custom filter

The filter function allows you to display/hide points, occupations, observations in MAGNET Tools views. Filtering data is performed by type, time, quality control test and code. Hidden points, occupations, and observations will be excluded from processing, adjustment, exporting, and reports.

The MAGNET Tools allows you to create your own filters. To do so:

1. In the *Filters* group of the *View* tab, click the **Filters** icon.

   The ***Filters*** dialog is displayed.
2. Click **New filter**.

   The ***New filter*** dialog is displayed.
3. In the *Filter Name* editbox, type the name for the filter.
4. At the criteria tabs, configure the filter criteria. See the description of tabs in the appropriate sections:
   - *By Type*. See "By Type tab" section on page 388 for details.
   - *By Code*. See "By Code tab" section on page 388 for details.
   - *By QAQC*. See "By QAQC tab" section on page 389 for details.
   - *By Time*. See "By Time tab" section on page 389 for details.
   - *By Source*. See "By Source tab" section on page 389 for details.
5. When finished, click **OK**.

   The filter is created and displayed in the filters list. Note, that is has the icon.

# Importing filters

MAGNET Tools allows you to import the filters to external filter (**.tf*) files. You may import one or several filters fro, one file. They will appear as custom filters.

To import filters:

1. In the *Filters* group of the *View* tab, click the **Filters** icon.

   The ***Filters*** dialog is displayed.
2. Click **Import filters**.

   The ***Open*** dialog is displayed.
3. Navigate to the required filter (**.tf*) file, and open it.

   The filters appear in the filter list as custom ones.

# Exporting filters

MAGNET Tools allows you to export the pre-defined and custom filters to external filter (*.*tf*) files. You may export one or several filters to one file.

To export filters:

1. In the *Filters* group of the *View* tab, click the **Filters** icon.

   The ***Filters*** dialog is displayed.
2. Select the required filters.
3. Click **Export filters**.

   The ***Save As*** dialog is displayed.
4. Navigate to the required folder, and *File Name* editbox, type the name for the file.
5. Click **Save**.

# Creating custom format file

MAGNET Tools allows you to create a custom text format for coordinates files; GPS and TS vector files; and Code/Layer library files. The created file format will be included into the format list for import and export.

To create custom format of the file:

1. In the *Exchange* group of the *Job* tab, click the **Import** icon.

   The ***Import*** dialog is displayed.
2. In the *Format name* drop-down list, click .

   The ***Custom Format Properties*** dialog is displayed.
3. In the *Format name* editbox, type the name for the new format.
4. From the *File type* drop-down list, the required data type.
5. In the *Available items* list, select a required element.
6. Click >>.

   The item is added to the *Included items* list.
7. Repeat steps 5 and 6 to add all the required parameters. If needed, use the **Move Up** and **Move Down** buttons to arrange their sequence.
8. If needed, tick the *Header in first row* checkbox.
9. In the *Format file extension* editbox, type the extension of the data file.
10. If needed, tick the *Fixed width* checkbox. When ticked, you may define the width of each item, by using the *Width* field of the *Included items* list.
11. From the *Separator* drop-down list, select the required separator of items in the data file.
12. From the *Lat/Lon format* drop-down list, select the required format of Latitude and Longitude.
13. Click **OK** to save the custom file format and close the ***Custom Format Properties*** dialog.

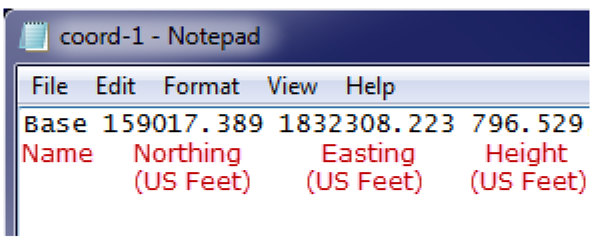
**Fields of the *Custom Format Properties* dialog**

| Field | Description |
|---|---|
| *Format name* | Defines the name of the custom file format. |

| Field | Description |
|---|---|
| *File type* | Defines the type of the data in file. The following types are available:<br>• *Coordinates*<br>• *TS Observations*<br>• *GPS Observations*<br>• *Code/Layer library — this option available only for import.* |
| *Available items* | Contains the available items for the selected file type. |
| *Included items* | Contains items, selected for custom file format. |
| *Header in first row* | Tick to treat first row of the data file as a header. |
| *Format file extension* | Defines the extension of the data files for this format. |
| *Fixed width* | Tick to manually define the width of each item, by using the *Width* field of the *Included items* list. |
| *Separator* | Defines the separator of items in the data file. |
| *Lat/Lon format* | Defines the format of Latitude and Longitude coordinates in data file. |

Example: Creating of a file format which allows import/export coordinates file.

Let us create a file format which allows import/export of the following coordinates file. The coordinates are in SPC83 grid system, zone Ohio (North), linear units are US Feet:




To import the coordinate file on to an opened MAGNET Tools job:

1. In the *Information* group of the *Job* tab, click the **Job Configuration** icon.

   The ***Job Configuration*** dialog is displayed.
2. Select the *Setup* tab of the *Coordinate Systems* item.
3. From the *Projection* drop-down list, select the required projection.
4. From the *Coordinate* type drop-down list, select "Grid".
5. Select the *Units* item.
6. From the *Linear Unit* drop-down list, select the required linear unit.
7. Click **OK** to save the settings and close the ***Job Configuration*** dialog.
8. In the *Exchange* group of the *Job* tab, click the **Import** icon.

   The ***Import*** dialog is displayed.
9. In the *Format name* drop-down list, click .

   The ***Custom Format Properties*** dialog is displayed.
10. In the *Format name* editbox, type the name of the created format.

11. From the *File type* drop-down list, select "Coordinates" (this is for our example file).
12. In the *Available items* list, select the *Name*, *Northing*, *Easting* and *Height* elements.
13. Click >>.

    The items are added to the *Included items* list.
14. Confirm, that the *Header in first row* checkbox is not ticked.
15. In the *Format file extension* editbox, type the extension of the file.
16. From the *Separator* drop-down list, select "Comma" (this is for our example file).
17. From the *Lat/Lon format* drop-down list, select the required format of Latitude and Longitude.
18. Click **OK** to save the custom file format and close the ***Custom Format Properties*** dialog.
19. The newly created format is added to the *Format name* drop-down list of the ***Import*** dialog.
20. Select the newly created format.
21. Navigate to the location of the coordinates file and select it.
22. Click **Open** to import the coordinate file into the job.

# Filters Dialog

The dialog displays a list of the filters predefined in the program and filters created by the user. Using the filters allows you to display/hide points, occupations, observations in MAGNET Tools views. Filtering data is performed by type, time, quality control test and code. Hidden points, occupations, and observations will be excluded from processing, adjustment, exporting, and reports.

In this dialog you can:

- create unlimited number of filters with individual names for each set of hidden / displayed objects.
- select the current (created or predefined) filter from the filter list. The name of the current filter is displayed in the filter combo box.
- export / import any filter from / to MAGNET Tools.

The following filtration types are available:

- By Type
- By Code
- By Time
- By QAQC (Quality Analysis Quality Control)
- By Source

By default, the filter is set to None and all objects are displayed in the job.

To open the dialog, in the *Filter* group of the *View* tab, click the **Filters** icon.

#### Fields of the *Filters* dialog

| Field | Description |
|---|---|
| *Name* | Displays the name of the filter. For the predefined (created by Topcon programmers) filter, the icon is used, for the custom (created by a customer) filter, the icon is used. |

#### Buttons of the *Filters* dialog

| Button | Description |
|---|---|
| **New Filter** | Click it to create a new custom filter. See "Creating custom filter" section on page 383 for details. |
| **Delete** | Click it to delete the selected custom filter. |
| **Properties** | Click it to open the ***Properties*** dialog for the selected filter. This window contains five tabs, where you can review and edit the filtering conditions:<br>• *By Type*. See "By Type tab" section on the next page for details.<br>• *By Code*. See "By Code tab" section on the next page for details.<br>• *By QAQC*. See "By QAQC tab" section on page 389 for details.<br>• *By Time*. See "By Time tab" section on page 389 for details.<br>• *By Source*. See "By Source tab" section on page 389 for details. |
| **Export filters** | Click it to export the selected filter from MAGNET Tools. See "Exporting filters" section on page 384 for details. |

| Button | Description |
|---|---|
| **Import filters** | Click it to import a filter (*.tf format) to the MAGNET Tools. See "Importing filters" section on page 383 for details. |

# By Type tab

The *By Type* tab appears in the either ***New Filter***; or ***Edit Filter***; or ***View Filter*** dialog.

It allows you to create or edit a custom filter; or view a predefined filter which will hide/display object of the job depending on their type. There are two groups of the objects in the list of criterions: points and observations.

The points group contains types of points which do not belong to any GPS, RTK, TS, DL observations.

The observations group can include the types of points and occupations related to corresponding observations. In this group you may select independently these objects from the given observation type. An object marked in red is hidden, an object marked in green are displayed. By default all objects in the tab are marked in green.

> *NOTE*
> *The point which belongs to different data types simultaneously (for example, both a GPS and TS point) is hidden only if all data types the point belongs to are hidden.*

# By Code tab

The *By Code* tab appears in the either ***New Filter***; or ***Edit Filter***; or ***View Filter*** dialog.

It allows you to create or edit a custom filter; or view a predefined filter which will hide/display points of the job based on their codes.

In the *Codes to filter* editbox you can type a code name using the asterisk (*) or a question mark (?) wildcards.

Using two checkboxes each of which has two different options with different names in the tab you can hide/display the points from the job by the following rules:

If the first checkbox has the *Hide data with the given codes* condition:

- the points with these codes will be hidden in all views.
- the points without the codes will be displayed in all views, if the second checkbox has the *Exclude objects without codes* condition.
- the points without the codes will be hidden in all views, if the second checkbox has the *Include objects without codes* condition.

If the first checkbox has the *Show only data with given codes* condtition:

- the points with these codes will be displayed in all views.
- the points without the codes will be hidden in all views, if the second checkbox has the *Exclude objects without codes* condition.
- the points without the codes will be displayed in all views, if the second checkbox has the *Include objects without codes* condition.

If the second checkbox has the *Exclude objects without codes* condition:

- the points without the codes will be displayed in all viewers, if the first checkbox has the *Hide data with the given codes* condition.
- the points without the codes will be hidden in all viewers, if the first checkbox has the *Show only data with given codes* condition.

If the second checkbox has the *Include objects without codes* condition:

- the points without the codes will be hidden in all viewers, if the first checkbox has the *Hide data with the given codes* condition.
- the points without the codes will be displayed in all viewers, if the first checkbox has the *Show only data with given codes* condition.

# By Time tab

The *By Time* tab appears in the either ***New Filter***; or ***Edit Filter***; or ***View Filter*** dialog.

In this tab you can create or edit a custom filter which will hide/display GPS and TS occupations with the corresponding points of the job based on the time interval. You can specify the start and end time for two independent time intervals.

To use the first time interval, tick the *Use first time interval* checkbox, and specify the time and date period in the appropriate fields.

To use the second time interval, tick the *Use second time interval* checkbox, and specify the time and date period in the appropriate fields.

The tab also contains the checkbox which has two different conditions with different names. It allows you hide/display the objects from the defined time interval:

- If it has the *Hide data within time interval(s)* condition, the given objects for which the occupations are fully within the given interval will be hidden in all views.
- If it has the *Show only data within non-empty time interval(s)* contition, only the given objects for which the occupations are fully within the given interval will be displayed in all views.

# By QAQC tab

The *By QAQC* tab appears in the either ***New Filter***; or ***Edit Filter***; or ***View Filter*** dialog.

In this tab you can create or edit a custom filter which will hide/display the objects which did not pass the Quality Control test. The object marked in red is hidden, the object marked in green is displayed. By default all objects in the tab are green.

# By Source tab

The *By Source* tab appears in the either ***New Filter***; or ***Edit Filter***; or ***View Filter*** dialog.

In this tab you can create or edit a custom filter which will hide/display GPS and TS occupations with the corresponding points of the job based on the folder/file from which the data is taken.

In the *Filter by source* editbox you can enter the folder/file.

The tab also contains checkbox which has two different conditions with different names:

- If it has the *Hide data without source* condition, the objects whose data was taken from other source will be hidden
- If it has *Show data without source* condition, the objects whose data was taken from other source will be displayed.

# Symbols In MAGNET Tools

This chapter contains description of the symbols are used in Tabular View and Observation View. See the appropriate section for details:

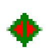
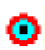
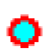
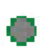

- "Symbols for the Points tab" section below
- "Symbols for the GPS Occupations tab" section on page 392
- "Symbols for the GPS Obs tab" section on page 393
- "Symbols for the left panel of the TS Obs tab" section on page 394
- "Symbols for the right panel of the TS Obs tab" section on page 394
- "Symbols for the left panel of the DL Obs tab" section on page 394
- "Symbols for the right panel of the DL Obs tab" section on page 395
- "Symbols for the Surfaces tab" section on page 395
- "Symbols for the left panel of the Lines tab" section on page 395
- "Symbols for the X-Section table view" section on page 395
- "Symbols in the X-Section Template tab" section on page 396
- "Symbols in Road String Set or separate Road String table view" section on page 396
- "Symbols in the table view of horizontal alignment" section on page 396
- "Symbols in the vertical alignment table view" section on page 396

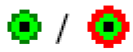
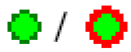

## Symbols for the Points tab

These symbols of points are used in the *Icon* field at the *Points* tab of the Tabular View.

Symbols of points are marked red if the point did not pass Quality Control test. To identify why the test failed for the point, click **Properties** on the pop-up menu and select the *Quality Control* tab.

| Symbol passed/not passed Quality Control test | Description |
|---|---|
|  | Manual point. The point added to the job by using the command **COGO** -> **Inverse**in the Main Menu or clicking **Add Point** in the Toolbar. |
|  | Unknown point. The non-control point imported to the job from a coordinate file. |
|  /  | Fixed Both coordinates point. You can set this status for any point in the *Control* field. |
|  /  | Fixed Horizontal coordinates point. You can set this status for any point in the *Control* field. |
|  /  | Fixed Vertical coordinates point. You can set this status for any point in the *Control* field. |

| Symbol passed/not passed Quality Control test | Description |
|---|---|
|  /  | Stakeout point. The point imported to the job from a MAGNET Field job. |
|  /  | Design point. The point imported to the job from a MAGNET Field job or a coordinate file. |
|  /  | Point coordinates calculated by means of COGO. |
|  /  | Adjusted point. |
|  /  | TS station.The point imported to the job from a MAGNET Field job or a TS Observation file. |
|  /  | TS point. The point imported to the job from a MAGNET Field job or a TS Observation file. |
|  /  | TS BackSight point. The point imported to the job from a MAGNET Field job or a TS Observation file. |
|  /  | RTK base point. The point imported to the job from a MAGNET Field job. |
|  /  | Topo Point. The point collected during a static RTK measurement. The point imported to the job from a MAGNET Field job. |
|  /  | Auto Topo Point. The point collected during a kinematic RTK measurement. The point imported to the job from a MAGNET Field job. |
|  | Unprocessed GPS Static point. The point imported to the job from a GPS raw data file. |
|  | Unprocessed GPS Stop point in the stop&go measurements. The point imported to the job from a GPS raw data file. |
|  | Unprocessed GPS Go point in the stop&go measurements or kinematic point in the kinematic measurements. The point imported to the job from a GPS raw data file. |

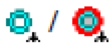
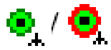
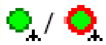
| Symbol passed/not passed Quality Control test | Description |
|---|---|
|  | Processed GPS Static point. The point imported to the job from a GPS raw data file. |
|  | Processed GPS Stop point in the stop&go measurements. The point imported to the job from a GPS raw data file. |
|  | Processed GPS Go point in the stop&go measurements or kinematic point in the kinematic measurements.The point imported to the job from a GPS raw data file. |
|  | Tape Measurement point. The point imported to the job from a MAGNET Field job. |
|  | GPS offset point. |
|  | PTL (point to line) offset point. |
|  | Traverse point for digital level observation.The point imported to the job from a MAGNET Field job or DL Observation file. |
|  | Level point for digital level observation. The point imported to the job from a MAGNET Field job or DL Observation file. |
|  | Scan point. The point imported to the job from a MAGNET Field job or Field Scan Data file or Photo Fieldbook file. |
|  | Image measured point. The point imported to the job from a MAGNET Field job |

# Symbols for the GPS Occupations tab

These symbols are used in the *Icon* field at the *GPS Occupations* tab of the Tabular View.

Symbols are marked red if the GPS Occupation did not pass Quality Control test. To identify why the test failed for the point, click **Properties** on the pop-up menu and select the *Quality Control* tab.

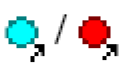
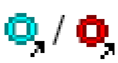
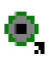
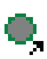
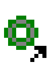
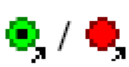
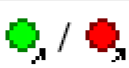
| Symbol passed/not passed Quality Control test | Description |
|---|---|
|  | RTK base station occupation |

| Symbol passed/not passed Quality Control test | Description |
|---|---|
|  | Topo occupation (the static occupation in the RTK survey) |
|  | Auto Topo Occupation (the kinematic occupation in the RTK survey) |
|  | Processed Static GPS occupation |
|  | Processed Stop GPS occupation in the stop&go measurements |
|  | Processed Go GPS occupation in the stop&go measurements or Kinematic GPS occupation in the kinematic measurements |

# Symbols for the GPS Obs tab

These symbols are used in the *Icon* field at the *GPS Obs* tab of the Tabular View.

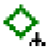
Symbols are marked red if the GPS Observation did not pass Quality Control test. To identify why the test failed for the point, click **Properties** on the pop-up menu and select the *Quality Control* tab.

| Symbol passed/not passed Quality Control test | Description |
|---|---|
|  | RTK GPS observation from a base station to a Topo point |
|  | RTK GPS observation from the base station to an Auto Topo point |
|  | Unprocessed Static GPS observation |
|  | Unprocessed Stop GPS observation for the stop&go measurements |
|  | Unprocessed Go GPS observation for the stop&go measurements or Kinematic GPS observation for the kinematic measurements |
|  | Processed Static GPS observation |
|  | Processed Stop GPS observation for the stop&go measurements |

| Symbol passed/not passed Quality Control test | Description |
|---|---|
|  /  | Processed Go GPS observation for the stop&go measurements or Kinematic GPS observation for the kinematic measurements |

## Symbols for the left panel of the TS Obs tab

This symbol is used in the *Icon* field in the left panel of the *TS Obs* tab of the Tabular View.

| Symbol | Description |
|---|---|
|  | TS station |

## Symbols for the right panel of the TS Obs tab

These symbols are used in the *Icon* field in the right panel of the *TS Obs* tab of the Tabular View.

Symbols are marked red if the TS Observation did not pass Quality Control test. To identify why the test failed for the point, click **Properties** on the pop-up menu and select the *Quality Control* tab.

| Symbol passed/not passed Quality Control test | Description |
|---|---|
|  /  | SideShot (SS) measurement |
|  /  | ForeSight(FS) measurement |
|  /  | BackSight (BS) measurement |
|  /  | BackSightBearing (BKB) point measurement |
|  /  | Horizontal Resection / Vertical Resection / Resection observation |

## Symbols for the left panel of the DL Obs tab

This symbol is used in the *Icon* field in the left panel of the *DL Obs* tab of the Tabular View.

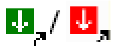
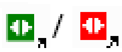
Symbols are marked red if the DL Occupation did not pass Quality Control test. To identify why the test failed for the point, click **Properties** on the pop-up menu and select the *Quality Control* tab.

| Symbol passed/not passed Quality Control test | Description |
|---|---|
|  /  | DL run (DL Occupation) |

# Symbols for the right panel of the DL Obs tab

This symbol is used in the *Icon* field in the right panel of the *DL Obs* tab of the Tabular View.

Symbols are marked red if the DL Observation did not pass Quality Control test. To identify why the test failed for the point, click **Properties** on the pop-up menu and select the *Quality Control* tab.

| Symbol passed/not passed Quality Control test | Description |
|---|---|
|  | BackSight level measurement |
|  | ForeSight level measurement |
|  | SideShot level measurement |

# Symbols for the Surfaces tab

These symbols are used in the *Icon* field in the left panel of the *Surfaces* tab of the Tabular View.

| Symbol | Description |
|---|---|
|  | Updated Surface without Focus Point |
|  | Not updated Surface without Focus Point |
|  | Updated Surface with Focus Point |
|  | Not updated Surface with Focus point |

# Symbols for the left panel of the Lines tab

These symbols are used in the *Icon* field in the left panel of the *Lines* tab of the Tabular View.

| Symbol | Description |
|---|---|
|  | Unclosed line |
|  | Closed polyline (area) |

# Symbols for the X-Section table view

This symbol is used in the *Icon* field in the left panel of the *Roads* tab of the Tabular View for the X-Section element.

| Symbol | Description |
|---|---|
|  | X-Section |

# Symbols in the X-Section Template tab

This symbol is used in the *Icon* field in the left panel of the *X-Section Template* tab of the Tabular View.

| Symbols | Description |
|---|---|
|  | X-Section Template |

# Symbols in Road String Set or separate Road String table view

This symbol is used in the *Icon* field for the Road String Set or separate Road String table view.

| Symbols | Description |
|---|---|
|  | Road String Set or separate Road String |

# Symbols in the table view of horizontal alignment

The symbols are used in the *Icon* field in the horizontal alignment table view.

| Symbols | Description |
|---|---|
|  | Line |
|  | Curve |
|  | Spiral |
|  | Intersection |

# Symbols in the vertical alignment table view

These symbols are used in the *Icon* field in the vertical alignment table view.

| Symbols | Description |
|---|---|
|  | Grade |
|  | Parabola |
|  | Circular Arc |
|  | Parabola Long Section<br>Arc Long Section |