



MAGNET Field 1.0 Help

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Rev A

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Preface

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Manual Conventions

This manual uses the following conventions:

Example	Explanation
File ▶ Exit	tap the File menu and tap Exit.
Enter	Indicates the button or key labeled Enter.
<i>Notes</i>	Indicates a field on a dialog box or screen, or a tab within a dialog box or screen.
<i>Topo</i>	Indicates the name of a dialog box or screen



Supplementary information that can help you configure, maintain, or set up a system.



Supplementary information that can have an affect on system operation, system performance, measurements, personal safety.

Introduction

Introduction MAGNET Field

MAGNET Field is a field application of the MAGNET software system that also includes the office and the web service (MAGNET Enterprise) applications. Data from the field and office applications can be used by MAGNET Enterprise for graphical representation of the project on the Enterprise Google map.

This Help provides information for the MAGNET Field application. For help using the other applications of the MAGNET software system, refer to the application Help.

To work with a fully featured MAGNET Field, you need to activate it. After successfully installing the application on the device, you are prompted to activate the Product using the Activation Manager wizard, which guides you through the process.



NOTICE

Once activated MAGNET Field does not require a new activation after updating.

If you cancel activation, the application will run in Demo mode, which allows you to store up to five points. Also, you can clear the **Activate MAGNET Field now** check box at the end of the MAGNET Field installation to work in Demo mode.

The activated MAGNET Field will prompt you to establish [Connections](#) with the Device before opening a job and with the Enterprise project to exchange data.

When the connection with the device is established, the [Home screen](#) is displayed.

Connections

When MAGNET Field runs for the first time, click the Home button



to open the [Home screen](#) for the default job. Then you can create a job with a required configuration to work.

On each subsequent MAGNET Field startup, the [Connections](#) dialog runs for the current job.

Home screen

Click an icon to open the folder or execute the command:



[Job](#)

Manages jobs.



[Configure](#)

Manages job configurations.



[Exchange](#)

Exchanges data between an active job and other jobs, files and enterprise projects.



[Chat](#)

Chats with online recipients.



[Edit](#)

Edits existing job data.



[Calculate](#)

Calculates various coordinate geometry tasks.



[Map](#)

Shows the current job data on the map.



[Connect](#)

Switches between GPS and optical instruments, and sets connections with the instrument, a network, and with MAGNET Enterprise.



[Setup](#)

Sets up surveying: GPS+ survey or Optical (Total Station) survey. Unavailable for Level configuration style.



[Survey](#)

Conducts a survey: GPS+ survey or Optical survey. Not available for a GPS static and Level surveys.



[Two Peg Test](#)

Performs the Two Peg Test for a Level survey.



[Level Run](#)

Sets up a Level survey in running mode.



[Stake](#)

Stakes different objects.



[Apps](#)

Uses applications that are pre-installed on the same device as the MAGNET Field.

The top banner of the home screen shows the name of the job that is open and associate icons:



[Options](#)

Provides access to Help files and options that are specific to the current open screen.



Indicates the power status of the controller battery.



Indicates the connection status with the enterprise: a green check mark means there is an established connection and a red cross means that the connection is off. You can connect/reconnect in the [Connections](#) dialog.



Indicates the connection status with the device. You can connect/reconnect with the device in the [Connections](#) dialog. If the device is disconnected, the indicator is grey. When connecting, it turns yellow, then green, and finally turns into the image of the connected device with a green check mark near it.



Closes the program.



Returns to the home screen.



Help Options

Click the icon to open a menu of options which may be useful for you. Every screen and dialog in MAGNET Field has such an icon in

the top left corner, the menu, opened by clicking the icon, always contains the Help option and may contain some additional options specific to the current screen.

The help options for the home screen and for every folder are as follows:

Help

Access help files.

Keyboard

Check mark to enable type entries in a dialog's fields using the soft keyboard.

Chats

Click Chats -> Create New to configure a chat with the MAGNET Enterprise users. Find out [more...](#)

Port Data Logging

Click to view incoming and outgoing traffic information of a controller port connected to MAGNET Field. Find out [more...](#)

Activate Modules

Click to view or change the license activation of the modules in MAGNET Field. Find out [more...](#)

About

Click to view basic information about MAGNET Field software.

Managing Jobs

Click the **Job** icon on the Home screen to manage jobs. Jobs include all data collected in surveys of different configurations.



Job folder

Upon installation, MAGNET Field only contains and opens the default job.

Click an icon to manage your jobs:



[New Job](#)

Creates a new job.



[Open Job](#)

Makes a selected job current.



[Delete Job](#)

Deletes a selected job from data storage.



[Job Info](#)

Shows information about a current job.



New Job

The new job creation process is performed with the help of a Wizard.



indicates the directory in which this job will be created. The last specified file path is retained.

To create a new job:

1. In **Name**, enter a name for the job.



NOTICE

The Job name length should not exceed 63 characters and contain any of the following symbols:


!, ? % * @ # \$ % ^ & ' " \ / | ~ ; [] { } () < > ` + = .

2. Optionally, in **Created by**, enter any identifier of the person creating the job.
3. Optionally, in **Comments**, enter a description for the job.
4. **Current date** displays the date and time when the job is being created.
5. Click [Browse](#) if required to save the New Job file in a folder




different from that indicates.




6. Click  at this step if you want the new job to use the settings from the last opened job as the default settings. The new job becomes the current job, and the Home menu displays with the job name in the title area.
7. Click **Next** to follow the wizard to complete the required steps.

 **NOTICE**


Clicking  during any of the following step creates the new job with the settings that were configured in all the previous steps (including the opened one).

8. Select the **Survey Style** or create a new configuration, and click **Next**. A Survey Configuration is a set of parameters that does not depend upon the job. A Configuration can be used by different Jobs. [More...](#)
9. Configure the **Coordinate System** settings required for the job, and then click **Next**. [More...](#)
10. Specify the **Units** for the job, and then click **Next**. [More...](#)
11. Configure the **Display** parameters for coordinates, azimuths and positions on roads, and then click **Next**. [More...](#)
12. Set **Alarms** for various situations. [More...](#)



13. Click  to open the Home menu for the newly created job. The title of the Home menu will be the current job name. When opening the job the [Connections](#) screen displays by default.



Open Job

Upon starting, MAGNET Field always opens the last used job after the product activation and [Connections](#) are performed.

All existing jobs that are created/opened with MAGNET Field are



defined as **.mjf** files and have the symbol .

To open an existing job:


1. From the **Job Name** list, highlight the name of the job you want to open.
The **Created** and **Modified** fields will display when the job was created and last modified.




will show the directory in which this job resides. By default the job files are stored in the [program]\Jobs folder.

2. Click [Browse](#) to navigate to the desired job in another folder if required.




3. Click  to open the job. The Home screen displays.

To open job backups of existing jobs:

1. Click [Browse](#) to navigate to the desired job.
2. In the File Types drop-down list, select MAGNET Field Job Backups (*.mjf.bak).
3. Highlight the name of the job to be opened, and click  .

To open a job that was created in TopSURV:

1. Click [Browse](#) to navigate to the desired job.
2. In the File Types drop-down list, select TopSURV Job Files (*.tsj) or TopSURV Job Backups (*.tsj.bak).
3. Highlight the name of the job to be opened, and click  .



Delete Job

Current Job: shows the name of the current job.


To delete a job:

1. From the **Job Name** list, highlight the name of the job you want to delete.

The **Created** and **Modified** fields will display when the job was created and last modified.



will show the directory in which this job resides. By default the job files are stored in the [program]\Jobs folder.

2. Click [Browse](#) to navigate to the desired job in another folder if required.
3. Click  to delete the job. A confirmation message displays.
4. Click Yes to confirm deletion or No to cancel, and return to the Job folder.



NOTICE

When deleting a job, MAGNET Field automatically deletes all associated files (the job history file, images, etc.).



Job Info

Displays information about:

- The current job in general
- The settings in the job
- The currently connected receiver:
 - Receiver firmware version
 - Receiver OAF expiration date (for nearest expired option).
Click on this date to expand a full list of OAF options.

Browse

The title of this dialog depends on the path from which it is called.



displays the path to the current folder where you will search for a desired file:

1. Use an icon to:



move up a folder



create a new folder



switch the display mode for the list of files to the detailed view



switch the display mode for the list of files to the icon view

2. From the **Type** drop-down list, select the type of files to display in the list for the current folder.
3. In **Name**, enter the name of the file to select or select the desired file from the list.

Configuring Jobs

Click the **Configure** icon on the Home screen to configure settings for the current job.



Configure Folder

Click an icon to configure the settings:



[Survey](#)

Creates or edits a survey configuration.



[Coordinate System](#)

Sets a coordinate system for the job. Allows Grid to Ground transformation ([find out more...](#)).



[Global](#)

Logs the current job history to the file and connects with the instrument at the startup prompt.



[Backup](#)

Changes the directory to save job backups.



[Units](#)

Sets default units to be used in the job.



[Display](#)

Customizes the interface to display data in the job.



[Alarms](#)

Sets alarm parameters.



[Menus](#)

Shows / hides functions in the menus.



[Codes](#)

Sets code global parameters.



[Stake Reports](#)

Configures reports for staking.



[Enterprise](#)

Configures the user account to enter into MAGNET Enterprise.

Configuring a New Job

When creating a new job, a wizard guides you through all of the steps needed to setup the new job configuration. If required to change the settings for the current job, use the options of the Configure folder.



Select Survey Configuration

Survey Configuration is a set of parameters that control a survey, define communication between devices, measure and store points. MAGNET Field contains some default configurations for different types of surveys with GNSS receivers and optical instruments. If the defaults do not suit your needs, you can create a new configuration for

your survey. To do this, click . When you have created the new configuration, the name of this configuration will appear in the list.

To set a survey configuration for the job:

- From the **GPS+ Config** drop-down list of available configurations, select the required configuration.
- From the **Optical Config** drop-down list of available configurations, select the configuration for the Total Station or Level mode.
- After selecting the survey configurations for your job, click



to store settings, which will be used each time you start a survey, and to return to the Home screen.

NOTICE NOTICE

Both types of configurations can be selected for one job. They will be used with the device selected upon [Connections](#): Optical or GPS+.

Configurations

The Configurations dialog presents a list of available survey configurations: names and types. Survey configurations are stored in the *Styles.tsstyles* file in the MAGNET Field directory. Magnet Field contains a list of pre-defined configurations that you can use or modify.

You can customize the list of the configurations to include only ones you need:

- Highlight the name of the configuration.
- Click the **Delete** button to remove the configuration from the list.
- Click the **Edit** button to change the highlighted configuration to suit your survey preferences.
- Click the **Add** button to create a new configuration.

Creating / editing a survey configuration is accomplished with the help of a Wizard. Find out [more...](#) on GPS+ configurations and [more...](#) on optical configurations.



Coordinate System

To set the coordinate system for the Job:

1. Select the **Projection** to be used in the job. MAGNET Field has many pre-defined projections and tabular projections, which are selected during the MAGNET Field installation.
2. **Use Grid/Ground** to convert to ground coordinates if required.
3. Specify the **Datum** as required. MAGNET Field has a lot of cataloged datums.
4. Select the **Geoid** to bring to elevations if necessary. MAGNET Field has a lot of geoid files, which are selected on MAGNET Field installation.

[Find out more...](#)



Units

You can set different units and the precision for how MAGNET Field will display various numerical values in dialogs:

- [Distance](#) (including area and volume)
- [Angle](#)
- [Coordinate](#) precision
- [Temperature and pressure](#)

On the **Distance** tab, select as required:

- **Distance unit** for any length values. That can be Meters; IFeet - (1 International ft = 0.3048 m); US Feet (1 US survey ft = 1200/3937 m); IFeet and Inches, US Feet and Inches (the latter two are calculated by taking into account that 1 ft = 12 in), IChains (1 International ch = 66 International ft) or USChains (1 US survey ch = 66 US survey ft).

NOTICE**NOTICE**

If the selected units are USfeet, linear values can be entered as meters or IFeet by appending "m" or "if" to the entered value. If the selected units are in meters, then a linear value in USFeet or International feet can be entered by appending "f" or "if" to the end of the entered value. If the selected units are in IFeet, linear values can be entered as meters or USfeet by appending "m" or "f" to the entered value. The appended characters "m", "f", or "if" are case insensitive. In other words, enter "M", "F", or "IF".

NOTICE**NOTICE**

When using IFeet and Inches or US Feet and Inches the following format is observed: f.ix, where f is feet, ii is inches and x is 1/8th of an inch.

- **Distance precision** for the number of decimal places in length values.

NOTICE**NOTICE**

To display only integers, select "0" and so on. To display 5 decimal places, select "0.12345".

- **Area unit** for area values
- **Volume unit** for volume values

On the **Angle** tab, select as required:

- **Angle unit** for angular values. That can be **DMS**, represented as ddd mm ss (the full circle contains 360 degrees) or **Grads (Gons)** - the full circle contains 400 grads (gons).

NOTICE**NOTICE**

Azimuth can be entered as two points separated by "-", " ", or ";". Certain angles can be entered as three points

separated by "-", ",", or ";". For instance a value of 100-101 indicates the Azimuth from Point 100 to Point 101.

- **Angle precision** for the number of decimal places in angular values. [More...](#)
- **COGO angle unit** for angular values in COGO tasks. In addition to **Angle unit** settings, that also can be **Radians** (the full circle contains $2 \cdot \text{PI}$ radians); or **Mils** (1 Mil = 1 Milliradian = $1/1000$ of a Radian)
- **COGO angle precision** for the number of decimal places in angular values in COGO tasks. [More...](#)

On the **Coordinate** tab, select as required:

- **Northing/Easting precision** for the number of decimal places in Northing/Easting coordinates. [More...](#)
- **Lat/Lon precision** for the number of decimal places in latitude/longitude seconds.
- **Height precision** for the number of decimal places in ellipsoidal heights and elevations. [More...](#)

On the **Other** tab, select if necessary:

- **Temperature unit** only for the raw measurements. That can be Celsius (C) or Fahrenheit (F).
- **Pressure unit** only for the raw measurements. That can be mmHg, hPa, inHg or mbar.



Display

You can configure the display of the following settings:

- **Coordinate Type** to view coordinates for the coordinate system selected
- **Coordinate Order** to display: Northing/Easting/Height or Easting/Northing/Height, X/Y/Z or Y/X/Z

- ***Azimuth Origin*** to display the azimuth computed from either reference directions: North, South, East, or West
- ***Disp Dir As*** to view directions as bearings or azimuths
- ***Disp CL Pos As*** to display stations or chainages (distance along the centerline) for stationing the centerline
- ***Full Station*** to set one full station that was always 100 units traditionally

For example, when using 100 m as a full station, a position at the distance of 341.256 m (chainage) from station 0 + 00 is designated 3 + 41.256. The numbers to the left of the plus are hundreds of meters (even full stations) and to the right of the plus are tens and units of meters to the nearest 0.001 m (a remainder of a station).



Alarms

You can configure alert conditions:

- On the Main tab, check ***Audible Alarm*** to enable audible alarms. The alert will sound automatically when an alert situation occurs.
- On the Controller tab, place check marks in the ***Power Alarm*** and ***Memory Alarm*** boxes to select the alert conditions of low power and memory in the controller.
- On the GPS+ tab, place check marks in the ***Power Alarm*** and ***Memory Alarm, Radio Link*** and ***Fix-Float*** boxes to select the alert conditions of low power and memory, poor radio link, and loss of initialization in the GNSS receiver.
- On the Optical tab, place check marks in the ***Power Alarm*** and ***Track*** boxes to select the alert conditions of low power and loss of the target in automatic tracking mode for optical instruments.

GPS Survey Configurations

To create a new configuration:

1. Enter the *Name* for the configuration that will be displayed in the Configurations list.
2. Select the survey *Type* that depends on the equipment you will use and the results you need to obtain.

MAGNET Field provides configurations for the following GPS+ survey types:

- [RTK](#)
 - [Network RTK](#)
 - [Network DGPS](#)
 - [Real Time DGPS](#)
 - [Generic NMEA](#)
 - [PP Static](#)
 - [PP Kinematic](#)
 - [PP DGPS](#)
3. From the *Corrections* drop-down list, select the type of correction data that will be used for survey if the Network RTK, RT DGPS, or Network DGPS survey type is chosen.
 4. If required to log rover data for post-processing in a real-time survey, select and enable the *Post Processing* box.
 5. Click **Next**. The wizard will set default parameters specific for the equipment selected.

Receiver Make

Set general conditions for the survey, and click **Next**:

- To access GPS real-time surveys and stake routines without using real hardware, select the *Simulation mode* check box.
- In the *Rover* field, designate the *Manufacturer* of the rover receiver. MAGNET Field supports Topcon and Sokkia.

- In the **Base** field, designate the **Manufacturer** of the base receiver, if required.
- Select the **Post Processing** check box to store raw observations and process them later.

RTK Survey

Real-Time Kinematic survey implies use of a pair of receivers operating simultaneously and a radio link established between the two receivers. From a functional point of view, the two receivers will differ from each other. One of the receivers (a Base) is located at a fixed point with known coordinates. The base receiver will transmit the data via a radio link to the other receiver (a Rover) to compute differential corrections. To establish a proper connection between the two receivers, specify the necessary communication parameters first.

To configure an RTK survey:

- [Configure the base receiver](#)
- [Configure the base radio](#)
- [Configure the rover receiver](#)
- [Configure the rover radio](#)

Base Receiver

To configure the base receiver:

1. From the **Receiver Model** list, select the model of the receiver you are using as the base.
Note: **Topcon Generic** selection will work with all receiver models including GR-3 but some functionality, like automatic SBAS satellites tracking, will not be accessible.
2. The **Ext. Receiver** box is always checked and is enabled for devices that have internal receivers. The connection for external receivers can be **Bluetooth** and **Serial**.
3. Set **Elevation Mask**. Usually the default 13 degrees is appropriate. Data from satellites below this elevation will not be used.

4. From **RTK Format**, select the format for the differential corrections data transmitted by the base radio.
5. From the **Antenna** drop-down list, select the type of the antenna used at the base.
6. Set the **Antenna Height** and height type. The height type can be either **Vertical** when the height is measured to an ARP (the antenna reference point, usually the middle bottom of the antenna) or **Slant** when the height is measured to the antenna edge.
7. Click **Peripherals** to enable the Multiple Ports option if needed to transmit data from different ports of the base receiver to peripherals.
8. Optionally, you can turn off the charger mode for the receiver's internal battery if it is available. To do this, select the **Receiver Settings** option from the pop-up menu that displays by clicking



in the top left corner. [More...](#)

9. Optionally, you can set relative calibrations for the base antenna. To do this, click **Use relative calibrations** in the pop-



up menu (the check will appear near the option name). The default is the use of absolute calibrations. All antenna calibrations are referenced to the ARP. You can find details on antenna calibrations at the NGS site [here](#).

10. Click Next.

Base Peripherals

Select the **Multiple Ports** check box, and then select the number of ports to use for base output if required.

Additional dialogs will appear later in the wizard sequence to setup parameters for each port.

Receiver Settings

When an external power supply is used at the base, and the receiver charger mode is turned on, it supplies power to the receiver battery. You can connect an external power supply without charging the receiver battery.

To do this:

1. Select the *Turn Charger Mode Off* check box.



2. Click  to save the setting.


Radio

Radio modems are used in GPS real-time surveys. The base radio is intended for transmitting differential corrections and the rover radio is used for receiving them. Also, there can be some radios that may be configured for output NMEA messages if required.

To configure the radio:


1. Select the *Radio Modem* type from the list of pre-defined modem types. The list contents depends upon the survey configuration and the receiver model selected.
Note: For a Network survey, in the *Network Type* field, select either the existing network connection or dialup.
2. If you use a AirLink CDMA or GPRS radio modem, select the *Modem Register* option from the pop-up menu that displays by



clicking  in the top left corner to register the radio modem. [More...](#)

3. Optionally, you can configure RE-S1 Repeater for the rover radio. To do this, select the *Config RE-S1 Repeater* option from



the pop-up menu that displays by clicking  in the top left corner. [More...](#)

4. Specify communication parameters for the receiver **Port** that the radio is connected to: **Parity**, the number of **Data** bits, **Baud** rate, the number of **Stop** bits, which are specific to the connected modem.
5. If required, click **Defaults** to return all the communication parameters to the default settings.
6. Click **Next** to specify the [Radio Parameters](#).

Modem Register

AirLink GPRS and AirLink CDMA require registration.

To register the modem:

1. Select **Provider**.
2. Enter **Register Information: Net ID, Password** and **Phone Number**.
3. Click the **Defaults** button to set the default data.
4. Click the **Register** button to pass registration.

Radio Parameters

Specify parameters for the radio selected:

- AirLink GPRS, CDMA, CDPD1, CDMA2000, Generic, Sierra Wireless MP200 CDPD modem types do not require setting any parameters for the base radio.
- Other modems require additional parameters to be set.

For more information see:

[AirLink CDMA\(MUDP\)](#)

[Digital UHF](#)

[FH915Plus](#)

[Internal Satel](#)

[Internal HiPer Lite Radio](#)

[Pacific Crest](#)

[UHF Satel](#)

- [Cellular Modem](#)
- [Internal CDMA](#)
- [Rover AirLink CDMA](#)
- [Rover AirLink CDPD](#)
- [Rover AirLink GPRS](#)
- [Rover Internal CDMA](#)

Base Multicast

To set IP addresses for communication between the base and several rovers using UDP protocol:

1. In the **Address to Add** field, enter the IP address as required.
2. Click **Add** to add the IP address to the list.
The **IP Addresses list** displays all IP addresses available.
3. Click **Delete** to delete an address from the list.

Cell Phone

To set phone information:

1. For the base radio, enter the **Base PIN**.
2. For the rover radio, enter the **Rover PIN** and the **Base Phone Number** that can be added to a **Phone number list**.

Digital UHF

To set parameters for the Digital UHF radio:

1. Select the **Revision** type of digital UHF radio used: either **Digital UHF** or **Digital UHF II**.
2. Select an appropriate operation **Protocol** for data transmitting/receiving:
 - **Simplex** is the default. This is ArWest's proprietary protocol. It only works with other ArWest (Digital UHF) radios.
 - **Trimble** works with Trimble Trim Talk and Trim Mark Radios.
 - **PDL** works with existing PDL radios and Hiper XTs set in PDL mode.

3. Select the type of **Modulation** for the radio modem. Select either DBPSK/DQPSK if using the Simplex protocol or GMSK if using Trimble or PDL.
4. Select the channel **Spacing** step: either 12.5 or 25 kHz or Do not set (the default). This is a hardware set.
5. Enable/Disable **Scrambling**: either Set up (the default) or Don't set up. When set up, it provides more robust data communication over high interference areas.

FH915 Plus

To set parameters for the FH915 Plus radio:

1. Select the **Location** to adjust the frequency range and RF power level depending on the country.
2. Set the operation **Protocol**. Select FH915 Ext if all receivers on the job site are equipped with FH915Plus radios.
3. Set the **Channel** number. This feature allows up to ten simultaneously transmitting radio modems, without interference, at the job site (1 is the default).

Int Satel Parm

To set parameters for the internal Satel radio:

1. Select **Satel FCS On** (default) or **Satel FCS Off**. In Free Channel Scan mode, the radio modem will regularly scan the current operating frequency and under certain conditions it can switch to the next frequency.
2. Or select **PDL** (PacCrest) operation protocol.

Internal HiPer Lite

Set the **Channel** number. This feature allows up to five simultaneously transmitting radio modems, without interference, at the job site (1 is the default).

Pacific Crest Radio Parm

To set parameters for the Pacific Crest radio:

1. Select the *Channel* number from 0 to 15.
2. Set the *Sensitivity* of the radio to *Low*, *Medium* or *High*, or turn it *Off*.

UHF Modem

To set parameters for the internal UHF radio:

1. Select the compatibility *Protocol*.
2. Set the *Channel* number.
3. Select the output *Power* value for the base radio.

Satel Radio Parm

To set parameters for the Satel radio:

1. Select the *Model* of the Satel modem.
2. Select the *Channel* number. *Frequency* displays the corresponding value for the channel number selected.
3. If required, set *PCC Mode* (Pacific Crest Corporation).
4. In *FEC*, select if you want to use the Forward Error Correction technique to maximize data communication.

Rover CDMA Parm

Set the IP address for communication between the rover and the base.

1. Enter the CDMA address of the base radio in the *Base CDMA Address* field.
2. Press **Add** to add the address to the *IP Addresses list*.

Rover CDPD Parm

To set the IP address for communication between the rover and the base.

1. Enter the CDPD address of the base radio in the *Base CDPD Address* field.
2. Press **Add** to add the address to the *IP Addresses list*.

Rover GPRS Params

To set the IP address for communication between the rover and the base:

1. Enter the GPRS address of the base in the *Base GPRS Address* field.
2. Press **Add** to add the address to the *IP addresses list*.


Rover Receiver

To configure the rover receiver:

1. From the *Receiver Model* list, select the model of the receiver you are using as the rover. Note: *Topcon Generic* selection will work with all receiver models including GR-3 but some functionality, like automatic SBAS satellites tracking, will not be accessible.
2. The *Ext. Receiver* box is always checked and unavailable for every receiver model in the Receiver Model list except GRS-1. MAGNET Field directly installed on the GRS-1 can use GRS-1's internal GPS receiver.
3. Set an *Elevation Mask*. Typically the default 13 degrees is appropriate for the base and rover. Satellites below this elevation will not be considered.
4. From *RTK Format*, select the format for the differential corrections data transmitted by the rover radio.
5. In Network survey, set the *Protocol* for data transmission: *NTRIP*, direct *TCP/IP*, or *CSD* technology.
6. From the *Antenna* drop-down list, select the correct antenna type used on the rover side.
7. To set the default antenna height, enter a value in the *Antenna Height* field. The height type can be set to either *Vertical* when the height is measured to an ARP (the antenna reference point, usually the middle bottom of the antenna) or *Slant* when the height is measured to the antenna edge.
8. Click *Peripherals* to enable options to configure selected peripherals in the dialogs later. [More...](#)


- Optionally, you can turn off the charger mode for the receiver's internal battery. To do this, select the **Receiver Settings** option



from the pop-up menu that displays by clicking  in the top left corner. [More...](#)

- Optionally, you can instruct the rover to use relative calibrations on the base. To do this, click **Relative calibrations**



on base in the pop-up menu (the check  will appear near the option name). The default is the use of absolute calibrations. All antenna calibrations are referenced to the ARP. You can find details on Antenna Calibrations at the NGS site [here](#).

- In Network RTK survey you can set a fixed position for a GGA message from the rover receiver. To do this, click **Use fixed GGA position** in the pop-up menu to enable and **Set fixed GGA position**. [More...](#)

Position for GGA

If required, set a fixed position for GGA message from the rover receiver.

You can do this in one of the following ways:

- Click the **Map** selection button and select the point on the map. The point position values appear in the coordinate fields.
- Click the **List** selection button and select the point in the list. The point position values appear in the coordinate fields.
- Enter the coordinate values in the edit fields.

RE-S1 FH915 Repeater

If required, the RE-S1 modem can be used as a stand-alone repeater to increase the range between the Base and Rover in spread spectrum systems.


To configure the RE-S1 Repeater:

1. Select the **Enable RE-S1 Repeater configuration** check box to enable further configuration of the RE-S1 as a repeater.
2. From **Connect Type**, select the type of connection of the repeater: either to the **Receiver** or to the **Controller** to setup the modem.
3. In **Connect Port Setup** set the properties of the connection port. Press **Defaults** to set the port properties to the default values.
4. Press Next and configure the modem parameters:
 - Select the **Location** to adjust the frequency range and RF power level depending on the country.
 - Set the operation **Protocol**.
 - Set the **Channel** number. This feature allows up to ten simultaneously transmitting radio modems, without interference, at the job site (1 is the default).


Rover Receiver Peripherals

If required, select any option to work with peripherals:

1. Select the **NMEA Ports** check box to configure the output of the NMEA messages. Select the number of ports from the drop-

down list that appears and click . Additional dialogs will appear later in the wizard sequence to setup parameters for each port and specify NMEA messages for output. [More...](#)

2. Select the **Multiple Ports** check box to configure multibase input for the rover. Select the number of ports from the drop-

down list that appears and click . Additional dialogs will appear later in the wizard sequence to setup parameters for each port. Note: Use only one radio to receive corrections from the base.

3. Select the *mmGPS+* check box to configure the mmGPS+ system. Click *Parameters* to specify them. [More...](#)
4. Select the *External Laser* check box to configure the laser device that can be connected either directly to the *Controller* or through the *Receiver*. Click *Parameters* to specify them. [More...](#)

Output NMEA

To configure the *NMEA Messages* for output:

1. Select the check boxes near the types of messages as required. [More...](#)
2. Select the *Set GP as Receiver Talker ID* check box to instruct the receiver to use "GP" as Talker ID in appropriate NMEA sentences generated. This enables support of Goggle Maps that cannot recognize default "GN" or "GL" as Talker IDs in these messages.
3. Enter the *Interval* in seconds in which the application will output the messages (up to 0.1 sec.).

List of NMEA messages

The following *NMEA Messages* are available for output:

- *GSA* to output the operation mode of the GNSS receiver, the satellite used for positioning, and DOP.
- *GLL* to output data on the current latitude/longitude and positioning mode.
- *VTG* to output the traveling direction and velocity.
- *GRS* to output the residual error of distance for each satellite. This is used to support RAIM.
- *ZDA* to output the UTC, day, month, year, and local time zone.
- *GST* to output the statistics of position errors.
- *GNS* to output data on time, position, and positioning of GPS+GLONASS (GNSS).
- *GGA* to output data on time, position, and positioning.

- **GSV** to output the number of satellites, satellite number, elevation angle, azimuthal angle, and SNR.
- **HDT** to output the direction (heading).
- **P_ATT** to output attitude parameters.
- **RMC** to output time, date, position, course and speed data provided by a GNSS navigation receiver.
- **ROT** to output rate of turn.
- **GMP** to output GNSS map projection fix data.

mmGPS+

In mmGPS aided RTK survey, a wireless sensor connected to the Rover picks up the signals from the laser transmitter for accurate (millimeter) elevations.



NOTICE

When measuring the height of the Rover antenna, include the height of the sensor with a 5/8 inch plug.

To configure the mmGPS+:

1. Select the **Receiver port**, which is connected to the mmGPS+ Sensor.
2. Select the **Sensor Gain** to adjust the gain on the mmGPS+ Sensor. Select Auto to automatically control the mmGPS receiver's detection level of the transmitter's signal.
3. Enter the **Height Difference Limit** value to set the threshold for the difference between GPS and mmGPS+ height measurements. If the GPS+ height and mmGPS+ height differ by more than the amount entered, the mmGPS+ icon will change to warn the user.

Laser Configuration

To configure the **External Laser** instrument connected to the **Receiver** or to the **Controller**:

1. Select the laser *Manufacturer*. Currently, **Magnet Field** supports MDL and Laser Technology, Inc.
2. Select the *Model* of the Laser Instrument.
3. Select the *Type* of laser measurement system if it uses Encoding or not.
4. Set *Laser Port Setting* including port, parity, data, baud and stop rates to connect to the Laser Instrument.

Survey Parameters

The survey parameters are associated with the type of the survey.

To set the parameters that will be used during a survey:

1. From the *Solution Type* drop-down list, select the solution type for each position computation in a real-time survey as required. Data will be considered only if the solution type satisfies this selection. What is displayed in the list for selection depends on the type of selected survey. There can be a combination of the following solution types:
 - **Fixed mmGPS+**: indicates that the positions were Fixed Only solution with mmGPS+ calculated height.
 - **Fixed Only**: indicates that positions were computed by the RTK engine using the carrier phase measurements from Base and Rover receivers. Integer ambiguities were fixed.
 - **Float mmGPS+**: indicates that the positions were Float solution with mmGPS+ calculated height.
 - **Float**: indicates that the positions were computed by the RTK engine using the carrier phase measurements from base and rover receivers. Integer ambiguities, however, were NOT fixed. (Their float estimates were used instead.)
 - **DGPS**: indicates that the positions were achieved using the pseudo-range measurements from base and rover receivers.
 - **All**: indicates that the positions were computed using all the epochs accepted, including autonomous solutions.

- **Auto**: indicates autonomous positions when differential corrections are not available.
2. In the **Auto Accept** field, set the following parameters for auto-storing positions in a stationary survey:
 - Select the **Num Meas to Avg** check box and, if it is to be used in the logging, in the edit field enter the number of measurements required before a point can be saved. The default is 3.
 - Select the **Precision** check box and, if they are taken into account, in the edit fields enter the horizontal and vertical accuracy in meters required before a point can be saved. The defaults are 0.015 m and 0.030 m, respectively.
 - Note: If both the check boxes are selected, both these conditions must be satisfied before the point is saved.
 3. In the **Auto Topo** field, set the following parameters for auto storing positions in the dynamic survey:
 - From the **Method** drop-down list, select the method for setting the interval between the received epochs: by time, by horizontal distance, or by slope distance.
 - In the **Interval** edit field enter the value of this interval.



NOTICE

Every survey parameter can be changed with the help of the Settings button from any Survey screen in GPS+ mode.

Stakeout Parameters

To set the parameters that will be used during a GPS stakeout:

1. In the **H_z Dist Tolerance** edit field, enter the horizontal distance tolerance value. This is used to determine when you are close enough to the point for the bull's eye to show up.
2. From the **Reference Direction** drop-down list, select the reference direction that will be used in point stakeout. It can be


- North, moving direction, or the direction to the reference point (azimuth).
3. From the ***Solution Type*** drop-down list, select the solution type to filter the type of solutions that will be used for the stakeout. There can be a combination of the following solution types:
 - ***Fixed mmGPS+***: indicates that the positions were Fixed Only solution with mmGPS+ calculated height.
 - ***Fixed Only***: indicates that positions were computed by the RTK engine using the carrier phase measurements from Base and Rover receivers. Integer ambiguities were fixed.
 - ***Float mmGPS+***: indicates that the positions were Float solution with mmGPS+ calculated height.
 - ***Float***: indicates that the positions were computed by the RTK engine using the carrier phase measurements from base and rover receivers. Integer ambiguities, however, were NOT fixed. (Their float estimates were used instead.)
 - ***DGPS***: indicates that the positions were achieved using the pseudo-range measurements from base and rover receivers.
 - ***All***: indicates that the positions were computed using all the epochs accepted, including autonomous solutions.
 - ***Auto***: indicates autonomous positions when differential corrections are not available.
 4. In the ***Auto Accept*** field, set the following parameters for the auto-storing of staked points:
 - Select the ***Num Meas to Avg*** box if required to use the number of measurements to average before logging a point. The default is 3. If you want to enter your own number, enter the value in the field.
 - Select the ***Precision*** box if required to take into account the horizontal and vertical precision tolerances for GPS vector in meters that should be met before a point is saved. The defaults are 0.015 m and 0.030 m, respectively. If you want to enter your own precision tolerances, enter the values in the fields.

NOTICE NOTICE

If both the boxes are checked, both these conditions must be satisfied before the point is saved.

5. Select the **Display** option from the pop-up menu that appears by



clicking  in the top left corner of the dialog if required to specify an icon for the staked point. [More...](#)

6. Click **Next** to set the parameters for storing staked points in the **Store Staked Point As** fields:
 - The **Point** name can be set to the design point, next point, design point with a predefined prefix, design point with a predefined suffix. [More...](#)
 - The **Note** can be set to the design point, design point with a prefix or design point with a suffix. [More...](#)

Defining names for the staked points

The Point name can be set to either design point name, next point name, design point with a pre-defined prefix (that is, stk_01, where “stk_” is the prefix), or design point with a pre-defined suffix. The choice of the prefix or suffix appears only when the corresponding item is chosen from the drop-down menu. Also, a specified numerical constant can be added to automatically generate the staked point name. For instance, if the constant specified is 1000, and the design point is 100, the staked point would be named 1100 (that is, 100+1000). If the design point is alphanumeric, the constant is appended to the name. For example, for the design point ALPHA, the corresponding staked out point is named ALPHA1000.


Setting notes for the staked points

The Note can be set to either design point name, design point with a prefix, or design point with a suffix. Also, it can be Station & Offset information. If the Station & Offset option is activated, an edit box for entering an alphanumeric prefix appears. For the United States, this

prefix is “Sta”, for the international markets the prefix is “Cha”, and for the Korean/Japanese markets the prefix is “No”. With this option activated, depending on the choice for the prefix, MAGNET Field automatically generates one note for each stakeout point: Sta5+5.5R5.0, Cha505.5R5.0, or No.5+5.5R5.0 respectively.

Staked Point Icon

To define the icon for staked points to display on the map:

1. Select the *Use icon for staked point* box to enable settings.
2. In the *Staked Point* field:
 - From the *Icon* drop-down list select the icon appearance that will be reflected in the window.
 - In the *Color* field press the  button to set the color for the icon in the dialog. [More...](#)

Color Palette

This palette allows you to select the color for the objects to be displayed on the map.

To do this:

1. Click on the box of the desired color to highlight it.
2. Click the ok button to return to the Staked Point Icon dialog to view the colored icon.

Advanced Parameters

This dialog allows you to change advanced signal processing parameters:

- The *Satellite System* to use from the default *GPS and GLONASS* to *GPS* only.
- From *RTK Position*, the method of RTK corrections definition: *Extrapolation* or *Matched Epoch* (sometimes described as asynchronous or synchronous, respectively).

- Select the **Track L2C Satellites** check box to enable L2C signal tracking.
- Select the **Track L5 Satellites** check box to enable L5 signal tracking.
- By default the **Multipath Reduction** is selected to enable the use of a special signal processing technique for reduction of C/A code phase multipath.
- Select the **Co-Op Tracking** check box to involve additional resources for acquisition of the signal, phase- and delay-lock loops.
- Select the **Canopy Environment** check box to allow the RTK engine to use less rigid thresholds when filtering out measurement outliers. This mode is recommended when working under tree canopy or in other cases of high multipath.
- From the **Base Station Make** drop-down list, select the manufacture of the Base receiver to designate Base Make (IGS Class) used by the Rover receiver to account for GLONASS biases.
 - Select **Other** for the base receiver of another class that is included in the IGS list.
 - Select **Unknown** for the base receiver's class that is not included in the IGS list.
 - By default, it is set to **Automatic Detection** to override the Base Make automatically detected by the Rover receiver if this information is transmitted by the Base.

 **NOTICE**

This option requires a Topcon receiver f/w at rover 3.4 or higher.

- Select the *RTK Settings* option from the pop-up menu that



appears by clicking in the top left corner of the dialog if required to set more advanced parameters. [More..](#)

Miscellaneous (GPS) Parameters

The Miscellaneous dialog is used to customize the user interface:

- *Display coordinates after measurement*: when selected (by default), computed coordinates are displayed automatically after a GPS measurement is performed and before the point coordinates are stored into the database.
- *Prompt for antenna height*: when selected (by default), prompts for a height of the antenna before a point is stored.
- *Beep on storing points*: by default this is turned on to beep each time the point is stored.
- *Auto-connect to server*: when selected (by default), an automatic connection to the server is established in a Network survey.
- *Check signal quality*: select the box to check the signal quality for the radio link in a Network survey.
- *Auto-disconnect from server*: when selected (by default), an automatic disconnection from the server is performed in a Network survey.

RTK Settings

This dialog allows you to set the following parameters to govern the RTK engine:

- *Ambiguity Level*: this three-state parameter is a simplified version of a float ambiguity fix indicator the RTK engine uses when fixing integer ambiguities. *Low*, *Medium* and *High* selection correspond to the indicator's 95%, 99.5% and 99.9% thresholds, respectively.

The higher the confidence level specified, the longer the integer ambiguity search time.

- **Resolution Period:** defines the interval in seconds for Base Transmission / Rover Reception period at which the ambiguities estimation is performed.
- **Expected Correction:** sets the differential correction update interval for the base station, effective only in the RTK Matched Epoch mode. The value should be set to the exact rate during which the base station transmits differential correction data. This parameter will instruct the rover receiver to output the RTK position at the same rate at which differential corrections are updated.

Network RTK

Network Real Time Kinematic is similar to [RTK survey](#) but implies that the Rover uses RTK correction data received from operating reference station networks to compute its position. Today's operating reference station networks are creating various sets of data.

To configure the Network RTK:

1. Name the configuration, and select the **Network RTK** type in the [Survey](#) dialog.
2. Select the desired **Corrections** type:
 - **VRS** – to receive Virtual Reference Station data.
 - **MAC** –to use Master-Auxiliary Concept data.
 - **FKP** – to use network area corrections.
 - **Single Base** – to receive RTK corrections from a single base.
 - **External Config** – when the receiver uses an External program to configure RTK corrections.
3. Configure the [Rover Receiver](#). As required, select one of the following protocols from the **Protocol** drop-down list.

- **NTRIP** – select to receive RTK corrections from the Internet through NTRIP Caster. You have to obtain the user name and password for NTRIP server.
 - **TCP/IP** – select to receive RTK corrections from the Internet.
 - **CSD Data** – select to use the CSD form of data transmission to receive RTK corrections via a cellular phone.
4. On the [Modem Connect](#) dialog select the device the modem is connected to.
 5. For internet connection, enter the settings in the [Modem Internet Info](#) dialog. If needed, select the Use GPUID box to turn on the method of GPUID authorization.
 6. For server connection, enter the user name and password in the [Login Info](#) dialog.
 7. Enter dialup information in the [Modem Dialup Info](#) dialog if required.
 8. Select a virtual radio port for data input in the [Modem Receiver Info](#) dialog.
 9. For radios connected to the Receiver, configure the receiver port for connection and the [Rover Radio](#) parameters.

Modem Connect

To configure the modem connection:

1. Select **Receiver** if the modem is connected with the receiver.
2. Select **Controller** if the modem is connected with the controller.

Modem Dialup Info

To set parameters for a dialup internet connection:

1. Enter the **Dialup Number** needed to make the internet connection.
2. Enter the **User ID** for the server.
3. Enter the **Password** to log into the server with the entered user ID.
4. Enter the **PIN** number for the server.

5. To set the values to default, click the *Defaults* button.

Modem Internet Info

To enter information for an internet connection:

1. Enter an internet *Address* that will be used for the connection in the *IP* or *Web* format (select the radio button as required).
2. If required, enter a *Name* for the address which displays in the address list.
3. Press **Add New** to add the address to the *Address list*. New IP/ Web addresses/ports can be deleted or added to the list.
4. Press **Update** to update the address in the address list.
5. You can select an address by double-clicking on it in the list.

Login Info

Enter your *User ID* and *Password* to log into the server with these credentials.

Modem Receiver Info

The *Virtual Radio Port* for AIM (Advanced Input Mode) is automatically selected from the following default values:

Product	Virtual port (BT connection)	Virtual port (Cable connection)
GR-3	B	B
Hiper	D	B
Hiper II	A	D
GRS-1	C	D
GRX1	A	D

Network DGPS

Network Differential GPS implies the usage of pseudorange corrections received from operating differential GPS reference station networks. The configuration of the Network DGPS survey type is similar to [Network RTK](#). The difference is that MAC data is not used and DGPS solutions are derived from Network DGPS survey (see [Survey Parameters](#)).

Real Time DGPS

Real Time Differential GPS implies that the rover receiver uses differential pseudorange correction data transmitted from DGPS services. Real Time DGPS survey is used in GIS applications.

A number of differential services exist to transmit differential correctional data, including maritime radio beacons, geostationary satellites (as with the OmniSTAR service), and SBAS (Satellite-Based Augmentation Systems) service.

To configure Real Time DGPS:

1. Name the configuration and select the *Real Time DGPS/NMEA* type in the [Survey](#) dialog.
2. Select the *Corrections* type to receive DGPS correction data from one source of differential corrections as required and also enabled for the receiver.
3. In [Receiver Make](#), select the manufacturer for the rover receiver: Topcon or Sokkia.
Note: When *SBAS/Autonomous* correction type is selected, [Generic NMEA](#) will appear in the Manufacturer drop-down selection list.
4. Configure the [Rover Receiver](#).
5. Configure the appropriate parameters for the differential source selected:
 - *User Base* configuration is similar to [RTK](#)
 - [Beacon](#)
 - [SBAS/Autonomous](#)

- **CDGPS** (Canadian nation-wide DGPS service), specify communication parameters for the receiver *Port* that the **CDGPS** radio is connected to: *Parity*, the number of *Data* bits, *Baud* rate, the number of *Stop* bits.
- [OmniSTAR-VBS](#) or [OmniSTAR-HP](#)

Config: Beacon

To configure settings for a radio beacon source for differential GPS corrections:

1. Select the **Country** where the radio-beacon based differential service is located.
2. Select the **Station** that provides broadcasting differential corrections for the rover.
3. Select the **Beacon Corrections from BR-1** check box if required to use the beacon receiver BR-1 as a source of differential corrections for the rover.
4. Select the **Automatic Scan Mode** check box if you want to enable this mode in BR-1 to get the Beacon signal automatically. BR-1 will search broadcasting frequencies and output RTCM corrections from the best signal.

SBAS Setup

This dialog contains settings for the Satellite-Based Augmentation Systems (WAAS, EGNOS, or MSAS) source of differential correction data. The availability of satellite signals depends upon the receiver type and location.

To configure SBAS:

1. For GR-3 and other new receivers that support automatic tracking, you can select one of two options for use of SBAS satellites: **Best Available** or **Custom**.
Note: If the Topcon Generic receiver was selected in the Rover Receiver dialog, custom setup is required. Not more than two SBAS satellites can be enabled for tracking in Topcon Generic receiver.

2. For custom selection, Select the boxes near the PRN numbers of the satellites as required.
 Note: All satellites can be selected. The satellite most available from those selected will be used in DGPS solution.
 - **PRN #, Name and Type:** These columns will list all possible SBAS PRN numbers with the respective names of the satellites and types of satellite systems.
 - **GPS #:** This PRN # applies only to the Topcon Generic receiver. One of currently unused GPS numbers should be selected in this column to be able to track this satellite in Satellite View dialog. To change, click GPS number and select the appropriate number from the pop-up menu.
3. Enable/disable use of ionospheric corrections from the SBAS satellite when computing positions. It is recommended to use ionospheric corrections.
 - **None:** ionospheric corrections are not used
 - **Apply if avail:** use ionospheric corrections if available
 - **Use sat only if avail:** use only the satellites for which ionospheric corrections are available.

Config: OmniSTAR

For OmniSTAR-VBS and OmniSTAR-HP (a wide-area, satellite delivered, differential Virtual Base Station and High Performance GPS services), select the name of the *Satellite* to be used. The availability of satellite signals depends upon the receiver type and location.

Generic NMEA

MAGNET Field supports [Real Time DGPS](#) survey on Topcon controllers with internal NMEA-standard GPS receivers (except GRS1). **Generic NMEA** configuration only implies reception of DGPS correction data from an SBAS system.

To configure this survey type:

1. Name the configuration, and select the *Real Time DGPS/NMEA* type in the [Survey](#) dialog.
2. Select *SBAS/Autonomous* in the Corrections drop-down list.
3. In [Receiver Make](#), select *Generic NMEA* in the Manufacturer drop-down list.
4. Configure the [Rover Receiver](#). The Receiver Model will be set to *Generic NMEA* and Antenna to *Unknown*.
5. Configure [SBAS/Autonomous](#) parameters.

PP Static

Post Processing Static survey is a post-processed survey using raw GPS data collected by two or more receivers at stationary occupations for a long period of time. In the office, the software operator processes the data collected in the field and calculates the relative position of the receivers. Differential processing takes place when data from two or more receivers are processed together in order to compute the receivers relative position. If the coordinates of one receiver are known, then the coordinates of the other can be calculated.

To configure the PP Static survey for one static receiver:

1. Name the configuration, and select the *PP Static* type in the [Survey](#) dialog.
2. Select the receiver vendor in the [Receiver Make](#) dialog.
3. Configure [Static Receiver](#).
4. Enter information for the raw data logging in the [PP Setup](#) dialog.
5. Configure the [Occupation Times](#).

PP Setup

Enter information for the raw data logging.

- **File name:** Select if the name of the receiver file is to be set automatically or by you. For the user-defined, the corresponding dialog box will display at the logging start.

- **Log To:** You can log only to the *Receiver*. Note: In PP DGPS survey, the raw data logging to the *Controller* is allowed.
- **Logging Rate:** Select the logging interval in seconds during which data is logged to the file. The default depends on the survey type.
- **Start Log:** Only for the rover PP setup in PP-enabled surveys, you can select *Manual* or *Automatic* to start logging.

- **Log corrections:** Only for the rover PP setup in PP-enabled standard and Network RTK survey (right now for Controller modem connection only), you can Select this box to allow logging additional checkout information about RTK mode for software developers.

Occupation / Initialization Times

This dialog contains timing settings for receiver loggings used in automatic mode during a PP Survey.

Note: The occupation times vary based on the number of satellites and the number of receiver frequencies. A minimum of four satellites is required.

Select the *Initialization time in minutes* to define initialization times. Generally the default settings are appropriate.

PP Kinematic

Post Processing Kinematic implies two receivers. One is fixed, and the other is moving along some trajectory like in [RTK](#). The processing of the collected data is performed later, just as it is for the [PP Static](#) type.

PP DGPS

Post Processing Differential GPS implies that the raw observations made by the Rover and Base receivers in [Real Time DGPS](#) has to be written to files for further processing.

Optical Survey Configurations

To create a new configuration:

1. Enter the *Name* for the configuration that will be displayed in the Configurations list.
2. Select the survey *Type* that depends on the equipment you will use and the results you need to obtain.

MAGNET Field provides configurations for the following Optical survey types:

- *Conventional* - standard survey with a total station and reflectors.
- *Reflectorless* - survey in which a reflector is not used.
- *Robotic* - survey can be performed by one person with a motorized instrument.
- *Level* - levelling with a digital level.

Instrument

To set an instrument for the survey:

1. Select the *Manufacturer* of total stations or levels. MAGNET Field supports Topcon and Sokkia, and also Gowin for total stations.
To simulate a real survey, select Manual Mode. In this mode, no measurements are performed. All the data is entered manually.
2. Select the total station or level *Model*.



NOTICE

The models shown in the list correspond to the chosen type of survey.

Connection mode

Initial Connection

Depending upon the type of the instrument, the connection mode can be the following: *Cable, Radio, Bluetooth, RC Unit, etc.*

Cable

Cable Comm Settings

The parameters of the cable connection include the following: Baud (baud rate), Parity, Data (number of the data bits), and Stop (number of the stop bits).

For a Digital Level, make sure the Output Module is set to RS232.

Survey Parameters

The Survey Params dialog contains the parameters that will be used by default during the survey.

Measurement Method

Sets the mode of side-shot measurements. It can be: Sideshot-Direct, Sideshot Direct/Reverse, and Angle/Dist Sets-Dir/Rev.

Angle Sequence

Sets the sequence of measured angles. Here FS is foresight point (the next occupation point), BS - backsight point (the previous occupation point), and Plunge term stands for flipping and rotating the total station telescope by 180 degrees. These are used for the reduction of the angle errors. Possible sequences are BS/FS Plunge BS/FS; BS/FS Plunge FS/BS; FS/BS Plunge BS/FS; FS/BS Plunge FS/BS; BS Plunge BS/FS Plunge FS; or FS Plunge FS/BS Plunge BS.

Num Sets

The number of measurement sets participating in the average. Here the Num Sets defaults to 1 and cannot be changed if Sideshot-Direct or Sideshot Direct/Reverse is selected in the Meas Method field. A choice of Angle/Dist Sets-Dir/Rev in the Meas Method field allows for NumSets to be greater than 1.

Tolerances

The admissible deviation values of the horizontal and vertical angles and the distance.

Auto Accept Meas

This is for use with the sideshot Meas Method "Angle-Dist Sets-dir/Rev" and "Sideshot-Direct/Reverse" for motorized surveys. If this option is checked, when the total station turns to the prism it will automatically take a measurement, then turn to the next point in the sequence. If unchecked, once the total station turns to the prism, you will be prompted to accept the measurement, then turn to the next point in the sequence.

Auto Advance Set

This is for use with the sideshot Meas Method "Angle-Dist Sets-dir/Rev" for Robotic and non-RC2 surveys. If checked, when each set is complete (if more than one set is chosen), the total station will automatically advance to the next set and continue the operation. If unchecked, when a set is complete, the user will be prompted to advance to the next set.

Distance Averaging

It determines if the distance used is measured using one signal or an average of several signals.

Measure Reverse Distances

Enables the reverse distance measurements. These are used for the reduction of the distance measurement errors.

Next

Opens the second Survey parameters dialog.

Survey Parameters

Meas Type

Sets the order and the type of the measurements in one set. Here: HA - horizontal angle; VA - vertical angle; SD - slope distance; HD - horizontal distance; VD - vertical distance.

EDM mode

Determines the sensitivity to use for the distance measurements - coarse or fine.

Prism Constant

The parameter of the prism, characterizing the difference between the reflection plane and the center of the prism.

Point Guide

Select this check box to operate the tracking lights.

Non-Prism

Set whether to use the prism or non-prism mode

AutoTopo (only for the Robotic survey)

The parameters of the automatic survey.

Stakeout Parameters

The Stakeout Params dialog enables you to set the parameters that will be used during a stakeout.

Horiz Dist Toler

Set the horizontal distance tolerance value.

Reference Direction

The Total Station Stakeout uses the location of the instrument as the Reference Direction.

Turn TS to Design Point

Turns the Instrument to the Design Point based on HA only or HA/VA, or in the Automatic HA, or Automatic HA/VA modes

Point Properties

Point Increment

Select if the point number is to be incremented when adding a new point.

Miscellaneous (Optical) Parameters

The Miscellaneous dialog is used to customize the user interface:

Display Coordinates after Measurements: when checked, computed coordinates are displayed automatically after a TS

measurement is performed and before the point coordinates are stored into the database.

Apply Earth Curvature and Refraction: corrects the computed heights for Earth Curvature (Vertical Distance) and slope distances and vertical angles for atmospheric refraction.

Prompt for Rod Height: when checked, prompts for a height of the Rod (Target) before a point is stored.

Prompt for BS Check: when checked, will bring up the Backsight Check dialog when the Backsight Setup dialog is exited.

Prompt for Codes: when checked, a dialog will appear to specify the code and attribute before a surveyed point is stored.

Stakeout sound: gives a sound indicator in Stakeout as the point is staked out.

Manual Stakeout Update (Robotic Only): when checked, the Meas button in the Stakeout dialogs must be pressed to make a measurement to the Robotic Total Station. When not checked the measurements are recorded continuously. This applies to the Stakeout dialogs only. NOTE: In conventional or reflectorless modes this option may be checked for the ENT button on controllers to invoke the MEASURE process; otherwise, the ENT key will MEASURE the first time in stakeout and then become a SAVE button.

Beep on storing points: beeps each time the point is stored.

VA Zero at Level: VA is set to Zero at Level.

Use Horizontal Angle Left: Horizontal Angles are measured counter-clockwise.

Automatically display BS Setup dialog: if checked, the Backsight Setup Dialog will be displayed automatically when you attempt to access any of the dialogs involving total station observations.

Hold Offset Measurement: if checked, the dialog to measure an offset point with the help of the selected offset tool displays automatically after each measurement.

Hold Vertical Offset: available only for the Digital Level. If checked, this is used to hold the Vertical Offset between measurements.

BS Is Always Required: if checked, a warning to set Backsight always displays when attempting to access any of the dialogs involving total station and level observations.

Search/Track (Topcon)

The Search/Track dialog contains the settings for the total station signal tracking in the Robotic mode.

Turning Speed

Sets the turn speed of a total station in revolutions per minute.

Start Search After

Sets the delay between the loss of the signal and the start of searching.

Pattern

Sets the program for the tracking and searching.

The *Normal* (for AP-L1A and GRT-2000) or *Pattern 1* (for the rest of the instruments) mode can be selected to search the prism at the point where the prism is lost. The Instrument searches in up and down directions gradually from the point where the prism is lost. The searching continues until the prism is found.

The *High* (for AP-L1A and GRT-2000) or *Pattern 2* (for the rest of the instruments) mode also can be selected to search for the prism. In this case the search pattern tries to locate the prism in a very short time. Instrument searches from up to down. The searching continues until the prism is found or a maximum of six attempts.

The auto tracking mode changes to manual mode when the prism cannot be found within six attempts and returns to the point where the prism was lost.

Trk Speed

Sets the speed for tracking. It can be slow, medium or fast, or, in the case of GTS800a model - Survey or Machine controlled.

Sensitivity

Sets the power of the accepted signal. It can be low, medium, or high.

Track Light

Sets if the light on the line of sight should be switched on, off, or the automatic mode is enabled.

Scan Range

Sets the width of the tracking signal. It can be narrow, middle or wide. Available only in the AP-L1A total stations.

Range

Sets the range of searching, in degrees, for the vertical and horizontal planes.

Search/Track (Sokkia)

The Search/Track dialog contains the settings for the total station signal tracking in the Robotic mode.

Search Area

Sets the area of searching or tracking, in degrees, for the vertical and horizontal planes.

Monitor Options

Log To

Select from options None, File, or communication ports.

If Log To File or a communication port is chosen, select from the following:

Output Type

Select whether to output *Raw Data* or *Coordinates*.

Output Format

For *Raw Data*, select whether to output FC-5, FC-6/GTS-7 or GTS-6 format.

For *Coordinates*, only GGA format is available.

File Name

If Log To File is chosen, enter the name and location of the file to log into.

Comm Settings



If a serial COM port is selected, enter the baud rate, parity, data and stop bits settings for the comm port.

Store As Check Point

When selected, the measurements are stored as Check Points to the original points in the monitor list; otherwise, they are stored as normal points.

Coordinate System


To specify the Coordinate System for the Job:

1. In **Projection** select the projection to be used from the drop-down list. Initially the list is empty. Click  to activate projections necessary for work. [More...](#)
2. Select the **Use NADCON** check box, available for all projections on NAD27 datum, to make the coordinates in MAGNET Field equal to the same from Corpcon (Coordinate Conversion Software).
3. Select the **Use Grid/Ground** check box to enable transformation to ground coordinates for surveying. Click  to set transformation parameters. Find out more on [Grid to Ground transformation](#).
4. In **Datum** specify the datum as required for the projection selected. Select the datum from the drop-down list.




NOTICE

The NAD83 datum has three independent realizations in MAGNET Field with respect to the WGS84 datum: NAD83, NAD83(ITRF96) and NAD83_NO_TRANS. [More...](#)

Click  to add a custom datum if necessary. [More...](#)

5. Select *Geoid* from the drop-down list. The job will refer to the selected geoid file to convert ellipsoidal heights to elevations.

Click  to add the geoid to the list. [More...](#)

NAD83 Datum Details

The NAD83 datum has three independent realizations in MAGNET Field with respect to the WGS84 datum: NAD83, NAD83(ITRF96) and NAD83_NO_TRANS to reflect the updates to these datums. The original intent was for WGS84 and NAD83 to be identical. The mathematical definition of the ellipsoids (WGS84 and GRS80) differs slightly due to the choice of defining constants and number of significant figures. The maximum discrepancy between a Cartesian X,Y, Z coordinate projected onto both ellipsoids is 0.1 mm at 45 degrees latitude. So consider the ellipsoids to be identical.

There is some confusion between the WGS84 and NAD83 datums. When NAD83 was first realized in 1986, it used the same control stations as WGS84, some of which were Doppler stations, which were accurate to about one meter. Consider the datums to be identical.

Since this time, there have been several realizations of WGS84, the latest being WGS84 (G1150), which was performed using data from IGS tracking stations collected during GPS Week 1150. Recent studies have shown that WGS84 (G1150) is essentially identical to the International Terrestrial Reference Frame of 2000 (ITRF00). Also, during this time there have been no new realizations of NAD83.

What this means is that WGS84 and NAD83 can no longer be considered identical and are in fact different by more than one meter. This is because the WGS84 datum has been updated over time, using GPS while the NAD83 datum has remained constant since 1986. However, most software manufacturers still consider WGS84 to be identical with NAD83.

To be compatible with other manufacturers, Topcon provides transformation parameters from WGS84 to NAD83 where all the parameters are zero. This means WGS84 equals NAD83. This set of datum transformation parameters is called NAD83 No_Trans.

Topcon also provides another set of datum transformation parameters called NAD83 which reflects the updates to WGS84. These parameters are taken from the National Geodetic Survey. Topcon only uses the first seven parameters, three translations, three rotations, and scale.

Projections

The Projections dialog contains a list of cataloged projections divided by regions, that can be chosen for use in the job.

To add a desired projection to the list in the Coordinate System dialog:

In the *Pre-Defined* panel:

1. Click the region node to expand the tree of available projections, and use the scroll bar to view the full list of projections.
2. Highlight the name of the desired projection.
3. Use the arrow button to select the chosen projection in the Pre-Defined panel and insert it into the Active panel.
4. Repeat the steps to add other projections.
5. Create a custom projection to the list of pre-defined ones by clicking the *Custom* button. [More...](#)


In the *Active* panel:

1. View all active projections.




2. Use  to delete a highlighted projection from the Active panel if required.



3. Click  to add the active projections to the drop-down list in the Coordinate System dialog.

Grid/Ground Parameters

To set Grid/Ground parameters:

1. In *Parameters*, select which set of parameters to enter: *Scale factor* ([more...](#)), *Average Job Height* ([more...](#)), or *Origin Point* ([more...](#)).
2. In Origin Pt and Scale Factor modes directly enter the *Combined Scale Factor* to be used in the transformation. In any Parameters mode resulting combined scale factor will be displayed at the bottom of the dialog for reference purposes.
3. In Avg Job Ht mode enter the *Map Scale Factor* from Ellipsoid to Grid to be used in the transformation.
4. In Scale Factor mode designate *combined scale factor transformation direction*. In Origin Pt and Avg Job Ht modes this *displays used direction*.
5. Enter the *Average Job Height* to be used in the transformation.
6. Enter the angle value of Azimuth Rotation directly if it is known.
7. Click  to calculate the rotation from azimuths on Grid and Ground. [More...](#) Azimuths/Bearings in turn can be calculated from points in the job. [More...](#)
8. In *Scale Factor* or *Average Job Ht* modes enter *Offsets of the origin along the North and East axes*. These offsets are from the Geodetic North -> Ground North.
9. In *Origin Pt* mode select from map, list or enter *the coordinates for the Origin Point*.
10. In *Origin Pt* mode enter *the coordinates for the Ground Point*.

Find out [more...](#) on how to perform Grid/Ground transformation.

Compute Rotation





To calculate Rotation from azimuths on Ground and Grid:

1. You can either manually enter the *Grid* and *Ground Azimuths* or click the [Compute](#) button to calculate azimuth using points in the job that define the needed directions.

2. Click  to compute *Rotation*.

Compute Azimuth/Bearing

To compute the azimuth by two points that define the direction:

1. In *From*, enter the name of the initial point or select the point from the map  or the list .
2. In *To*, enter the name of the terminal point or select the point from the map  or the list .
3. Enter an angle to *Add to Azimuth* if required.
4. View the computed *Azimuth*.


Custom Projections

This dialog contains a list of custom (user-defined) projections.

- Initially the *Projection* list is empty. Click the *Add* button to create a new custom projection and add it to the list. [More...](#)
- Click the *Edit* button to change a projection that was added to the list.
- Click the *Delete* button to delete a highlighted projection from the list.

Creating a Custom Projection

To create a new custom projection:

1. Enter a *Name* for the new projection.
2. Select a *Type* from the list of sample projections.
3. Select a *Datum* from the displayed list of datums, or click  to create a custom one ([more...](#)) and then select it.
4. Enter the *Region* to which the projection belongs. If no region is specified, it will be added to the Global list.


5. Enter a description (*Note*) for the projection.
6. Click *Next* to enter the new projection specifications depending on the selected sample projection type. [More...](#)

Custom Projection Specifications

Depending on the Type of projection selected, you are prompted to fill in some of the following fields.

1. Enter the latitude (*Lat0*) and longitude (*Lon0*) of a point chosen as the origin on the central meridian of the custom projection.
2. Enter the false Easting (*East0* or *E0*) and Northing (*North0* or *N0*) of the origin for the projection. These constant values are added to all negative Eastings and Northings to get only positive values of Easting and Northing.
3. Enter the *Scale* that sets a constant scale factor along the central meridian of the custom projection.
4. Enter the longitude of *Central Meridian* for the projection.
5. Enter the North and South latitudes bounding the area of the custom projection (*NorthLat* and *SouthLat*).
6. Enter the azimuth of the axis (*AxisAzimuth*) for the projection.



7. Click  to create the new projection and add it to the Projection list.



NOTICE

The Latitudes are positive for the Northern Hemisphere, and negative for the Southern Hemisphere. The Longitudes are positive for Eastern directions and negative for Western directions relative to the GMT line.


Custom Datums

This dialog contains a list of custom (user-defined) datums.

- Initially the *Datum* list is empty. Click the *Add* button to create a new custom datum and add it to the list. [More...](#)
- Click the *Edit* button to change a datum that was added to the list.
- Click the *Delete* button to delete a highlighted datum from the list.

Creating a Custom Datum


To create a new custom datum:

1. Enter a *Name* for the new datum.
2. Select an *Ellipsoid* from the displayed list of ellipsoids, or click  to create a custom one ([more...](#)) and then select it.
3. Enter a description (*Note*) for the datum.
4. Click *Next* to enter transformation parameters to convert from WGS84 to the new datum. [More...](#)

Custom Datum Specifications

MAGNET Field uses the seven-parameters Helmert Transformation Strict Formula for datum transformation.

To create a custom datum:

1. In *Offsets*, enter the Datum to Space (WGS84) offsets: dX, dY, dZ.
2. In *Rotations*, enter the Datum to Space (WGS84) rotations: rX, rY, rZ, in seconds.
3. Enter the *Scale* in ppm.
4. Click  to create the new datum and add it to the Datum list.

Custom Ellipsoids

This dialog contains a list of custom (user-defined) ellipsoids.


- Initially the *Ellipsoid* list is empty. Click the **Add** button to create a new custom ellipsoid and add it to the list. [More...](#)
- Click the **Edit** button to change an ellipsoid that was added to the list.
- Click the **Delete** button to delete a highlighted ellipsoid from the list.

Creating a Custom Ellipsoid

To create a custom ellipsoid:

1. Enter a *Name* for the ellipsoid.
2. Change the values of ellipsoid semi-major equatorial axis (*A*) and inverse flattening (*I/F*) as required.
3. Note: By default, the *A* and *I/F* fields contains the values for the most common reference ellipsoid defined by WGS84.
4. In *Note*, enter a description for the ellipsoid.



5. Click  to create the new ellipsoid and add it to the list of all the available Ellipsoids.

Geoids

Geoid is the physical reference surface of the Earth. Its shape reflects the distribution of mass inside the Earth. Geoid undulations are important for converting GPS-derived ellipsoidal height differences to orthometric height differences (elevations).

The Geoids List dialog contains a list of Geoids available for selection: the *Name* and *Full Path*.

- Initially the *Geoid List* is empty. Click the **Add** button to add a new geoid to the list. [More...](#)



NOTICE

*Install the geoid file on the disk prior to adding it to the list.
Some geoid files can be installed into the Geoids folder*

during MAGNET Field installation. They are provided with the installation program as Geoid File Format (.gff) files.

- Click the **Edit** button to change a geoid that was added to the list.
- Click the **Remove** button to delete a highlighted geoid from the list.


Adding a Geoid

In the Add/Edit Geoid dialog, select a Geoid file from the disk and see the boundaries for the geoid. After being selected, the geoid file appears in the Geoids List dialog.


To add a geoid to the geoids list:

1. Select the **Geoid Format** of the geoid file to load.
2. Click [Browse](#) to navigate to the desired file on the disk, and select it.



- After the geoid is selected,  displays the path to the file.
- You can see the boundary of the geoid application: the longitudes and latitudes of the north-west and south-east corners of the geoid boundary.



3. Click  to add the selected geoid to the list of all the available Geoids in the jobs.



Global Settings

Sets general settings in MAGNET Field to use with the currently selected job.

In the **Global** tab:

1. Select the **Use Bold Font** check box to display the text in bold typeface.
2. Select the **Enable Job History** check box to enter and save the surveyor's operation on the job in the file.
3. **Button Sound** is the default to provide sound effects when you click any functional button.
4. **Prompt for Connection** is the default to display the [Connections](#) dialog on opening a job. Clear the box to automatically connect with the device.

On the **New Jobs** tab, set parameters to automatically import:


1. **Localization from previous job:**
 - Select **Never import** to create new jobs without previous localization.
 - Select **Always import** to automatically export localization from the last open job to a new job upon opening the new job.
 - Select **Prompt to import** to choose if you want to use localization from the last open job.
2. Global code library to job:
 - Select **Never import** to create new jobs without automatic import of global codes.
 - Select **Always import** to automatically import.
 - Select **Prompt to import** to choose whether to import or not.



Job Backup Settings


Backup copies are automatically created for the current job and safely stored with new names "<job file_name>!YYY-MM-DD!.mjf.bak" in the **Target folder**. You are able to open the backup of the job file in the usual way. [More...](#)

To configure backup settings:

1. Click **Permanent** to change the Target folder. Type the new folder name in the backup path or select it by clicking .
2. Select the **Frequency** in which you want the backup to occur. Ten minutes is the default. If you select None, backups will not be created.
3. In **History Depth**, change the number of backups to keep if required. Three files is the default.

NOTICE NOTICE

*MAGNET Field will create a separate *.bak file for the current job every time you open the job file during the day with another date. If the job file is opened in subsequent days, the *.bak files previously formed will be overwritten to the ones with the newer dates.*

4. Click  to save the settings and return to the Home menu.




Configuring Menus

This allows you to change the view of the [Home](#) screen and the view and contents of the folders within it. Click the **Lock Menu** button to freeze menus for editing.

To edit the Home screen (in the left/top panel):

1. Highlight the name of the desired icon.


2. Use the  and  buttons to move the name up and down in the list to change the order of icons in the Home screen.

3. Click  to store the changes and open the modified Home screen.

To edit the folder (in the right/lower panel):

1. Highlight the name of the desired Home icon in the left panel. The right panel will show the contents of the corresponding folder. By default MAGNET Field displays full contents of all the folders.
2. If you want to erase a seldom or never used icon in this folder, clear the box near the desired name. Select the box again to restore the icon in the folder.

3. Use  and  buttons to move the name up and down in the list to change the order of icons in the folder.

4. Click  to store the changes and return to the Home screen.



Codes Settings

To configure global settings for codes:

1. In **Default New Type**, set the default type for a new code. If set to **Prompt**, you will be prompted to define the new code when storing points.
2. In **Data Entry**, set the preferred entry mode between **Notes** and **Codes** for Survey dialogs.
3. In **Code File**, use the [Browse](#) button to select the Global Code file to be used along with the codes in the job.

 **NOTICE**

The default code file (*TopSURVDefCodeLib.xml*) is installed automatically in the *tpsdata* folder upon MAGNET Field installation.

4. The global setting **Code with Description** toggles the display of descriptions with Codes.
5. Selecting **Allow Custom** allows you to custom define the control codes and enables you to set them **Persistent** for Survey dialogs.
6. In the **Code Prompts** tab, select the appropriate boxes in order to be prompted for setting codes in Survey, COGO, and Stake dialogs.



Configuring Stake Reports

Contains a list of default configurations of stakeout reports and their types.

To edit the list of report configurations:

1. Highlight a name of the report configuration to control.
2. Click the **Delete** button to remove the report configuration from the list.
3. Click the **Edit** button to change the highlighted report configuration. [More...](#)
4. Click the **Add** button to create a new configuration. [More...](#)

Report Configuration

You can edit:

1. The **Name** of the report configuration. To do this, click in the field.
2. The **Type** of the report configuration. Select a type from the drop-down list.

3. Select the corresponding items in the list to include corresponding information in the report. Use the scroll bar to view the entire list. By default all items are included.



4. Use the  and  arrow buttons to change the order of displayed information in the report.
5. Click the *Edit* button or just click the item to open a field to edit



the item *Name* as required. You can use *Calculator* to make some calculations if required.



Enterprise Configure

To configure settings for connection to the Magnet Enterprise web-server:

1. In *Login*, enter the user name of your account.
2. In *Password*, enter the secret word of your account.
3. Select *Login on startup* to login upon starting the program.

Exchanging Data

Click the **Exchange** icon on the Home screen to exchange data.

Click an icon to perform the task:



[To Job](#)

Exports data from the current job to another job.



[To File](#)

Exports data from the current job to a file.



[To 3DMC](#)

Exports data from the current job to a 3DMC project.



[Enterprise Upload](#)

Uploads job data to MAGNET Enterprise.



[From Job](#)

Imports data to the current job from another job.



[From File](#)

Imports data from a file to the current job.



[From 3DMC](#)

Imports data from a 3DMC project.



[Enterprise Download](#)

Downloads data from Magnet Enterprise.

Export To Job

To export data from the current job to another job:


1. Select an existing job or create a new one to which you will export data. [More...](#)
2. Define the general types of data to be exported. [More...](#)
3. Select what specific data of the defined types will be exported. [More...](#)
4. Filter points for export if required. [More...](#)
5. View the export progress. [More...](#)

Select Job

To select a Job to open:

1. Highlight the job in the job list. The job list contains the **Job Names** of all existing jobs created/opened using this software.
2. When a job is selected in this list, the **Created:** and **Modified:** fields will reflect when the job was created and last modified.



3.  indicates the path to the selected job. By default, the job files are stored in the [program]Jobs folder.
4. If you do not see the desired job name in the list, click **Browse**. It takes you to the [Browse](#) dialog to browse directories to search for the job.
5. You can export data to a new job. Click **New** to create a new job.

Export Data To Job

To select data to be exported from the current job to another job:

1. From the **Points** drop-down list, select the filter for points to export:
 - All Points
 - By Point List(s)

- By Type(s)
 - By Range and Code(s)
 - By Type(s), Range and Code(s)
 - or None
2. Select the corresponding check boxes to select data types, which should be exported. The data that was absent in the current job will be unavailable for selection. [More...](#)
 3. Click *Settings* if required to setup the export of points as control. By default, they are exported as design.
 4. Click *Next* to filter the points if required, then choose the needed objects from a list of objects of the selected data type.

Filter Points By Range and Code(s)


To select for exchange points by a range and code(s):

1. Select the *Filter by Codes* check box to make the field active. Enter the desired codes or click *Select* and choose the codes from a dialog which appears. [Select Codes For Filter](#)
2. Select the *Filter by Range* check box, to make the field active. Specify the names of the points to be included. These can be specified by a range or by enumeration individually. The symbols ';', '!' or ',' can be used for *Name Separator* and '-' for *Range Separator*.



NOTICE

If available, click Next to continue selecting data. The Next button is available until all data of the chosen types is selected. After the Next button becomes greyed

out, the  button appears to start the export process.

Select Objects to Export

The title of this dialog changes based on the data type selected for export.

1. When filtering points by types, the existing types of points will be available for selection.
2. The objects in this dialog are those available in the current job.
3. Choose the needed objects from a list of objects:
 - Selection can be done by placing check marks in the list next to the desired codes.
 - Click **Check** and **Uncheck** to toggle the highlighted item(s) on and off, respectively.
 - Click **Select All** to choose all the items at one time.

NOTICE

If the Next button is available, click it to continue selecting data.

The Next button is available until all data of the chosen types is selected. After the Next button becomes greyed



out, the button appears to start the export process.

Select Codes For Filter

All the codes existing in the current job will be listed in the Code(s) list.

Select the code(s) for which you want to exchange all the points having that code:

- Selection can be done by placing check marks in the list next to the desired codes.
- Click **Check** and **Uncheck** to toggle the highlighted item(s) on and off, respectively.
- Click **Select All** to choose all the items at one time.

Export Status

The export process is reflected in the Export Status dialog that contains a progress bar and comments about the export process. The progress bar displays the percentage of the points being exported.

Export Warnings

display the warning messages during the Export process if necessary.

Import from Job

To import data from another job to the current job:

1. Select the job from which you will import data. [More...](#)
2. Define the general types of data to be imported. [More...](#)
3. Filter points for import if required. [More...](#)
4. Select what specific data of the defined types will be imported. [More...](#)
5. View the import progress. [More...](#)

Import Data from Job

The title of this dialog contains the name of the job selected. The dialog enables you to select the data to import and, if necessary, filter the imported points:

1. From the **Points** drop-down list, select the filter for points to import:
 - All Points
 - By Point List(s)
 - By Type(s)
 - By Range and Code(s)
 - By Type(s), Range and Code(s)
 - or None

2. Select the corresponding check boxes to select data types which should be imported. The data that was absent in the current job will be unavailable for selection. [More...](#)
3. Click **Settings** if required to setup the import of points as control. By default, they are imported as design.
4. Click **Next** to filter the points if required, then choose the needed objects from a list of objects of the selected data type.

Select Objects to Import


The title of this dialog changes based on the data type selected for import.

1. When filtering points by types, the existing types of points will be available for selection.
2. The objects in this dialog are those available in the current job.
3. Choose the needed objects from a list of objects:
 - Selection can be done by placing check marks in the list next to the desired codes.
 - Click **Check** and **Uncheck** to toggle the highlighted item(s) on and off, respectively.
 - Click **Select All** to choose all the items at one time.

NOTICE

If the Next button is available, click it to continue selecting data.

The Next button is available until all data of the chosen types is selected. After the Next button becomes greyed

out, the  button appears to start the import process.

Filter Points By Range and Code(s)


To exchange points by a range and code(s):

1. Select the **Filter by Codes** check box to make the field active. Enter the desired codes, or click Check and choose the codes from a dialog which appears. [Select Codes For Filter](#)
2. Select the **Filter by Range** check box, to make the field active. Specify the names of the points to be included. These can be specified by a range or by enumeration individually. The symbols ';', '!' or ',' can be used for **Name Separator** and '-' for **Range Separator**.



NOTICE

If the Next button is available, click it to continue selecting data. The Next button is available until all data of the chosen types is selected. After the Next button becomes

greyed out, the  button appears to start the import process.

Import Status

The import process is reflected in the Import Status dialog that contains a progress bar and comments about the import process. The progress bar displays the percentage of the points being imported.

Import Warnings display the warning messages during the Import process if necessary.

Export To File

To export data from the current job to a file:

1. Select the data type and the file format to which you will export data as required. [More...](#)
2. Set the code style if needed. [More...](#)
3. If required, select file units for data to be exported. [More...](#)
4. If required, select the points types to export. [More...](#)

5. Filter points for export if required. [More...](#)
6. Set a name and destination directory for the file.
7. Set the coordinate system and coordinate type for exported points.
8. Define settings for custom text formats. [More...](#)
9. View the export progress. [More...](#)

Export Data To File

The **To File** dialog is used to export different data types to files with either predefined or custom formats.

Data

Select the data type to export to the file: Points, Lines, Point Lists, Code Library, Raw Data, Horizontal Alignments, Vertical Alignments, X-Section Sets, Roads, X-Section Templates, Localization, Scanning Data, Roads Survey, Job History, Surfaces (TINs), Layers or Multiple Types.

Format

Select the file type for export that corresponds to the data type you selected.

Select file units

Check this field to set units for values in the file. [More...](#)

Select types of the points

Check this field if not all types of points should be exported (only for Points data type).

Use filters

Check this field if filters (by code and by range) should be used for exported points (only for Points data type).

ASCII file properties

Define the conditions of the exported file interpretation. These conditions are the use of the same type for the attributes and the use of quotes for the text values. The ASCII File Properties field appears only when points are being exported to a file of text type.

[Setup DXF/DWG Settings For Export](#)

Code Style Setup

This dialog allows you to setup a code style for the Custom Text, TDS RAW and MC project (tp3) formats.

List of code styles

You can add/delete any code style. All saved code styles are available in the list. Initially four predefined styles are available: Topcon, Carlson, GeoPAK, and Eagle Point.

Available fields for code style

You can combine any available fields to the one code style. Using arrows, move the necessary items from the Available column to the right part the Order column in the desired order.

[Code Style Separators](#)

[Control Codes](#)

Code Style Separators

This dialog lists the current separators for the selected code style.

Code Separator

Enter the separator to delimit the multiple codes.

String Separator

Enter the separator to delimit the code string.

Control Code Separator

Enter the separator to delimit the control code.

Note Separator

Enter the separator to delimit the note.

Control Codes

This dialog lists the control codes which can be replaced by user-defined values during an export routine. The changes are applied only for the selected style. The current MAGNET Field control code value

(if it exists) is placed in the brackets after the name of the corresponding control code.

Arc Start (AS): Value of the Arc Start control code.

Arc End (AE): Value of the Arc End control code.

Rectangle (R): Value of the Rectangle control code.

Close (C): Value of the Close control code.

Line Start: Value of the Line Start control code.

Line End: Value of the Line End.

File Units

This dialog allows you to select units for the data being exchanged.

This option is available for all data types and formats containing distance/angular values. Depending on the data and format selected, you can set only distance, or distance and angle units if available.

Select Data For Export To File

This dialog lists the available data to export depending on the selected format.

Possible data types

Points, Lines, Codes, Surfaces, Alignments, X-sections (templates), TS Raw Data and GPS Raw Data.

Selection

Check the control after the appropriate data type to export. The control next to this selection lists the number of the corresponding elements in the job.

Select Filters For Points

This dialog is used to select the points filters for the file export.

Points

Select the filter for the points to export from the drop-down menu: All Points, By Type, By Range and Code, By Type, Range and Code, None.

Settings For Text Custom Formats

The Text File Format dialog allows you to select the format for the Text File.

Delimiter

Select the separator symbol between the data in the import file. It can be a space, comma, tab, or other (select from the list).

Select File Format

Selects the order of the fields in the imported file.

Add Format

Allows you to create a new file format with the help of the Custom Style dialog.

Edit Format

Allows you to change an existing file format with the help of the Custom Style dialog.

[Select Fields For Custom Formats](#)

Select Fields For Custom Formats

Using arrows, move the necessary items from the left part of the dialog (the Available column) to the right part (the Order column) in the desired order.

Save

Saves the File Style and returns to the Text File Format dialog. A new string appears in the Select File format drop-down menu.

Latitude/Longitude Record Format

From the Format (Lat/Lon) drop-down menu in the Lat/Lon Record Format dialog, select the desired format to represent data being imported from/exported to the file.

Setup DXF/DWG Settings For Export

You can select the styles of the point/lines for output.

Point Style

Choose one from the available styles:

- ***AutoCAD Points***: only point coordinates.
- ***AutoCAD Points with Text Fields***: point coordinates with text fields for point name, elevation, codes, and attributes.
- ***Civil 3D/Land Desktop Point Objects***: Civil 3D points will be used.
- ***Carlson Point Blocks***: Carlson point blocks will be used.
- ***TopSURV Point Blocks***: the default TopSURV style will be used. It includes point name, elevation, codes, strings, and attributes.

Line Style

- ***AutoCAD Lines***: only line coordinates.
- ***AutoCAD Lines with Text Fields***: line coordinates with text fields for line name, elevations, codes, and attributes.
- ***TopSURV Line Blocks***: the default TopSURV style will be used. It includes the line name, elevations, codes, strings, and attributes.

Use 3D coordinates

Check this button to export elevations with plain coordinates as well.

Use text font height

By default, it is auto. Check mark this box to open a field to manually/ automatically set the height of text fonts to show the text (in CAD units).

Import From File

To import data from a file to the current job:

1. Select the data type and the file format from which you will import data as required. [More...](#)
2. Select settings for importing points. [More...](#)
3. If required, select file units for imported data. [More...](#)
4. Select the file from which data will be imported.
5. Define settings for custom text formats. [More...](#)

6. Set up the coordinate system and coordinate type for imported data.
7. View the import status. [More...](#)

Import Data From File

The **From File** dialog is used to import different data types from files with either predefined or custom formats.

Data

Select the data type to import from the file: Points, Lines, Point Lists, Code Library, Horizontal Alignments, Vertical Alignments, X-Section Sets, Roads, X-Section Templates, Localization, Scanning Data, Surfaces (TINs), Layers or Multiple Types.

Format

Select the corresponding type of the file being imported for the data type you selected.

Select file units

This option is available for all data types and formats containing distance/angular values. When this checkbox is selected, the Next button opens the File Units screen that allows you to select units for imported data. Depending on the data and format selected, you can set only distance, or distance and angle units if available.

Settings

Set the type of the imported points. [More...](#)

[Settings For Text Custom Formats](#)

[Import of Multiple Data Types](#)

Setup Settings For Import

Set the type of the imported points:

Import Points As (only for Points, Point Lists and Multiple data types)

Select the type of the points you import:

- **Control Points:** the points with coordinates, known from the catalog. These are used for localization.
- **Design Points:** points used as targets for staking.

There are several options to customize the import process from a DXF/DWG file.

Import block base points

Select this check box to import block base coordinates as points.

Load as background image

Select this check box to import data from the file as a background image. If the box is unchecked, all data from the file will be stored as a set of the points/lines within a job. This will not happen if you choose to import the point lists.

Import of Multiple Data Types

After loading data from the file you can select the data types you want to import.

List of Imported Objects

This dialog shows the list with the objects loaded from the file. Check the control before the appropriate object to import.

Export To 3DMC

The **To MC Project** dialog starts the procedure of export of different data types from a 3DMC project to the current MAGNET job.

Data

The multiple type of data is available for export.

Format

Sets the *.tp3 type of the MC project file.

Select file units

When this check box is selected, the Next button opens the File Units screen that allows you to select units for the data exported. Depending on the data and format selected, you can set only distance, or distance and angle units if available.

Export areas as lines

Select this check box to export area data from the current job or line data to the MC project.

Code Style

Opens the [Code Style](#) dialog to set a format for point properties (codes, control codes, strings and notes) to export to the file.

Alphanumeric points will be renumbered starting at:

Displays a number at which MAGNET Field will start renaming points with alphanumeric names as the TDS format demands points that have only numerical names. MAGNET Field will continue numbering from the last previous number of the job point.

Import From 3DMC

The **From MC Project** dialog starts the procedure of importation of different data types from a 3DMC project to the current MAGNET job.

Data

Multiple types of data are available for import.

Format

Shows only the *.tp3 type of the MC project file.

Select file units

When this check box is selected, the File Units screen displays to allow you to select units for the data imported. Depending on the data and format selected, you can set only distance, or distance and angle units if available.

Settings

Sets the type of the imported points:

- **Control Points:** the points with coordinates, known from the catalog. These are used for localization.
- **Design Points:** points used as targets for stakeout.

Enterprise Upload

To upload data from the current job to an enterprise project:

1. Select a **Project** from a list of available projects. After you select the project, the names and types of the in-boxes appear in the field. Check mark the desired in-box.
2. Click **Add** to upload a file. The name and path to the file will be displayed in the corresponding field.
3. If required, click **Clear All** to erase selections.
4. Click **Upload** to start uploading data to the selected in-box. **Upload status** will show the upload progress and the result.

Enterprise Download

To download uploaded data from an enterprise project to your device:

1. Select a **Project** from a list of available projects. After you select the project, the names and types of available in-boxes appear.
2. Select the in-box that contains the needed files. The names of the uploaded files and the dates they were uploaded appear. Select the file(s) to be downloaded.
3. If required, click **Refresh** to renew the content of the selected in-box.
4. Click **Download** to start downloading data to your device. **Download status** will show the download progress and the result.

Duplicate Objects

The dialog is being shown when an object with the same name as the imported one already exists in the job. Depending on the object type, the following options are available:

Overwrite?

The object in the database will be overwritten with the imported one.

Rename?

The imported object will be renamed.

Prefix?

The entered prefix will be added to the imported object name.

Suffix?

The entered suffix will be added to the imported object name.

Notes:

Chatting



Click the icon for text messaging.

The *Chat* dialog contains two tabs:

The *Contacts* tab displays a list of the names of all MAGNET Enterprise users who are currently assigned to a chat.

1. To make the list show only the users with online presence status, check the *Only Online* box. You will see the users who are ready for immediate connection.
2. To make the list show last recipients of your messages, select the Recent Contacts check box that appears if there have been any contacts.
3. To start chatting:
 - Select the user you want to chat with by checking the box near the name.
 - Click the *Start Chat* button to initiate conversation.
 - Type in the message you want to post to the selected user.

The *Active Chats* tab displays a list of the users with whom you have already started chatting.

Notes:

Editing Job Data



Click the icon to open the Edit folder.

Click an icon to perform the task:



[Points](#)

Edits properties of existing points and adds new points manually.



[Codes](#)

Edits code properties and adds new codes.



[Layers](#)

Edits layer properties and adds new layers manually.



[Linework](#)

Edits the linework properties and creates new lineworks manually.



[Areas](#)

Edits areas.



[Point Lists](#)

Edits point lists.



[Raw Data](#)

Edits raw data and recomputes coordinates.



[Images](#)

Deletes/adds background images.



[Sessions](#)

Edits observation sessions for GNSS receivers.



[Stake Reports](#)

Edits stake reports.



[Roads](#)

Opens a sub-folder with six options to edit the road properties and design new roads.

Edit Points

The Points dialog contains the list of the stored points with their coordinates and codes.

Find by Point

Select an option from the drop-down list to find a point: [By Range](#), [By Code](#), [By Code String](#), [By Radius](#), [By Name](#) or [By Layer](#).

Find Next

Finds the next point in the list that satisfies the same conditions as the previous Find.

Delete

Deletes the point from the list.

Edit

Opens a dialog to edit the selected point's parameters like name, code, coordinates, etc.

Add

Displays a dialog to create a new point.

Settings

Opens the Display Configuration dialog.

Point Info

This page contains information about the point to be added/edited. You can edit this information:

1. Name of the point.
2. Code and attribute information for the point.
 - You can select a code from the drop-down list. The code needs to be defined at the time it is entered if it is not a code that exists in the Codes dialog
 - If the code type is Line or Area, an icon will display that the point belongs to a line. Set a string and, if required, a control code. [More...](#)
 - Press the Code button to view information on the code. You can set two control codes and attribute values for the code. [More...](#)
3. The display of coordinates depends on the selected coordinate system.
4. If required, select the **Control Point** check box to use the point as a control point for localization.

Linework Package

Additional manipulations of linework can be performed using control codes for the points with the same code-string combination. Up to two control codes can be specified for every code associated with a point to store the points. These will be connected to form open or closed polylines. Select the codes of the Line type to use for such points.

The supported control codes of AS, AE, C, and R control line behavior:

1. The AS and AE control codes indicate the start and the end of an arc, respectively. Arc parameters are determined by the presence of additional points in the line. These points can create

the line segment with the arc start/or end point which will act as the tangent to the arc.

NOTICE NOTICE

If only one point is between the arc start and end points, the arc is formed so that all three points lie on the arc. If there are two, or more than two points, between the points with the AS and AE control codes, the points are all connected by straight line segments.

2. The R control code is applied to the third point of a three-point polyline and results in the automatic creation of a fourth point of a parallelogram whose diagonal is specified by the first and the third point.
3. When the C control code is applied to a point, it connects it to the starting point of the line, thus closing the line.

NOTICE NOTICE

MAGNET Field will not use this linework package if the Allow Custom Control Code box on the Global screen is checked. In this case, you can enter any string to mark it as a control code. MAGNET Field will not interpret these control codes.

Code - Attributes

The Code Attributes tab allows you to select a code and its associated string, attributes, and control code.

Code

Shows the selected code. A code can be selected from the drop-down list.

Ctrl Code

The control code list shows all the control codes used. The Control Code is a special type of code that can be used by some graphic tools for the interpretation of the survey results.

 **NOTICE**

A second control code can be added to the code by turning on the option for a second control code in the top left menu item.

String

Enter a string for the code.

 **NOTICE**

A string can be added to the code by turning on the option for strings in the top left menu item.

Attributes List

The list shows the available attributes for the code and allows you to enter/select its value.

Attrib Range

Opens the Attribute Ranges dialog, which displays the valid ranges for the attributes for the selected code.

Multiple Codes

To add multiple codes, click on this button. [More...](#)

Multi-Code

Displays a list of all codes, strings, and attributes for the point being edited.

Add

Add a code to the list. [More...](#)

Edit

Edit the selected code in the list. [More...](#)

Delete

Delete a code from the list.

Point Check

If a point exists and you try to save another point with the same name, a dialog displays a prompt that the point already exists.

1. Displays the offsets of the point you are trying to save from the point that is saved.
2. This dialog enables you to:
 - **Overwrite** on the existing point
 - **Rename** the point to store as another point
 - or **Store as check point** to the existing point
3. If you select to store the point as a check point, you can enable using it in weighted averaging positions. To do this, check **Use in weighted average**. [More...](#)
4. In RTK surveys, if checked, the **Correct base** option allows you to set up the Base at unknown position. In this case, you can correct the base position if an observed Topo point has known coordinates stored in the job and has the same name as the base. The known coordinates of the observed point are not replaced with the observed coordinates and are used to correct the Base coordinates.

After either closing the Topo dialog or moving to another tab, recomputations are performed and the coordinates of all points are updated using the new Base coordinates.

Note: For **Correct Base** to work properly, the coordinate type selected in [Display](#) must be the same as the known coordinates of the observed Topo point.

Layer/Style

Layer

Select the Layer in which to have the Point. Click the "..." to Edit Layers.

Point Style

Select the point type and color to be used with the point.

WA

List control displays a list of stations that can be used in the Weighted Average for the point. Also displayed are the E, N, U residuals, WA Control (whether its used or not), and notes.

Use in WA/Exclude from WA

Select a point in the List control. When you click on this button, the appropriate action will be taken - the point is added for the WA or excluded from the WA.

Photo Note

This displays a photo note attached to the point.

To edit the photo note:

5. Use the << and >> buttons to scroll through the photos attached to the point.
6. Click **Add** to attach an image to the note.
Note: If the controller supports the camera, there will be two options available. Click either **Browse** to select a photo from existing ones or **Capture** to [capture an image](#) using the controller.
7. Click **Edit** to delete the currently selected photo and attach a different one instead.
Note: If the controller supports the camera, there will be two options available. Click either **Browse** to select a photo from existing ones or **Capture** to [capture an image](#) using the controller.
8. Click **Delete** to remove the photo note currently displayed for the point.

The pop-up menu in the top left corner of the screen contains three additional options for a photo note. [More...](#)

Photo Note Pop up menu

- If required, click **Show Coordinates** to display the coordinate system and the coordinates of this point over the photos.
Note: If you select **Show Coordinates** and the WGS84 location of

the point is available, the coordinates will be displayed in DDMMSSSS format; otherwise, no coordinates will be displayed or saved in the image.

- If required, click **Show Direction** to display compass readings taken at the time you take the photo note. This option is enabled for the device that supports the camera and the compass.
Note: The direction is displayed over the photos provided the compass has been calibrated.
- When you first open the [Photo Note](#) tab and select the **Show Direction** option, the [Compass Calibration](#) dialog will prompt you to calibrate the compass before taking a photo (if not already calibrated). The Compass Calibration dialog appears automatically only once. If you skip the calibration, you will not be prompted again as long as you edit the point. You will be able to calibrate the compass any time by clicking the **Calibrate Compass** option enabled in the pop-up menu.

NOTICE

When you first open the job, the Show Coordinates and Show Direction options are unchecked. After you select one or both options for one photo, the application will keep the selections. The selections will be lost when the device is shut down. Also, you can turn on or off Show Coordinates and Show Direction from the Settings dialog in the [Image Capture](#) dialog.

Compass Calibration

The Compass Calibration dialog allows you to process the compass calibration. The application provides a graphic image describing calibration movement.

- If you do not want to process the calibration, click the **Skip** button to ignore the compass calibration, and no direction will be provided even if the **Show Direction** is selected.
Note: If you skip the calibration, you will not be prompted again as long as you edit the point. You can calibrate the compass any

time by clicking the *Calibrate Compass* option enabled in the pop-up menu.

- Click the *Start* button to start calibration. The calibration time depends on the device used. For example, it is 10 seconds for the FC-236 and 60 seconds for the GRS-1 device.

Image Capture

The Image Capture dialog allows you to take a photo note for the point.

You can turn on or turn off *Show Coordinates* and *Show Direction* from the Settings dialog that displays by clicking the Settings button in the top right corner of the dialog. [More...](#)

PTL

This page is displayed when the point is a PTL point or when the PTL mode is selected when adding a point.

From Point, To Point

Defines the Line for the PTL offsets. These points can be selected from the job by clicking on **List**.

PTL Offsets

Line defines the distance along the line from the From Point.

Offset defines the distance in a direction perpendicular to the line.

Height is the height difference between the From Point and the current point.

Point Check

If a point exists and we try to save another point with the same name, this dialog appears.

Offsets

Displays the offsets of the point we are trying to save from the point that is saved.

Asks you if you want to:

- Overwrite the existing point

- Rename the point to store as another point
- Save it as a Check Point to the existing point

Find by Point

The Find by Point dialog contains a form for searching a point by its name.

Name

The name or part of the name of a point.

Match entire name

Set if the whole name was entered in the Point Name field.

Match partial name

Set if a part of the searched name was entered in the Point Name field.

Search

Starts the search process and returns to the Points dialog, highlighting the point if it is found.

Find by Code

The Find by Code dialog contains a form for searching a point by its code.

Code

Select the code from the list which is to be searched.

Search

Starts the search process and returns to the Points dialog, highlighting the point if it is found.

Check Points

This page is present if the point has any check points associated with it.

The list displays the Name of the check point, the dE, dN, and dH vector of the check point from the recorded point, the Coordinates of the check point and any Notes associated with the check point.

Cut Sheet

This page is present if this point has been staked out and the stakeout point stored.

The list displays the Name of the check point, the dE, dN, and dH vector of the staked out point from the recorded point, the Coordinates of the staked out point and any Notes associated with the staked out point.

Code - Attributes

Contains a list of codes used for the survey, the list of attributes for each code, and a set of tools for editing.

Codes

List of codes in the Job.

Attributes

Lists the attributes of the selected code.

Add

Opens the blank Code or the Attribute dialog (depending upon the list below which the button is located). A new attribute can be added only if at least one code exists and it is highlighted.

Edit

Opens the Code or the Attribute dialog (depending upon the list below which the button is located) with the properties of the highlighted entry.

Delete

Deletes the highlighted entry.

Code

To create a new code or edit an existing code, enter the code details:

1. The *Name* of the code.
2. The *Description* for the code.

3. The *Type* of the objects that the code describes: *Point*, *Line* or *Area*. Each type has an associated plotting style(s) that can be edited.
 - *Point*: Set a symbol and attributes for points and color.
 - *Line*: Set a symbol for nodes, style and thickness for lines, and color.
 - *Area*: Set a symbol for nodes, style and thickness for the boundary, filling style and transparency for the area, and color.
 - *Attribute*: Select the radio buttons on this tab to enter the code at the beginning of a line/area (*Start*) or at every node point along the line/area (*Each Node*).
 - *DTM*: Select the corresponding check box on this tab to use the code in *DTM*, as a *Breakline* or/and an *Exclusion Area*.
4. Determine a *Layer* for the code if required.

Attributes

1. The *Name* of the attribute.
2. The *Type* of the attribute. *Text*, *Bool*, *Date-Time*, *Integer*, *Menu* or *Real Number*. Each type has associated settings that can be edited.
 - *Text*: Select this if the attribute value is an alphanumeric string. Set the maximum number of characters you can enter.
 - *Bool*: Select a boolean value.
 - *Date-Time*: Use the default (current date) and time for the code attribute, or set the date and time from the drop-down list.
 - *Integer*: Select this if the attribute value is an integer. Set the minimum and the maximum values of the attribute.
 - *Menu*: Select this to assign a list of values to select for the attribute. The values are entered in the field and added to the list with the Add button.

- **Real Number:** Select this if the attribute value is a real number. Set the minimum and maximum values of the attribute.
3. The **Default** value for the code attribute. Select the **Required** check box to be prompted to enter the attribute value every time when using the corresponding code. If the box is not selected, the default value will always be used for the code attribute automatically.

Multiple Code Strings

If it is necessary to add several strings to an object, you can use the Multiple Codes tool.

The dialog contains a table of Codes and Attributes.

To add a code string to the table, insert the name of the code in the Code field or choose it from the code list and set the attributes. Then type the string in the "&" field, and press the Add button. The new entry appears in the table.

Control Code

The Control Code is a special type of code that can be used by the graphic tool for the interpretation of the survey results. It can be any string.

Control Code

The control code list. It shows all the used control codes and also allows you to enter a new control code.

Linework

The Linework dialog contains a list of existing Lineworks on the left side of the dialog. The two windows on the right side represent the general view of the selected linework in the horizontal and vertical planes. To view the current selected linework in a larger map, double-click one of the map plots.

Note: The option to double-click on the map and property buttons is disabled if accessing this dialog from the Alignment Pair dialog.

Edit

Opens the Edit Line dialog. Press to edit the properties of the selected Line.

Delete

Press to delete the selected Line from the list.

Add

Add a Linework with this button.

Edit Area

Contains a list of existing areas on the left side of the screen, and the two windows on the right side that represent the view of the selected area in the horizontal and vertical planes.

Delete

Remove the highlighted Area from the list.

Edit

Edit the Area selected in the list.

Add

Create a new area.

Points in Area

Displays a list of existing points in the selected Area and the general view of the area boundary.

Area

The name of the Area.

List of Points

The list of currently selected points. The up and down arrows to the left of List of Points allow you to move the highlighted point up or down in the order of the points in the area. The arrows symbol switches on/off the keyboard arrow keys.

Area view

The area is bound with a closed line. Line nodes (points) have the same code of area type to form an area boundary. The point highlighted in the list of points will be marked with a yellow circle. The X symbol deletes the highlighted point from the area. The symbol to the bottom right of the map can be used to toggle between the point list and the plot with the point list.

Point Info

Shows the point information of the currently selected single point.

Select Points

Displays five methods of adding points to the beginning of the line:

By Code

Select the codes with which the points are added to the area.

By Code String

Select the codes and strings with which the points are added to the line.

From Map

Select the points by clicking them on the map; points that are sequentially clicked are connected with a line to arrange an area.

From List

Select the points from the list of points.

From Line

Select all points from the line.

Point Lists

The List of Point Lists dialog contains a list of existing Point Lists on the left side of the dialog. The two windows on the right side represent the general view of the selected list in the horizontal and vertical planes. To view the currently selected point list in a larger map, double-click one of the map plots.

Add

Opens the Add Point List dialog. Press to create a new List.

Edit

Opens the Edit Point List dialog. Press to edit the properties of the selected List.

Copy

Press to create a copy of the selected List.

Delete

Press to delete the selected Points List from the list.

Point List

The Point List tab shows the general properties of the Point List.

Point List Name

The name of the Point List.

List of Points

The list of currently selected points. Adding the point to the list can be performed in two ways.

- ***Through the map:*** tap the plot on the right. The large Map dialog opens. Select the points by tapping them on the map - the two consequently tapped points will be connected with a line. Press Close to return to the Add/Edit Point List dialog.
- ***Through the Select Points button:*** pressing the button displays the floating menu of five items: By Range, By Code, By Radius, By CodeString, From Map, and From List. Select the desired way of adding points and fill in the suggested form: set the range, check the codes, set the center point and the radius of the area, select the points from the map or using the list.

Point Info

Shows the point information of a currently selected single point.

The Up and down arrows to the left of List of points allows you to move the highlighted point up or down in the order of the points.

The arrows symbol switches on/off the keyboard arrow keys that duplicate the arrows on the dialog.

The X symbol deletes the highlighted point from the list.

The symbol to the bottom right of the map can be used to toggle between the point list and the plot with the point list.

Select Points By Range

Range of Points

Enter here the range of points you want included in the selected Points List.



NOTICE

The symbols ';', ':' or ',' can be used for Name Separators and '-' for a Range Separator.

Select Points by Code

Select Points with Codes

Select the codes for which you want to add all the points having that code.

Select Points by Radius

Point

Select the point either by entering it manually or by selecting it from the map or list. This will be the center of the circle.

Radius

Enter the Radius (distance) for which around the selected Point you want Points added to the List.

Select Points by Code Strings

Code

Select the code by selecting it from the combo box.

String

Select the strings you want to use for the codestring combination.

Point List Check

If a Points List exists with the same name, you are prompted to choose to overwrite the existing one or rename the Points List.

Layers

Layer List

List of Layers with Names and Status (whether it is empty or has objects, and if it is the default layer). The icon to the left of the name indicates whether it is visible or not.

Up/Down Arrows

Move the selected Layer up or down in the order.

Add

Add a new Layer.

Ins

Insert a new Layer after the currently selected one in the List.

Edit

Edit the selected Layer.

Del

Delete the selected Layer. The default layer cannot be deleted. The layer to be deleted should not have any objects.

Layer

Layer Name

Name of the Layer.

Visible

Check to make this layer Visible.

Note

Enter a note here for the Layer.

Style

Line Style

Select the Style for the lines to be displayed in this layer and also the width.

Point Type

Select the icon for the points to be displayed in this layer.

Layer Color

Select the color for the lines and points in this layer.

Color Palette

Color

Select the Color for the objects to be displayed on the map.

Objects

Display a list of Point, Lines and Alignments belonging to the Raw Data

The Raw Data listed includes information on the:

- **Name:** Point name and the icon displaying the type of the point.
- **Type:** The type of measurement.
- **Codes:** Codes for the point, also the Strings associated with the codes if the String display is selected.
- **HI/Ant Ht:** For the Optical mode - the height of the instrument; For the GPS+ mode - the antenna height.
- **Coordinates:** Coordinates of the point.
- **Ctrl Code:** Control codes associated with the point.
- **Notes:** The short note for the point.
- **Local Time:** It is the controller time when the point was stored. For points collected in the GPS mode, its the time of the epoch whose coordinates are stored or the time of the last accepted epoch when averaging.

First/Last

Moves the cursor to the first or last point.

Edit

Opens the Edit Raw Data dialog which allows you to edit user-entered raw data.

Recompute

Recomputes the point coordinates after editing the point's raw data.

Find by Point

Finds a point by its name or a part of its name.

Find by Code

Finds a point by its code.

Find Next

Finds the next point that satisfies the same conditions as the previous found point.

The button in the upper-left corner of the dialog enables the following menu:

- **Job Info**: displays the Job Info dialog.
- **Show Raw GPS+/TS**: If the GPS+ mode is active, the GPS+ raw data is displayed by default. If you want to display the TS raw data in the list, select this menu. Similarly, if you are using the Optical mode, the TS raw data is displayed and optionally the GPS+ raw data.
- **Angle Sets Report**: This menu item will only be displayed when we are in TS mode and the job contains angle sets which have been acquired. Click the option to get the Angle Sets Report.

[More...](#)

Setup Selection

An angle set is a group of total station observations at the occupation point which are taken at the same time and constitute a measurement to a point. This group can have a number of different foresight and backsight sequences.

The Setup Selection dialog displays a list of all of the occupations in the job which have angle sets associated with them. The **Occupation** column displays the points where the occupations was set up. The **#Sets** column displays the number of angle sets taken at the occupation. The **HI** column displays the instrument height of the occupation.


To generate an angle sets report:

- Select the check boxes associated with the occupations for which you want to get the report.
- To select all the occupations in the list, click **Select All**.
- To erase all selections of occupations, click **Clear All**.
- Click the **Report** button to generate the [Angle Sets Report](#).

Angle Sets Report

The Angle Sets Report allows you:

- To review detailed report information on the individual angle sets of only the occupations selected in the [Setup Selection](#) dialog.

- To save the generated report to a file, click the icon . The file will be saved in the Report folder.

Edit Raw Data

The Edit Raw Data dialog displays the properties of the selected record and allows you to change the name, code, notes, and record specific parameters.

Displays either the Mark or PC (Phase Center) Coords of the base station. The point, code, and antenna information is available for display and editing only if we have the Mark Coordinates available for the base. The Mark coordinates can be edited only if the point was manually entered or if it is a design point. The PC coordinates cannot be edited.

List of Stake Reports

Displays a list of existing reports in the job. The red asterisk icon near the report name means that the report is set as current for this type.

View

Show the full report selected.

Delete

Remove the highlighted report from the list. You will have to confirm the deletion twice before the report data is deleted.

Edit

Edit the report selected in the list.

Add

Create a new report.

Edit Stake Report

Name

Enter the name of the report selected.

Report Type

Select the report type from the list.

Configuration

Edit the report configuration for the report type selected in the list.

Set Current

If checked, set a new report current.

View Stake Report

Displays design references and appropriate information for this report type.

Background Images

The Image List dialog displays a list of available images for the background.

Add

Opens the Add Image dialog to browse the directories on the controller to add a file to the list.

Delete

Deletes the currently selected file from the list.

OK

Opens the selected file. If the file does not exist or there is an error, a warning message is displayed, and the Image List dialog will appear again so you can select another file.

Cancel

Exits out of the dialog without changes.

Only one GeoTiff file can be selected at a time. More file types will be added later. To use a file once it is added, make sure the file is checked in the list. If no file is selected, then a background image will not appear in the map.

Properties

This dialog displays the Properties of the selected file.

File Name

The image's file name without extension.

File Path

The image's location on the device or PC.

File Type

Specifies the file type of the image.

Units

Allows you to select the units in which the image file is scaled.

Use World File

The Use World File check box tells you whether or not the image needs a World File to be plotted properly.

Roads Folder



Click the icon to open the Edit Roads folder.

Click an icon to perform the task:



[Roads](#)

Edits properties of existing roads and creates new roads.



[Horizontal](#)

Edits an available horizontal alignment and creates a new one.



[Vertical](#)

Edits an available vertical alignment and creates a new one.



[Templates](#)

Edits properties of an existing x-section template and creates a new one.



[X-Sections](#)

Edits available x-sections and creates a new one.



[String Set](#)

Edits an existing set of strings and creates a new set.

Roads

The Roads dialog displays a list of the created roads and plots of the horizontal and vertical alignments of the selected Road.

Add

Select the Add Road dialog to create a new Road.

Edit

Opens the Edit Road dialog, displaying the parameters of the selected road.

Delete

Deletes the selected road from the job.

Add/Edit Roads

In this dialog you can edit the properties of a Road Alignment. The dialog consists of two separate tabs with Alignment properties. The properties are the following:

Alignment tab

Name

The name of the Road Alignment.

Layer

A combo box where you can select the layer in which this road should be placed. The associated button brings up the layer properties dialog.

H_z Alnt

In this combo box you'll find all available Horizontal Alignments. Select one for your Road. The associated button brings up the Horizontal Alignment list where you can add, edit and delete Horizontal Alignments.

V_t Alnt

In this combo box you'll find all available Vertical Alignments. Select one for your Road. The associated button brings up the Vertical

Alignment list where you can add, edit and delete Vertical Alignments.

Start Station/Stn/Chainage

Here you can enter the Start Station of the Road. Start Station is the start position along the Road Alignment.

Station/Stn Interval

This is the interval at which the next station position will be decided. Negative values can be entered, which will cause the advancement to decrease instead of increase along the line.

Surface tab

X-Sect Set / String Set

This button can toggle between X-Sect Set and String Set. Toggling between the two will change the contents of the combo box and the button. If you wish to associate your Road with a Cross Section or a String Set, please select one here.

Working Corridor: Left

Enter the left side working corridor here. The left side must be lower or equal to the right corridor.

Working Corridor: Right

Enter the right side working corridor here.

Start Point

The Start Pt tab displays the parameters of the road starting point.

Point

The point name can be entered manually (if a new point name is entered, the point will be created with the coordinates entered in the North, East and Height fields) or chosen from the map or from the list.

Code

The point code and attributes can be entered manually or chosen from the drop-down list for a new point.

North, East, Height

The local coordinates of the point.

Start Sta/Start Chain

The starting station or the starting chain distance.

Sta Interval

The interval between the points where the road related computations are made.

Vertical Alignment

The Vert tab shows the list of vertical alignment elements, or long sections (for the Long Section vertical alignment type), the vertical alignment plot, and the starting station (or chainage) at each element.

In the case of the Element vertical alignment type, the element list has the following columns:

Element: the icon and the name of the element: vertical grade or parabola.

Length: the length of the element;

Start Grade, End Grade: the grades of the element, in percentage, at the starting and ending points. For a Vertical grade element these values are the same.

In the case of the Long Sections vertical alignment type, the element list has the following columns: **Long Section:** the name of the element.

Station: the station distance.

Elevation: the elevation value on the station.

VC Length: the vertical curve length is the length of the interval near the station, where the alignment has a parabolic shape.

Add

Displays a floating menu from which to select an element or the Long Section dialog for adding a vertical element after the last element.

Insert

Displays a floating menu from which to select elements or the Long Section dialog for insertion at the selected location in the list.

Add/Edit Road

The first Road dialog is used to set the name of the road and select the VAL (vertical alignment) type of the created road.

Name

Enter a name for the Road.

VAL Type

There are two ways to create vertical elements for roads.

- **Long Section:** Select Long Section to create the road by sections. The vertical alignment is presented as a set of sections between the stations where the heights are known (usually these are the extremums of the vertical alignment line), and the interval around the station where the vertical alignment line has a parabolic shape.
- **Elements:** Select Elements to create the vertical curve using either Vertical Grades or Parabolas.

Long Section

The Long Section dialog contains parameters of the section.

Station

The station distance from the beginning of the road.

Height/Elevation

The height at the station.

Curve Type

Select if the curve is either a Parabola or Circular Arc.

VC length

Available when the Curve Type is Parabola. The length of the vertical curve at the station. (It is assumed that the station is located in the middle of the interval.)

Arc Radius

Available when the Curve Type is Circular Arc. Enter the radius of the Arc.

Horizontal Alignment

The Hz tab shows the list of horizontal alignment elements, the horizontal alignment plot and the starting station (or chainage) of each element.

The element list has the following columns:

- **Element:** the icon and the name of the element: line, spiral, curve, or intersection point
- **Length:** the length of the element
- **Azimuth:** the azimuth at the beginning of the element
- **Radius:** the radius of the curve, spiral or intersection point (the radius of the spiral is the radius at the end of the 'incoming' spiral or at the beginning of the 'exiting' spiral; the radius of the intersection point is the radius of the corresponding curve.)
- **A1:** Spiral constant 1: Length of Tangent-Spiral to Spiral-Curve. The spiral constant is the square root of the product of the length and the radius of the spiral.
- **A2:** Spiral constant 2: Length of Curve-Spiral to Spiral-Tangent. The spiral constant is the square root of the product of the length and the radius of the spiral.

Add

Displays a floating menu from which to select elements for adding after the last element.

Insert

Displays a floating menu from which to select elements for insertion at the selected location in the list.

Edit

Opens a dialog with properties of the selected element.

Delete

Deletes the element from the road.

Line

To add a line, press the Insert or Add buttons in the Hz tab of the Add Road dialog and select the Line item from the floating menu. The Line dialog will open. The plot at the bottom-left corner will show the element's appearance.

Length

The length of the line element.

Azimuth

By default, the azimuth is set tangent to the previous element. This field may be edited only for the starting element of the road. To change the azimuth of all other elements, the check mark from the Tangent to Previous Item menu on the bitmap in the upper-left corner of the dialog should be removed.



NOTICE

Caution should be exercised when setting the azimuth, since road elements are usually tangential to each other.

Curve

To add a curve, press the Insert or Add buttons in the Hz tab of the Add Road dialog and select the Curve item from the floating menu. The Curve dialog will open. The plot in the bottom-left corner will show the element's appearance.

Radius/ Deg Chord/ Deg Curve

The radius of the curve or one of the two parameters unambiguously defining the radius: degree of chord, or degree of curve.

Length/Chord/Tangent/Mid Ord/Delta/External

The length of the curve element or one of four parameters unambiguously defining the curve length: chord, tangent, middle ordinate (the distance from the midpoint of a chord to the midpoint of the corresponding curve), delta (the angle between the radii corresponding to the curve) or external (a section of a line connecting the center of the arc with vertex of the angle).

Azimuth

By default, the azimuth is set tangent to the previous element. This field may be edited only for the starting element of the road. To change the azimuth of all other elements, the check mark from the Tangent to Previous Item menu on the bitmap in the upper-left corner of the dialog should be removed.

Turn

The direction of turn. The Right value stands for clockwise direction and the Left value for counterclockwise direction.

Spiral

To add a spiral, press the Insert or Add buttons in the Hz tab of the Add Road dialog and select the Spiral item from the floating menu. The Spiral dialog will open.

Radius/ Deg Chord/ Deg Curve

The radius of the curve or one of two parameters unambiguously defining the radius: degree of chord, or degree of curve

Length/ Sp Const

Enter either the Length or Sp Const (Spiral Constant) for the Spiral. The Spiral Constant is the square root of the product of the length and the radius of the spiral.

Azimuth

By default, the azimuth is set tangent to the previous element. This field may be edited only for the starting element of the road. To change the azimuth of all other elements, the check mark from the Tangent to Previous Item menu on the bitmap in the upper-left corner of the dialog should be removed.

Turn

The direction of turn. The Right value stands for clockwise direction and the Left value for counterclockwise direction.

Dir

The direction of movement along the spiral, TS (traverse-spiral) to SC (spiral-circle) (entering the turn), or CS (circle-spiral) to ST (spiral-traverse) (exiting the turn).

Intersection Point

To add an intersection point, press the Insert or Add buttons in the Hz tab of the Add Road dialog and select the Intersection Point item from the floating menu.

Point

The name of the intersection point or select it from the map or the list. Either enter the name or the North and East coordinates.

North, East

The plane coordinates of the intersection point cannot be changed for an existing point.

Radius/ Deg Chord/ Deg Curve

The radius of the curve or one of two parameters unambiguously defining the radius: degree of chord, or degree of curve

Length1/ Sp Const1, Length2/ Sp Const2

Enter either the Length or Sp Const (Spiral Constant) for the Spiral. The Spiral Constant is the square root of the product of the length and the radius of the spiral.

Vertical Alignment

The Vert tab shows the list of vertical alignment elements, or long sections (for the Long Section vertical alignment type), the vertical alignment plot, and the starting station (or chainage) at each element.

In the case of the Element vertical alignment type, the element list has the following columns:

- **Element:** the icon and the name of the element: vertical grade or parabola.
- **Length:** the length of the element;

- **Start Grade, End Grade:** the grades of the element, in percentage, at the starting and ending points. For a Vertical grade element these values are the same.

In the case of the Long Sections vertical alignment type, the element list has the following columns:

- **Long Section:** the name of the element.
- **Station:** the station distance.
- **Elevation:** the elevation value on the station.
- **VC Length:** the vertical curve length is the length of the interval near the station, where the alignment has a parabolic shape.

Add

Displays a floating menu from which to select an element or the Long Section dialog for adding a vertical element after the last element.

Insert

Displays a floating menu from which to select elements or the Long Section dialog for insertion at the selected location in the list.

Vertical Grade

To add a vertical grade, press the Insert or Add buttons in the Vert tab of the Add Road dialog, and select the Vertical Grade item from the floating menu.

Length

The length of the vertical grade element.

Grade

The grade of the element in percents. If the grade is falling, the value should be set to negative.

Curve

To add a curve, press the Insert or Add buttons in the Vert tab of the Add Road dialog, and select the Curve item from the floating menu.

Curve Type

Select if the curve is either a Parabola or Circular Arc.

Length

Available when the curve type is Parabola. The length of the parabola element.

Arc Radius

Available when the curve type is Circular Arc. The radius of the element.

Start Grade, End Grade

The starting and ending grades of the element, in percents. If the grade is falling, the value should be set negative.

X-Section

The X-Section tab contains a list of stations, where cross section templates are applied. It also displays a general view of the cross section.

The list of templates contains the following columns:

- **Station:** The station where the template is applied.
- **Left X Section, Right X Section:** The names of the templates for the left and right parts of the road relative to the center line. The left and right cross sections can be different.



NOTICE

If two or more templates are defined, the intermediate cross sections are calculated using interpolation.

Add

Opens a blank X-Section dialog.

Edit

Opens the X-Section dialog with properties of the selected cross section.

Delete

Deletes the station from the list.

X-Section

The X-section dialog contains the parameters of the cross section.

Station

The station distance.

Left X-Section, Right X-Section

The cross section templates for the left and right parts of the road. These can be chosen only from the existing cross section templates.

Calculate Road Points

The Calculate Road Points dialog allows you to generate points along to the right and to the left of the center line of the road along its entire length.

Points to Generate

Defines the points to generate - center line points, the points to the right of the center line, and/or the points to the left of the center line. Also, if it is desired to include the transition points, place the check mark in the corresponding field and select a prefix/suffix for them, if necessary, in the appearing field below.

Station Interval

Sets the interval between the generated points. By default it is the Station Interval set in the Start Pt tab in the Roads dialog.

Next

Opens the CL Points Params dialog.

Centerline Point Params

The CL Points Params dialog displays the parameters of points to be computed along the center line.

First Point

The name of the first point.

Code

The code and attributes of the points being generated entered manually or chosen from the drop-down list.

Prefix/Suffix

When chosen, sets the prefix or suffix to be added to the generated point name.

Save points to Point List

Check if it is necessary to save the generated points to a separate points list. When checked, a field appears where the name for the list can be set.

Right/Left Offset Points Params

Displays the parameters of points to be computed to the right or left of the center line.

First Point

The name of the first point.

Code

The code and attributes of the points being generated entered manually or chosen from the drop-down list.

Prefix/Suffix

When chosen, sets the prefix or suffix to be added to the generated point name.

Save points to Point List

Check if it is necessary to save the generated points to a separate points list. When checked, a field appears where the name for the list can be set.

Offsets

Set the offset of the point from the center line along two dimensions: horizontal (the Right field) and vertical (the Up/Down field) relative to the surface (Surface Offset type) or to the horizontal line (Flat Offset type).

Horizontal Alignments

The horizontal alignments dialog contains three basic parts:

The alignment list

A list with all available horizontal alignments.

The alignment preview

A preview window displaying the currently selected horizontal alignment

The edit buttons

Delete

Select the alignment you wish to delete, and then press this button. You'll be asked for confirmation.

Edit

Edit a currently selected alignment.

Add

Add an entirely new alignment.

Vertical Alignments

The vertical alignments dialog contains three basic parts:

The alignment list

A list with all available vertical alignments.

The alignment preview

A preview window displaying the currently selected vertical alignment.

The edit buttons

Delete

Select the alignment you wish to delete, and then press this button. You'll be asked for confirmation.

Edit

Edit a currently selected alignment.

Add

Add an entirely new alignment.

High/Low Positions

This dialog will display any extremums found along a vertical alignment. The types of extremums found are the high or low positions of arcs, curves and the transition points between two straight lines.

The dialog consists of three parts:

- **Alnt Name:** The name of the vertical alignment.
- **List:** A list with high/low positions data.
- **The MAGNET Field menu:** "Save to File".

The High/Low Positions list contain the following data:

Station (Unit)

The station along the vertical alignment.

Type

"High" or "Low" position.

Ell ht/Elevation (Unit)

Ellipsoidal height or Elevation, depending on the coordinate system used.

Radius (Unit)

Radius of an arc with a high/low extremum.

Save to File will save the current listing to a file with a standard file name: "*HighLowPositions.txt*". The file name is selected by you.

X-Section Templates

The X-Sect Templates dialog displays a list of the existing templates in the upper part of the dialog and a plot of the highlighted template in the lower part.

The list contains three columns:

- Name (the name of the template)
- Cut Slope
- Fill Slope values

Add

Opens the blank X-Sect Templates dialog.

Edit

Opens the properties of the selected template.

Delete

Deletes the template from the list.

X-Sect Template

The X-Sect Template dialog contains parameters for the template.

Name

The name of the template.

Slope

The Cut and Fill parameter values (run values for cut and fill for a unit rise). These values represent the horizontal increment of the slope for a unit vertical increment. The Cut slope is used when the road surface is below the terrain, and the Fill Slope is used when the road surface is above the terrain.

Also the dialog contains a list of segments comprising the template and a plot of the template. A list of segments consists of three columns: Code (the code of the segment), Hz (the horizontal offset), Vert (the vertical offset).

Add

Opens the blank Segment dialog. The added segment will be attached after the last segment in the list.

Insert

Opens the blank Segment dialog. The added segment is inserted in the list above the currently highlighted segment.

Edit

Opens the Segment dialog with the parameters of the highlighted segment.

Delete

Deletes the segment from the template.

Segment

The Segment dialog contains the parameters of the segment.

Segment Point

The name of the segment point.

Offset

The horizontal and vertical offsets. Press the Down/Up/Grade button to select the type and value of the vertical offset. Being input as Grade (in %), the vertical offset will be recalculated to meters (or other selected units) after the OK button is pressed.

X-Section Set

This dialog contains a list with all available cross section sets. The dialog consists of five separate parts:

List

Each available cross section set is listed here by its name. The cross sections are sorted by their add date.

Preview

The selected cross section will be previewed on the dialog.

Delete

The delete button is used for deleting one or more cross sections. If the cross section being deleted contains references to cross section templates; these will also be removed if you choose to do so.

Edit

Select one cross section for editing.

Add

Add a new cross section.

String Set

The String Set dialog lists the currently available String Sets. It consists of a list, a preview window, and three buttons:

String Set list

The list containing all available String Sets.

Preview window

Displays the currently selected String Set.

Delete

For deleting one or more String Sets. Multiple String Sets can be deleted at the same time.

Edit

For editing a single String Set.

Add

For adding a single String Set.

Add/Edit String Set

This dialog is displayed when adding a new String Set or editing an existing one.

The dialog is separated into four distinct parts:

String Set

The name of the current String Set. If you're editing a current String Set, it is possible to change the name of the String Set by changing the name in the input box.

String Sets list

This list contains all the Strings that the String Set consists of. It is possible to change the order of the Strings by using the arrow buttons located on the left side of the Strings list.

Preview window

This window will display the currently selected String. It can be hidden with the arrow button in the right bottom corner.

Edit buttons

There are three buttons available for manipulating the Strings within the String Set. The first one is *Delete*, which will delete all the selected Strings. The second one is *Edit* which will edit the currently selected String (double-clicking on the String will also edit it). The third one is *Add* for adding a new String to the current String Set.

Add/Edit Road String Alignment Pair

Add or Edit a Road String Alignment Pair.

This dialog is separated into three parts:

Hz Alnt and Vt Alnt

Select the horizontal and vertical alignment you want the Alignment Pair to consist of.

Select

From Line

Create an alignment pair from a Line.

From Map

Select a Line from a Map and create the Alignment Pair from it.

MAGNET Field menu

Hz Alnt

Displays the horizontal alignment dialog where you can add, edit, or delete horizontal alignments.

Vt Alnt

Displays the vertical alignment dialog where you can add, edit, or delete vertical alignments.

Notes:

Calculate

The  icon represents the Calculate Folder.

Click an icon to calculate the task:



[Inverse](#)

The four inverse tasks available in the Inverse menu are based on computing the azimuth and distance between two points given their coordinates.



[Point in Direction](#)

Calculates the coordinates of a point using a known point, and the angle and distance offsets from the known point.



[Intersection](#)

Computes the intersection point or points given to known points and either the direction or distance from the known point.



[Calculator](#)

Does calculations and conversion. Type in the entire equation you want to calculate, press equals, and the result is shown.



[Curves](#)

Computes a full set of parameters to determine a curve using four various minimum sets of specified parameters.



[Area](#)

Calculates the area of a polygon formed by any points or the coordinates of a point/points which form a polygon of the desired area after being added to the point list/linework/area.



[Corner Angle](#)

Calculates the angle between two lines, a start line and an end line, which have a common mid point.



[Offsets](#)

Calculates the coordinates of points along a line, a curve, or a road.



[Adjust](#)

Transforms points and includes five tasks: Rotate, Translate, Scale, 2D Transform, and Traverse Adjustment.



[Traverse](#)


Calculates traverse and sideshot points based on horizontal and vertical offsets along a direction which is defined by an azimuth or right, left or deflection angles.



[DTM](#)

Calculates data between two DTMs, for a new DTM, and along contour lines.

Calculate Inverse

The  icon represents the Calculate Inverse feature.

Click an icon to calculate the task:



[Point To Point](#)

Computes the inverse (azimuth and distance) between two known points.



[Point to Line](#)

Computes the station of a known point inverse to a known line.



[Point to List](#)

Computes the inverse (azimuth and distance) for all the points in a Points list with respect to a known point.



[Point to Curve](#)

Calculates the station of the known point inverse to the known curve.

Two Point Inverse

The Two-Point Inverse task computes the inverse (azimuth and distance) between two known points.

The **Inverse** Page contains the data needed for the task:

From

Select the starting point.

To

Select the ending point.

These points can be entered manually, selected from the map or from the list of Job Points.

Calc

Calculates the inverse.

The **Results** Page shows the results of the calculation:

Azimuth to the second point from the first point.

HDist is the horizontal distance from one point to another.

VDist is the vertical distance from one point to another. The "-" sign means that the height of the second point is lower than the height of the first point.

dNorth is the increment of the North coordinate.

dEast is the increment of the East coordinate.

dHeight is the increment of the height.

Grade(Slope) - the increment of the height in percent.

Slope distance - the computed distance between the two points.

Inverse Point to Line

The Inverse Point to Line COGO task computes the station of a known point inverse to a known line.

The **Inverse Point to Line** page contains the data needed to calculate the offsets of the point with respect to the line:

Point

Select the known point name. It can be entered or selected from the map or the list of Job Points.

Code

Displays the code of the known point and cannot be changed here.

Start Point

Select the starting point of the reference line.

Azimuth/Az to Pt

Set the azimuth of the reference line manually. For Az to Pt, select another point, and the azimuth from the known point to this point will indicate the direction.

Start Stn

Set the starting station of the reference line.

Store PTL Point

If **Az to Pt** is selected, check if the known point is to be stored as a PTL point.

Calc

Press to calculate the inverse.

The **Results** Page shows the results of the calculation:

From Point is the name of the known point.

Start Point is the name of the starting point of the line.

Azimuth is the azimuth of the known line.

Start Station is the starting station of the line.

Station indicates the distance between the starting point and the projection of the known point on the reference line.

Offset is the horizontal offset between the known point and the Station point.

Height is the vertical offset between the known point and the Station point.

Inverse Point to Curve

The Inverse Point to Curve COGO task computes the station of a known point inverse to a known curve.

Point

Select the known point name. It can be entered, or selected from the map or list of Job Points.

Curve

The **Inverse Point to Curve** page contains the data needed to calculate the offsets of the point with respect to the curve.

The dialog changes its appearance depending upon the first curve point chosen. You can enter, select from the list, or select from the map the following two sets of points:

- **PC Point, Curve Point, PT Point**
- **RP Point, PC Point, PT Point**

In the second case, the distance between **RP Point** and **PC point** should be equal to distance between **RP Point** and **PT point**. The radius and the PC and PT points define two curves - one with delta less than or equal to 180 degrees (Small curve) and the other with delta greater than or equal to 180 degrees (Large curve). Values of **Small** or **Large** can be selected from the **Curve** drop-down box to indicate which of these two curves should be used for computations.

Start Stn

Set the starting station of the reference curve.

Calc

Press to calculate the curve parameters.

The **Results** page shows the initial data and the results of the calculation:

- **Tangent Azimuth** is the azimuth of the tangent at the point of intersection of the curve and the line joining the point of intersection to the radius point.
- **Sta** indicates the distance between the starting station and the point of intersection of the curve and the line joining the point of intersection to the radius point.
- **Offset** is the horizontal offset between the known point and the Station point.
- **dHeight** is the vertical offset between the known point and the Station point.

Inverse Point to Point List

The Inverse point to point list COGO task computes the inverse (azimuth and distance) for all the points in a Points list with respect to a known point.

The **Inverse Pt to Pt List** Page contains the data needed for the task, the list of points in the selected point list and a window for the plot of the point list:

Point

Select the known point. This can be entered manually, selected from the map or the list of Job Points.

Point List

Select the point list. The name can be entered or selected from the list of job Point Lists.

List of Points

Displays the list of points in the selected point list along with their codes.

Calc

Press to calculate the inverse.

The **Results** Page shows the following results of the calculation for every point in the point list:

Azimuth to the point in the point list from the known point.

HDist is the horizontal distance from one point to another.

VDist is the vertical distance from one point to another. The "-" sign means that the height of the point in the list is lower than the height of the known point.

dNorth is the increment of the North coordinate.

dEast is the increment of the East coordinate.

dHeight is the increment of the height.

Grade(Slope) - the increment of the height in percent.

Slope distance - the computed distance between the two known points and the point in the list.

Point in Direction

The Point in Direction COGO task calculates the coordinates of a point, using a known point, the azimuth, the angle offset from the azimuth line and the distance offsets from the known Point.

From Point

Set the starting point. It can be entered manually, selected from the list of Job Points or from the map.

Azimuth/Az to Pt

Set the azimuth either by value or as a direction to another known point.

Angle Offset

Set the angle offset from the azimuth line.

HD Grd/Gnd

Set the grid or ground distance offset along the angle offset line. To alternate between grid or ground press the button.

Vert Dist

Set the height offset.

Cogo Pt

Set the name of the computed point.

Code

Set the code of the computed point.

Calc

Press to calculate the coordinates of the unknown point.

The **Results** Page shows the following results of the calculation. The coordinates are displayed for both the computed points:

North is the northing coordinate of the point.

East is the easting coordinate of the point.

Ell Ht is the height of the point.

Azimuth from the known point to the unknown point.


H_z Distance is the horizontal distance between the two points.

Vert Distance is the vertical distance between the two points.

Save

Saves the results of the calculation. Only the points with check marks next to them will be saved.

Calculate Curves

The  icon represents the Calculate Curves feature.

Click an icon to calculate the task:



Curve

Calculates the full set of curve parameters given one length and one radius parameter.



3Pt Curve

Computes the curve parameters given three points: starting point of the curve (PC point), any curve point and ending point of the curve (PT point), the Radius point, and PC and PT points.



PI & Tangents

Computes the starting, ending and center points of a curve, given the point of intersection, the radius, and the azimuths from the PI point to the PC and PT points respectively.



Radius & Pts

Computes the parameters and the coordinates of the center of a curve given the starting and ending points of the curve and a radius parameter.

Curve Solution

The Curve Solution COGO task calculates the full set of curve parameters given one length and one radius parameter.

The **Curve Solution** page contains the data needed for the task and a window for the plot of the curve:

Radius/Deg Chord/Deg Curve

Select the curvature parameter.

Length/Chord/Tangent/Mid Ord

Select the length parameter of the curve.

Turn

Select the direction of turn relative to the starting point.

Calc

Press to calculate the parameters of the curve.

The **Results** Page shows the results of the calculation:

Radius of the curve.

Length of the curve.

Chord is the distance between the starting and ending points (tangent points) of the curve.

Degree Curve defines the angle in degrees which is used to compute the radius of a curve with a length of 100 units.

Degree Chord defines the angle in degrees which is used to compute the radius of curve whose chord is 100 units long.

Delta is the internal angle from center to tangent points.

Tangent is the distance between the point of intersection of the tangents at the starting and ending points, and the ending point.

External is the shortest distance between the point of intersection and the curve (along the line joining the point of intersection to the radius point).

Mid Ord is the length of the line segment between the curve and the chord on the line joining the point of intersection to the radius point.

Segment is the area of a circle bounded by a chord and the minor arc that it cuts off.

Sector is the area of a circle bounded by two radii and the minor arc they determine.

Fillet is the area between the arc of a circle and the two tangents at the end points of the arc.

PI & Tangents

The PI and Tangents COGO task computes the starting (PC) and ending (PT) points, and the center (Radius Point) of a Curve, given the Point of Intersection (PI), the radius, and the azimuths from the PI point to the PC, and PT points, respectively.

The **PI & Tangents** page contains the data needed for the task:

PI Point

Set the Point of Intersection. It can be manually entered, chosen from the map or from the list of Job Points.

Az PI to PC

Set the azimuth from the PI point to the starting curve point.

Az PI to PT

Set the azimuth from the PI point to the ending curve point.

Radius/Deg Curve/Deg Chord/Tangent

Set the appropriate radius parameter of the curve.

PC Point

Set the name and the code for the calculated starting curve point.

PT Point

Set the name and the code for the calculated ending curve point.

RP Point

Set the name and the code for the calculated radius point.

Calc

Press to calculate the parameters of the curve and the coordinates of the PC, PT, and RP points.

The **Results** Page shows the results of the calculation:

North is the northing coordinate of the PC/PT/RP point.

East is the easting coordinate of the PC/PT/RP point.

Ell Ht is the height of the PC/PT/RP point.

Radius of the curve.

Length of the curve.

Chord is the distance between the starting and ending points (tangent points) of the curve.

Degree Curve defines the angle in degrees which is used to compute the radius of a curve with a length of 100 units.

Degree Chord defines the angle in degrees which is used to compute the radius of the curve whose chord is 100 units long.

Delta is the internal angle from center to tangent points.

Tangent is the distance between the point of intersection of the tangents at the starting and ending points, and the ending point.

External is the shortest distance between the point of intersection and the curve (along the line joining the point of intersection to the radius point).

Mid Ord is the length of the line segment between the curve and the chord on the line joining the point of intersection to the radius point.

Segment is the area of a circle bounded by a chord and the minor arc that it cuts off.

Sector is the area of a circle bounded by two radii and the minor arc

they determine.

Fillet is the area between the arc of a circle and the two tangents at the end points of the arc.

Save

Saves the results of the calculation. Only the points with check marks next to them will be saved.

Three Pt Curve

The Three Pt Curve COGO task computes the curve parameters given three points: starting point of the curve (PC point), any curve point and ending point of the curve (PT point), or the Radius point and PC and PT points.

The **Three Points Curve** page displays the initial data for the task.

The dialog changes its appearance depending upon the first point chosen. You can manually enter, select from the list or from the map the following sets of points:

- PC Point, Curve Point, PT Point
- RP Point, PC Point, PT Point

In the first case the coordinates for the **RP Point** will be calculated along with the curve parameters. The name and the code for this calculated point can be set.

In the second case the distance between **RP Point** and **PC point** should be equal to the distance between **RP Point** and **PT point**. The radius, and the PC and PT points define two curves - one with delta less than or equal to 180 degrees (Small curve) and the other with delta greater than or equal to 180 degrees (Large curve). Values of **Small** or **Large** can be selected from the **Curve** drop-down box to indicate which of these two curves should be used for computations.

Calc

Press to calculate the curve parameters.

The **Results** page shows the results of the calculation:

North is the northing coordinate of the RP point.

East is the easting coordinate of the RP point.

Ell Ht is the height of the RP point.

Radius of the curve.

Length of the curve.

Chord is the distance between the starting and ending points (tangent points) of the curve.

Degree Curve defines the angle in degrees which is used to compute the radius of the curve with a length of 100 units.

Degree Chord defines the angle in degrees which is used to compute the radius of the curve whose chord is 100 units long.

Delta is the internal angle from center to tangent points.

Tangent is the distance between the point of intersection of the tangents at the starting and ending points, and the ending point.

External is the shortest distance between the point of intersection and the curve (along the line joining the point of intersection to the radius point).

Mid Ord is the length of the line segment between the curve and the chord on the line joining the point of intersection to the radius point.

Segment is the area of a circle bounded by a chord and the minor arc that it cuts off.

Sector is the area of a circle bounded by two radii and the minor arc they determine.

Fillet is the area between the arc of a circle and the two tangents at the end points of the arc.

Save

Saves the results of the calculation. Only the points with check marks next to them will be saved.

Radius & Points

The Radius & Points COGO task computes the parameters, and the coordinates of the center of a curve (RP point) given the starting (PC point) and ending points (PT point) of the curve, and a radius parameter.

The **Radius & Point** page contains the initial data for the task:

PC Point

Set the Point of Curvature. It can be manually entered, selected from the map or from the list of Job points.

PT Point

Set the Point of Tangency. It can be manually entered, selected from the map or from the list of Job points.

Radius/Deg Curve/Deg Chord

Set the radius parameter of the curve.

Turn

Set the direction of turn relative to the PC Point.

Curve

Set the curve in the circle that should be considered. The radius, and the PC and PT points define two curves - one with delta less than or equal to 180 degrees (Small curve), and the other with delta greater than or equal to 180 degrees (Large curve).

RP Point

Enter the name, code, and attributes of the computed radius point.

Calc

Press to calculate the curve parameters and the coordinates of the RP point.

The **Results** Page shows the results of the calculation:

North is the northing coordinate of the RP point.

East is the easting coordinate of the RP point.

Ell Ht is the height of the RP point.

Radius of the curve.

Length of the curve.

Chord is the distance between the starting and ending points (tangent points) of the curve.

Degree Curve defines the angle in degrees which is used to compute the radius of the curve with a length of 100 units.

Degree Chord defines the angle in degrees which is used to compute the radius of the curve whose chord is 100 units long.

Delta is the internal angle from center to tangent points.

Tangent is the distance between the point of intersection of the tangents at the starting and ending points, and the ending point.

External is the shortest distance between the point of intersection and

the curve (along the line joining the point of intersection to the radius point).

Mid Ord is the length of the line segment between the curve and the chord on the line joining the point of intersection to the radius point.

Segment is the area of a circle bounded by a chord and the minor arc that it cuts off.

Sector is the area of a circle bounded by two radii and the minor arc they determine.

Fillet is the area between the arc of a circle and the two tangents at the end points of the arc.

Save

Saves the results of the calculation. Only the points with check marks next to them will be saved.

Intersection

Intersection dialog can be used to compute the intersection point or points given two known points and either the direction or distance from the known point.

The **Intersection** Page contains the initial data for the Intersection task.

Point 1

Select the first point. This can be manually entered, selected from the job list, or map.

Azimuth/Distance/Az to Pt

Select the parameter that will be entered for the first point. This can be done by clicking this button. The text indicates what the value will be interpreted as. For Az to Pt, select another point, and the azimuth from point 1 to this point will indicate the direction.

Point 2

Select the second point. This can be manually entered, selected from the Job list, or map.

Azimuth/Distance/Az to Pt

Select the parameter that will be entered for the first point. This can be done by clicking this button. The text indicates what the value will be interpreted as. For Az to Pt, select another point, and the azimuth from point 2 to this point will indicate the direction.

COGO Point

Select the name and Code for the result of the calculation.

Calc

Starts the calculation process.

The **Results** Page shows the results of the calculation.

North: the North local coordinate of the first/second found point.

East: the East local coordinate of the first/second found point.

Ell ht: the height of the first/second found point.

Save

Saves the results of the calculation. Only the points with check marks next to them will be saved.

Calculator

The calculator is a powerful tool that does all sorts of calculations and conversions. It is very easy to use. Type in the entire equation you want to calculate, press equals, and the result is shown.

- **Input Field:** This field is where calculations are done. It will accept an entire calculation, and then once equals is pressed it will calculate everything at once.
- **Result Field:** Once equals is pressed the result is calculated and presented here. This field is also used as the y or theta values for rectangular/polar conversions.
- **Previous Result Field:** Once equals is pressed the previous result is moved up to this field. This field is also used as the x or r values for rectangular/polar conversions.
- **sin:** Function that calculates the sine.

- cos: Function that calculates the cosine.
- tan: Function that calculates the tangent.
- arcsin: Function that calculates the arcsine.
- arccos: Function that calculates the arccosine.
- arctan: Function that calculates the arctangent.
- log: Function that calculates the logarithmic value base 10.
- ln: Function that calculates the natural logarithmic value or base e.
- square root: Function that calculates the square root of a value.
- x squared: Function that calculates the square of a value.
- inverse: Function that calculates the inverse of a value or $1/x$.
- nth power: Function that calculates the nth power of a value in the format $x \wedge \text{power}$.
- percent: Converts the value to a percent or $x/100$.
- MC: Clears the memory.
- MR: Recalls the memory value indicated by M in the input field.
- MS: Saves the already computed result into memory.
- M+: Adds the already computed result to the value in memory.
- Rad Deg: Function that converts radians to degrees.
- Deg Rad: Function that converts degrees to radians.
- Grad Deg: Function that converts gradians to degrees.
- Deg Grad: Function that converts degrees to gradians.
- Deg DMS: Function that converts degrees to degrees minutes seconds notation.
- DMS Deg: Function that converts degrees minutes seconds notation to degrees.
- Rec Pol: Function that converts rectangular coordinates (xy) to polar (r theta). This is done by using both result fields, the top one being x, bottom one being y. Enter the values and click Rec Pol, and it will convert the top value to r and bottom to theta.

- **DMS Deg:** Function that converts polar coordinates (r theta) to rectangular (xy). This is done by using both result fields, the top one being r, bottom one being theta. Enter the values and click Pol Rec, and it will convert the top value to x and bottom to y.
- **DMS+:** Adds the left and right values assuming both are in DMS form.
- **DMS-:** Subtract the right value from the left assuming both are in DMS form.
- **e:** The constant e, base of the natural logarithm.
- **pi:** The constant pi, the circumference to diameter ratio for any circle.
- **C:** Clears out all the fields.
- **<-:** Backspace, removes the last entry.
- **copy:** If the calculator was started from an edit field, it copies the value back to that field.
- **std:** Brings up the standard calculator.
- **Deg:** If this is showing, it means the calculator is working in degrees.
- **Grad:** If this is showing, it means the calculator is working in gradians.
- **Rad:** If this is showing, it means the calculator is working in radians.
- **+/-:** Alternates the value between positive and negative.


Calculator

The calculator is a powerful tool to do all sorts of calculations and conversions. It is very easy to use. Type in the entire equation you want to calculate, press equals, and the result is shown.

- **Input Field:** This field is where calculations are done. It will accept an entire calculation and then once equals is pressed it will calculate everything at once.

- **Result Field:** Once equals is pressed the result is calculated and presented here. This field is also used as the y or theta values for rectangular/polar conversions.
- **Previous Result Field:** Once equals is pressed the previous result is moved up to this field. This field is also used as the x or r values for rectangular/polar conversions.
- **square root:** Function that calculates the square root of a value.
- **x squared:** Function that calculates the square of a value.
- **inverse:** Function that calculates the inverse of a value or $1/x$.
- **nth power:** Function that calculates the nth power of a value in the format $x \wedge \text{power}$.
- **percent:** Converts the value to a percent or $x/100$.
- **MC:** Clears the memory.
- **MR:** Recalls the memory value indicated by M in the input field.
- **MS:** Saves the already computed result into memory.
- **M+:** Adds the already computed result to the value in memory.
- **C:** Clears out all the fields.
- **<-:** Backspace, removes the last entry.
- **copy:** If the calculator was started from an edit field, it copies the value back to that field.
- **sci:** Brings up the scientific calculator.
- **+/-:** Alternates the value between positive and negative.

Calculate Area

The  icon represents the Calculate Area feature

Click an icon to calculate the task:



[By Points](#)

Computes the area of a polygon with known vertices.



[Hinge](#)

Computes the coordinates of a point, which when inserted between the starting and ending points of a pointlist, forms a polygon of a known area.



[Line](#)

Computes the coordinates of points, which along with two known points form a quadrilateral of the known area.

Comp Area

The Comp Area COGO task computes the area of a polygon with known vertices.

The **Area** page contains data needed for the task and a window for the plot of the polygon:

Point List

Select the name of the **Point List**, **Linework** or **Area** that contains vertices of the polygon. The name can be entered manually or selected from the list.

The arrow buttons can be used to modify the order of the points to obtain the correct shape of the polygon.

Calc

Press to calculate the area of the polygon.

The **Results** Page shows the results of the calculation:

Area of the polygon in (Job Units) and in acres.

Point List is the list of points constituting the polygon vertices in the correct order.

Known Area - Hinge

The Known Area Hinge method computes the coordinates of a point, which when inserted between the starting and ending points of a point list, forms a polygon of the known area.

The **Area** Pages are a wizard that contain the data needed for the task, the list of points in the selected point list, and a window for the plot of the point list. The first **Area** page contains:

PointList

Set the name of the point list. This can be entered or selected from the Job Point Lists.

List of Points

Displays the list of points in the selected point list along with their codes. Use the arrow keys to change the order of the points in the list for this COGO task.

Next

Press to proceed to the next page of the wizard.

The second **Area** page contains:

Azimuth

Set the known azimuth from the first point in the list, where the hinge point is located.

Area

Set the area of the polygon in either (JobUnits)² or in acres.

Cogo Point

Set the name of the calculated hinge point.

Code

Set the Code and attributes for the calculated hinge point.

Back

Press to go to the previous **Area** page to modify the pointlist.

Calc

Press to calculate the coordinates of the hinge point.

The **Results** Page shows the results of the calculation:

North is the northing coordinate of the hinge point.

East is the easting coordinate of the hinge point.

Ell Ht is the height of the hinge point.

Total Area of the polygon in (JobUnits) or acres.

Plot Area is the area enclosed by the points in the point lists alone in (JobUnits) or acres.

Difference is the difference between the Total Area and the Plot Area.

Save

Saves the results of the calculation. Only the points with check marks against them will be saved.

Known Area - Line

The Known Area Line method computes the coordinates of points, which along with two known points form a quadrilateral of known area.

The **Area** Page contains the data needed for the task:

Start Pt

Set the name of the known starting point. It can be entered manually, selected from the map or the list of Job Points.

End Pt

Set the name of the known ending point. It can be entered manually, selected from the map or the list of Job Points.

Az1

Set the azimuth of the line emanating from the start point (Line 1) to the calculated **COGO Pt 1** point.

Az2

Set the azimuth of the line emanating from the end point (Line 2) to the calculated **COGO Pt 2** point.

Area

Set the known area of the quadrilateral in either (Job Units) or acres.

Azimuth/Parallel

Set the azimuth of the line that will intersect Line1 at COGO Pt 1 and Line2 at COGO Pt 2 with an area of the quadrilateral equal to the known area. If Parallel is set, the line COGO Pt 1->COGO Pt 2 will be parallel to the line defined by the Start and End Points.

Cogo Pt1

Set the name, code, and attributes of the first calculated point.

Cogo Pt2

Set the name, code, and attributes of the second calculated point.

Calc

Press to calculate the coordinates of the two points.

The **Results** Page shows the following results of the calculation. The coordinates are displayed for both the computed points:

North is the northing coordinate of one of the two points.

East is the easting coordinate of one of the two points.

Ell Ht is the height of one of the two points.

Area of the quadrilateral in (JobUnits) or acres.

Plot Area is the area enclosed by the points in the point lists alone, in (JobUnits) or acres.

Difference is the difference between the Total Area and the Plot Area.

Save

Saves the results of the calculation. Only the points with check marks next to them will be saved.

Corner Angle

Calculates the angle between two lines, a start line and an end line, which have a common mid point.

Start Point

The point that defines the first side of the angle. Enter it manually or select it from the map or from the list.

Mid Point

The point that defines the corner of the angle. Enter it manually or select it from the map or from the list.


End Point

The point that defines the second side of the angle. Either enter it manually or select it from the map or from the list.

Calc

Calculates the corner angle.

Calculate Offsets

The  icon represents the Calculate Offsets feature.

Click an icon to calculate the task:



[Line Offset](#)

Defines a line between two points used for computing point locations relative to the line.



[Curve Offset](#)

Defines a curve (section of an arc) used for computing point locations in relation to the curve.



[Road Offset](#)

Computes point locations relative to the selected road or alignment.

Line & Offset

The COGO Line & Offset dialog allows you to define a line between two points used for computing point locations relative to the line.

Start Point

The starting point of the line. The line is defined by its azimuth, azimuth to another point, or the End point of the line.

End Point/Azimuth

The direction of the line. It can be set through the azimuth of the line or the ending point of the line.

Ht Comp

The type of height computations for the computed points. It can be:
Ht of Start Pt (height of the starting point): The computed points will have the same height as the starting point of the line.

Interpolate Ht: The height of the computed points will be computed through linear interpolation using the height of the starting and ending points of the line.

Num Subs

Designates the number of subdivisions if it is desired to subdivide the line. For instance a value of 3 indicates that you want to compute four points by subdividing the line in three equal segments.

Include Transition Points

Whether to include transition points if they do not fall on a designated station.

SS (Start Station)

The starting station (chainage) of the line.

Curve & Offsets

The Curve & Offsets dialog function allows you to define a curve (section of an arc) used for computing point locations in relation to the curve.

PC Point

The Point of Curve; the starting point of the arc.

PT Point

The Point of Tangency; the ending point of the arc.

Radius/ Deg Curve/ Deg Chord

The radius parameters of the curve.

Length/Chord/Tangent/Mid Ord/Extern/Delta

Is the length parameter of the curve.

Num Subs

Designates the number of subdivisions if it is desired to subdivide the line. For instance a value of 3 indicates that you want to compute four points by subdividing the line in three equal segments.

Include Transition Points

Whether to include transition points if they do not fall on a designated station.

Turn

Indicates which side the center point of the curve is located.

Ht Comp

The type of height computations for the computed points. Can be:

Ht of Start Pt (height of the starting point): The computed points will have the same height as the starting point of the line.

Interpolate Ht: The height of the computed points will be computed through linear interpolation using the height of the starting and ending points of the line.

SS

The starting station (chainage) of the line.

Road Offset

The COGO Road Offset dialog allows you to select a road or alignment used for computing point locations relative to their selection.

Road/H Alnt/V Alnt

The road or alignment to be used for computing points. This can be entered manually or chosen from the list.

Start Sta

The starting point of the selected road of alignment, the distance from the beginning.

Station & Offsets

The COGO Station & Offsets dialog is used to define stationing, which is used to compute the points location in relation to lines or curves.

Station

The starting or current station. The two arrows to the right allow you to decrease or increase the station by the interval specified in the Station Interval shown in the next line.

Station End

The desired end station if you wish to compute several points. The two arrows to the right allow you to decrease or increase the station by the interval specified in the Station Interval shown in the next line.

Interval

The station interval.

Right Offset/Left Offset

The right or left offset of the stakeout point with respect to the line at the station shown on the Station field.

Up/Down

The Up or Down Height offset with respect to the height of the line at the station.


Point ID

The name of the current or starting computed point.

Code

The feature code used for the computed points.

Calculate Adjust

The  icon represents the Calculate Adjust feature.

Click an icon to calculate the task:



[Rotate](#)

Rotates the selected points around a specific point.



[Translate](#)

Moves a group of points.



Scale

Scales the distances of a range of points relative to a Base Point.



2D Transform

Performs 2D transformations using a list of point pairs to get the transformation parameters.



Traverse

Performs traverse adjustments that apply corrections to the individual latitudes, departures, angles and/or elevations in order to make them meet given conditions.

Rotate

The Rotate task rotates the selected points around a specific point.

Select points

Select the points for rotation. These points can be chosen from the map, from the Jobs List, or by entering a Range using the **By Range** button.

Rotation Point

Select the point which is to be the center of rotation.

Rotation Method

Select the rotation method by entering a Rotation Angle or by entering the Old and New Azimuths.

Calc

Rotates the points. The results can be seen through the Edit Points dialog.

Translate

The Translate task allows you to move a group of points.

Select points

Select the points for translation. These points can be chosen from the map, from the Jobs List, or by entering a Range using the **By Range** button.

Translate By

Select the method for translation. This can be by Coords/Pts or Az,Dist,Ht.

Coords/Pts: all the selected points will be moved in the same direction and distance as between the points (locations), set by the next two fields: From Pt (From Crd) and To Pt (To Crd). In the first case, define only the point ID, in the second case - the local coordinates and the height of the location.

Az,Dist,Ht: all the selected points will be moved in the specified direction by a specified distance. These parameters are set through the Bearing (Azimuth) field, Hz Dist, and Vert Dist fields.

Calc

Translates the points. The results can be seen through the Edit Points dialog.

Scale

The Scale task allows you to scale the distances of a range of points relative to a Base Point.

Select points

Select the points for scaling. These points can be chosen from the map, from the Jobs List, or by entering a Range using the **By Range** button.

Base Pt

Sets the point that is the reference point for the scale transformation.

Scale Factor

The scale factor of the coordinate transformation.

Scale Heights

Check this field if the height values should also be scaled.

Calc

Scales the points. The results can be seen through the Edit Points dialog.

2D Transform

The 2D Transform dialog contains a list of point pairs used for getting the transformation parameters.

Add

Select the *Add* button to enter pairs of points / plane positions.

Edit

Select the *Edit* button to change an existing point pair.

Delete

Select the *Delete* button to remove an existing point pair.

Next

Select the *Next* button to move to the 2D Transform Parameters page.

Traverse Adjustment

Before the result of a traverse can be used to determine its location from the traverse stations, the traverse must be mathematically consistent. The misclosures in latitudes, departures, angles and/or elevations must be adjusted out. The process of applying corrections to the individual latitudes, departures, angles and/or elevations in order to make them meet given conditions, is called **traverse adjustment**.

Start Point

The station on which the traverse originates.

End Point

The station on which the traverse closes.

Adjust Elevations

Enable this check box to include elevation adjustments if it is needed to determine elevations in the traverse.

Adjust Sideshots

Enable this check box to include sideshots in adjustments.

Curvature refraction

If you need to consider Earth curvature and atmospheric refraction corrections, set the value of curvature refraction to 0.14 or 0.20.

Job to store the results

Set the name of the new job where the results of adjusted traverse will be stored.

Adjustment Close

Sets the methods of traverse adjustment.

Apply Compass Rule

Enable this check box to adjust the traverse by the compass rule.

Apply Angle Balance

Enable this check box to adjust angles in the traverse.

Closing Angle

Shows the closing angle for the traverse adjustment.

Adjustment Results

Adjustment results contain the following information:

- Adjustment methods
- Names of the start and end points of the traverse
- Whether an adjustment of elevations and adjustment of sideshots are made or not
- Coefficient of refraction
- Path to the new job with the adjusted traverse
- Information about control points
- Original coordinates of a traverse station
- Adjusted coordinates of a traverse station
- Differences between original and adjusted coordinates of a traverse station (Change)

- Total difference for the traverse station (Linear)

Also, if the Adjust Sideshots option has been chosen:

- Original coordinates of the sideshots
- Adjusted coordinates of the sideshots
- Differences between original and adjusted coordinates of the sideshots (Change)
- Total difference of the sideshots (Linear)

Point Pair Info

The **Point Pair Info** dialog selects the pairs of points or coordinates to obtain transformation parameters.

From Pt/From Crd

Changes the field to enter either the point or coordinates from which the parameters will be calculated.

To Pt/To Crd

Changes the field to enter either the point or coordinates from which the parameters will be calculated.

2D Transform Parameters

The 2D Transform Parameters dialog displays the transformation parameters which will be applied to the set of points needing transformation.

"From.. To"

Tap the button to select points to transform from the **By Range** dialog.

Map

Tap the button to select points to transform from the map.

List

Tap the button to select points to transform from a list.

Layer

Tap the button to transform all points from a layer selected in the **Layer** dialog.

Back

Returns to the *2D Transform* dialog.

Calc

Performs the two dimensional transformation and displays a successful message.

Traverse Calc

The Traverse Calc task calculates Traverse and Sideshot points, based on horizontal and Vertical Offsets along a direction which is defined by an azimuth or right, left or deflection angles.

The **Traverse Calc** page displays the initial data for the traverse task:

From Point

Set the occupation point (the traverse point). It can be manually entered, chosen from the map or the list of Job points.

Azimuth/Angle Right/Angle Left/Deflection

Set the azimuth from the known point to the calculated point. The azimuth can be entered as is, computed from the right or left angles, or deflection entered in this field and Backsight information.

The angle to the right is the angle at the known point from the backsight point to the calculated point in a clockwise direction.

The angle to the left is the angle at the known point from the backsight point to the calculated point in an counter clockwise direction.

The deflection is the angle at the known point between the prolongation of the line from the backsight point and the line to the calculated point.

HD Grd/Gnd

Set the grid or ground horizontal distance along the azimuth line. To alternate between grid or ground press the button.

Vert Dist

Set the Vertical Distance along the azimuth line.

To Point

Set the name of the calculated point.

Code

Set the code and attributes associated with the calculated point.

BS Point

Press to display the BS Point dialog that allows you to enter the Backsight Point or Backsight Azimuth. If a BS point has not been entered, then an Azimuth is required. In this case if an angle value is entered as Angle Right, Angle Left, or Deflection, this value will be considered as azimuth.

SideShot

Press to compute the coordinates of the To Point, based on the entered values for Azimuth/Angle Right/Angle Left/Deflection, Horizontal and Vertical distances. The From Point does not change, and To Point is incremented to the next new Point in the database.

Traverse

Press to compute the coordinates of the To Point, based on the entered values for Azimuth/Angle Right/Angle Left/Deflection, Horizontal and Vertical distances. The From Point changes to the To Point, and the To Point changes to the next new name in the database.

The **Results** page shows the results of the calculation of all the sideshots of traverse tasks:

North is the northing coordinate of the SideShot/Traverse point.

East is the easting coordinate of the SideShot/Traverse point.

Ell Ht is the height of the SideShot/Traverse point.

From Point of the task.

To Point of the task.

Azimuth from the From Point to the To Point.

Bearing from the From Point to the To Point.

Hz Distance is the horizontal distance between the From Point and the To Point.

Vert Distance is the vertical distance between the From Point and the To Point.

Save

Saves the results of the calculation. Only the points with check marks next to them will be saved.

BS Point

The BS Point dialog allows you to enter the backsight azimuth for the Traverse task of COGO.

The azimuth can be computed from the **Traverse From Point** to a backsight point or can be entered manually.


BS Point/BS Azimuth/

Set the backsight point location or the backsight azimuth. The backsight point may be entered manually, selected from the map, or from the list of Job Points.

Code

If a backsight point is entered, the code and string of the point are displayed.

Calculate DTM

The  represents the Calculate DTM feature.

Click an icon to calculate the task:



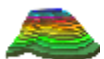
[DTM Volumes](#)

Calculates the cut, fill, and area between two DTMs.



[Create DTM](#)

Creates a new DTM.



[Contour DTM](#)

Represents DTM data along contour lines.

DTM Volumes

To perform volume calculations:

1. In the **Final** field, select the DTM on which you want the volume calculations to be performed. Either enter the name of an existing DTM in the edit field, or press the List selection button and choose the DTM from the list. When the DTM selection changes an information message will display the maximum and minimum Northing and Easting values for the area covered by the DTM.
2. From the **DTM** drop-down menu, select one of four options for volumes calculations.
 - If **DTM** is selected, select another existing DTM. Either manually enter the name of the second DTM or press the List selection button and choose the DTM from the list. The plots will display both of the DTM selected.
 - If **None** is selected, the plot will display only the final DTM. The plane of projection of the final DTM will be defined as a flat plane at a fixed elevation of zero.
 - If **Elevation** is selected, the plot will display only the final DTM. The plane of projection of the final DTM will be defined as a flat plane at a fixed elevation. Either manually enter the fixed elevation in the edit field or press the Map or the List selection button to select a point in the job whose elevation will be used as the fixed elevation. After the point selection dialog has closed the edit field will display the elevation of the selected point.
 - If **Plane** is selected, the plane of projection of the final DTM will be defined by three separate points. Either manually enter the names of the three points in the edit fields or use the associated Map and List selection buttons to select these points from the job.
3. Press the **Calc** button to calculate the cut and fill volumes and projected areas of a DTM to another DTM or a plane of projection.

When a successful DTM calculation has been performed the Results tab will display the calculation data. A warning message displays if any of the fields are empty or contains a name that does not exist.

Creating DTM

Create DTM allows you to create a Topcon *tn3* Tin by selecting points from their job, existing point lists, existing areas, and existing linework. DTM is a three-dimensional display of transformed elevation data. DTM describes the topographic surface with a network of digitized points and optional breaklines.

To create a DTM

1. In the **Points/Point List/Linework/Area** field, select the current method of selection of data required to create the DTM.
 - For **Points**, in the **Sel Pts** drop-down list, choose an option to select multiple points in the job for creating the DTM:
 - *All* - all the job points.
 - *By Range* - points from a range. [More...](#)
 - *By Code* - points of a selected code. [More...](#)
 - *By Code String* - points of a selected code string. [More...](#)
 - *By Radius* - points around a selected point at a certain distance. [More...](#)
 - *From Map* - points selected graphically from the map [More...](#)
 - *From List* - points from a list of points. [More...](#)
 - *From Layer* - points on a selected layer. [More...](#)
 - For **Point List**, press the List selection button and select an existing point list in the job. [More...](#) The list name will appear in the edit field. The name can also be manually entered into the edit field and added to the point selection by pressing the ok button.
 - For **Linework** and **Area**, press either the Map selection button and select an existing linework/area from the map ([more...](#)) or press the List selection button and select an existing linework/area from the list ([more...](#)). The name will

appear in the edit field. The name can also be manually entered into the edit field and added to the point selection by pressing the ok button.

2. The list will display the points currently selected, and the plot will display the created DTM.
3. To obtain information about a single point highlighted in the list, use the Info button.
4. If required, check mark the **Include Breaklines** box to apply breaklines and exclusion areas to the DTM. Breaklines are linear elements that describe changes in smoothness or continuity of the surface.



NOTICE

The points whose feature code is flagged as being a breakline or exclusion area get applied to the DTM in the order that they appear in the points list. You can alter the exclusion areas and breaklines by moving their points up or down in the list.

5. Click **Save** to save the DTM created from the selected points in the DTM folder by default. The default name will be **newTIN.TN3**.
6. When a valid DTM has been created, the **Results** tab displays the results updated dynamically as you alter the data.
7. The Map tab displays the created DTM as the current selected points and the triangulation lines.
8. A warning message displays if less than three or no points have been selected, or there are not enough points to create a DTM since several have been excluded because their code was flagged as not to be used in a DTM or they are incomputable in the current system.

To edit the DTM

1. To view a point on the plot, highlight the point in the list.
2. To see a Map view of the current DTM, double-click in the plot window.

3. To delete any point from the DTM:
 - Highlight the point in the list.
 - Click the Delete button. The DTM will be updated.
4. To alter the boundary of the currently selected DTM:
 - Press the **Edit Boundary** button. Find out [more...](#)

Icons you can use

MAGNET Field general buttons and icons are described [here...](#)

General Icons



The Delete button is used to delete the selected points in the points list.



The Info button is used to display information on a single point highlighted in the list.



The Up (and Down) arrow button is used to move the selected points up (and down) in the list control. If the current selection is at the top or bottom or nothing is selected, the buttons will be disabled accordingly.



The Plot button is used to hide and show the plot window.



The Arrow control button allows you to use the keyboard arrow keys to move points inside the list.



Opens the list of points.



Opens a map.



Confirms settings, closes the dialog, and returns to the previous dialog.

Editing Boundary

The boundary selection dialog contains a list of points, which bound the DTM (the general plot of the DTM with the boundary in red).

To edit the boundary:

1. If required, move points up and down the list to change the order of the boundary. The DTM will be updated to reflect the changes to the point order.
2. To delete a point from the boundary, highlight the point in the list and click the red minus icon. The DTM will be updated.
3. Use the Map or List selection button to select points from all of the points in the DTM to add to the boundary.



NOTICE

When you select a point in the boundary Map selection dialog the point is added between the end points of the segment which is closest to the selected point. After each selection the DTM gets updated to show your selection. When you return to the Edit Boundary dialog, the point list gets updated to the order of the boundary in the map.

Find out the description of the icons on the dialog [here...](#)

Contouring DTM

This dialog allows you to contour an existing Topcon **TN3 TIN**. Contouring DTM is a method of transforming elevation data into a contoured surface, representing data along contour lines.

To create the contours on the DTM:

1. Enter the **DTM Name** manually in the edit field, or press the List selection button to select an existing DTM from the list.
2. The plot window will display the currently selected DTM.
3. Press the **Next** button to set the parameters required for contouring the DTM.
4. Enter a **Contour Interval** between the contour lines in the edit field as required. The Contour line interval must be greater than 0.001m. The difference between the start and end elevations is divided by the interval to get the number of contour lines.

5. The ***Start Elevation*** edit field initially shows the lowest elevation in the selected DTM. If required, you can enter a different value.
6. The ***End Elevation*** edit field initially shows the highest elevation in the selected DTM. If required, you can enter a different value.
7. Press the ***Save*** button to store the contoured DTM and generate the contour lines in the job. The lines will be added to the job as lines with the DTM name and an integer value starting at 1, which makes the line unique.

The results of contouring will be displayed on the ***Results*** tab.

The ***Map*** tab will display the currently selected DTM as well as the contour lines in red.

Map



Map

The Map screen displays the plot of the current job, the viewing tools, and the scale. The Map maintains the scale after changing the status of the main map.

Click a tool icon to execute the command:



[Zoom In](#)

Zooms the plot inwards.



[Zoom Out](#)

Zooms the plot outwards.



[Zoom Window](#)

Selects a frame of objects for zoom-in display; draw from left to right to get the object you want.



[Zoom All](#)

Displays all objects in the job.



[Zoom By Point](#)

Selects a point to center the plot.



[Properties](#)

Selects the map properties to display. Also, pressing and holding the stylus on the map area displays the Map Properties option.

The Main Map allows you to edit job data and to [stakeout](#) desired objects. On the Main Map, tap the object to highlight it. Hold the stylus on the selected object until a pop-up menu displays. The menu options depend on the object selected. Use the appropriate item from the pop-up menu.

Map Properties

The Map Properties dialog allows you to:

- Customize the map view
- Add to the points
- Show the point properties (names, codes, heights, etc.)
- Display the Auto Topo points

To enable display the points, place a check mark in the **Show Points** field. Along with the points their **names**, **codes**, **icons**, **heights**, **auto topo** and/or **scanned** points can be displayed.

Also, it is possible to display **roads**, their **stations** and **templates**, **lines**, their **stations** and start each time from the current position. Selecting the **Current Position** check box enables the current position to automatically snap back to the center if it moves off the edge of the map.

Zoom In/Out/Window

To customize the display, click **View->Zoom In**, **View->Zoom Out**, or **View->Zoom Window** to zoom the plot inwards or outwards, or to select an area to center on.

Zoom All

To view all objects in the map, click **View->Zoom All**.

Zoom By Point

To select a point for centering, click **View->Zoom By Point** and choose the point in the Select point dialog.

Connections



Connections

This dialog allows you to perform the following tasks:

1. To select a device type and a configuration style to work at the site.
Find out more...[Device connection](#)
2. To enable a connection prompt upon starting the job.
Find out more...[Device connection](#)
3. To connect with MAGNET Enterprise web-server and the project for data exchange.
Find out more...[Enterprise Connection](#)
4. To enable automatic connection with the network server.
Find out more...[Network connection](#)

To enable automatic disconnection with the network server.
Find out more...[Network connection](#)

General Connection Settings

The General tab of the Connections dialog allows you to change the type of the device to work and to select a job configuration before connecting to the device.

GPS

Select the GPS type of instrument and the configuration to work in the current job.

Optical

Select the Optical type of instrument and the configuration to work in the current job.

Prompt at startup

Unchecking this box will prevent the program from connecting to an instrument until you click the Connections icon on the main folder or enter a Survey or Stakeout dialog; however, the Network settings will be available. You can also set a prompt for connection at startup in the [Global](#) dialog.

Connect/Disconnect

Clicking this button initiates the connection to the instrument associated with the currently selected configuration or close communication, respectively. Find out more about [Bluetooth](#) connections.

Bluetooth

Device Discovery

The **Select Bluetooth Device** dialog lists all visible Bluetooth Devices.

Each device's name is displayed. If the name cannot be resolved, the Bluetooth Unique Address is displayed instead. Type of device and its services are displayed if the device provides this information.

The dialog title displays the type of device that application tries to connect to.

If a device is not present in the list or some devices did not report their names in a timely manner, try refreshing the list using the **Refresh** button. If the device is still not listed, then the distance to it can be too large or the device can be connected to a different controller. Connection with the device is possible even if its name was not resolved and only the Bluetooth Unique Address is listed.

The **Select** button will initiate [authentication](#) with the device.

If Bluetooth hardware is disabled (powered off) or the controller has an unsupported Bluetooth stack, a warning will be displayed. Currently, only the Microsoft Bluetooth stack is supported.

Authentication

The application maintains authentication information independently of the Bluetooth UI in the operating system. There is no need to pair devices beforehand, because the application will perform the pairing.

The application supports connections with devices that do not require a PIN code. To use this feature, uncheck the **Require PIN** check box. If the PIN code is provided and a connection is successful, the application will store the PIN code in a protected area for future use.

Press the **Connect** button to initiate a [connection](#).

If a connection succeeds, the Bluetooth Unique Address and its authentication will be stored. Next time the application will not display the Device Discovery.

Bluetooth Connection

When the application tries to establish a connection with the Bluetooth port, it displays the **Accessing Bluetooth Device** dialog. The title of the dialog displays the type of device that the application tries to connect to.

If a connection cannot be established in a timely manner, the dialog will automatically stop the connection. A connection can be cancelled manually and with the **Cancel** button.

It is possible to initiate the [Device Discovery](#) procedure using the **Change Device** button. Also, the device discovery can be initiated by clearing the **Connect to the last BT device** check box before connecting.

Enterprise Connection

The Enterprise tab allows you to establish a connection with an enterprise project:

- Enter your **Login** information to connect to the Magnet Enterprise server.
- Select a project from the **Connect to project** drop-down list. You can create a new project using the nearby icon.

- Click **Connect** to establish the connection. Connection status displays the result.

Network Connection Settings

The Network tab allows you to manage an automatic connection of the modem to the NTRIP server for Internal CDMA and GPRS modems.

Auto-Connect

When this box is checked, an automatic connection of the modem is enabled. After clicking the back button, the Network tab will display the process of the connection. Find out more: [Connection to Network](#). If automatic connection is disabled in the Connections dialog, you can configure the modem from the Status or Topo screens.

Check signal quality

When this check box is selected, the signal quality is displayed on the Signal bar.

Auto-Disconnect

When this check box is selected, an automatic disconnection and switching off the modem is enabled on exiting MAGNET Field.

Setting Up GPS Survey



Setup folder

Before conducting the survey you may need to perform some preliminary work that depends upon the current job configuration.

Setup GPS folder

Click an icon to perform the task:



[Localization](#)

Calculates localization parameters of the mathematical coordinate transformation between an original coordinate system, in which the job points are measured or given, and a local coordinate system, in which control points are known. [Find out more...](#)



[Start Base](#)

Sets the Base Receiver in RTK survey.



[Status](#)

Displays information about the current position of the GNSS receiver, RTK status, and the satellite constellation.



[Known Pt Init](#)

Initializes the receiver using known coordinates for the Rover station.



[mmGPS Init](#)

Sets up mmGPS+ system for RTK surveying.



[Static Occupation](#)

Starts logging data at the point occupied for static observations in PP Static survey.



[Simulator](#)

Sets initial WGS84 position for GPS simulation.

Status

This allows you to check the status of a GPS+ survey. The Status dialog contains information about the current position of the receiver, RTK status, and the satellite constellation.

[Position](#)

[System](#)

[Log History](#)

[Multi Base Status](#)

[Scatter Plot](#)

[SVs](#)

Position

Position page displays:

- Total number of the available satellites. The lock icon signifies the number of the satellites tracked, and the star icon shows the number of satellites used in position determination.
- Current UTC time.
- Coordinates of the position in the selected coordinate system and units.
- PDOP value; it is a factor depending solely on satellite geometry describing how the uncertainty in the coordinates will depend on

the measurement errors. PDOP is proportional to the estimated position uncertainty.

- H and V stand for HRMS and VRMS, the RMS values of the horizontal and vertical coordinates, respectively.
- Base Dist: slope distance to base antenna. The field is empty if no differential corrections are received.

[Settings](#) opens the dialog where Elevation Mask or Base Make At Rover parameter can be changed.

Other pages in the Status dialog:

System


Log History

Multi Base Status

Scatter Plot

SVs



The icon  opens a pop-up menu which varies depending on the configuration type used. [More...](#)

Status pop-up menu

The pop-up menu can contain a different set of the following options depending on the configuration type used

Rover Antenna Setup

Config Radio

Config OmniSTAR

Config Beacon

Config RE-S1 Repeater

Reset RTK or Reset DGPS - the command that reinitializes the receiver.

mmGPS+ Options

Mission Planning

Clear NVRAM - the command that resets the receiver parameters to factory default values (such as active antenna input, elevation mask and recording interval, and information about the receiver's internal file system). This command will not delete any files from the receiver memory. After clearing the NVRAM, the receiver will require some time to collect new ephemerides and almanacs (around 15 minutes).

System

Open the System page to view the information about the current state of the RTK measurements:

- **Position Type** - Indicates the [solution type](#) of the position.
- **Common Sats** - Number of common satellites between the base and rover.
- **Initialized Sats** -Number of satellites initialized.
- **Radio Link** -Quality of the radio link.
- **RTK Age** - Age of the last RTK message in seconds.
- **Receiver Memory (KB)** - Available memory in the receiver for storing TPS files.
- **Receiver Power(%)** - Percentage of receiver power remaining.
- **Controller Memory (KB)** - Available memory in the controller.
- **Controller Power(%)** - Percentage of controller power remaining.
- **NetRTK (MAC) Status** - Applies to Network RTK style with MAC corrections selected. Will display 'Yes' if MAC is used for position computation.
- **Base Make at Rover - Requires Topcon receiver f/w at rover 3.4 or higher.** If Automatic detection of Base Make is selected in style settings, this field will report the Base Make that was detected by the Rover receiver. If the Base receiver does not support IGS Class extensions to correction formats or if the required RTCM messages were not enabled on the base, this field will report a dash (-), and the rover will apply default GLONASS corrections. You can override this by pressing the Settings button

in the Status dialog or in the Styles Settings (Advanced). No Base Make At Rover will be reported by MAGNET Field in this mode.

Other pages in the Status dialog:

Position

Log History

Multi Base Status

Scatter Plot

SVs

Solution type

Possible solution types:

- No Solution - receiver cannot produce a solution (not enough satellites or incorrect antenna model)
- Autonomous (Standalone)
- DGPS (Code-differential)
- Float
- Fixed (RTK)
- HP DGPS - High-Precision Omnistar solution
- DGPS(VBS) - indicates DGPS solution produced using code-differential corrections received from an Omnistar satellite



mmGPS+ solution marker indicates that solution was produced using mmGPS+ technology

Log History

If the Log History is available, a Log History tab is displayed.

The Log History tab graphically displays the usage of satellites over time. For convenience, the field is divided into 5-minute portions

along dotted lines. The starting time and next half hour is marked with time labels.

Other pages in the Status dialog:

Position

System

Multi Base Status

Scatter Plot

SVs

Multi Base Status

The Multi Base Status page displays the information about the current state of the RTK measurements in the multiple base configuration.

RTK - Use: a check mark indicates this base station is currently used by the RTK engine.

RTK - ID: the numerical ID of this base station.

RTK - Base: the name of this base station. (Only available if this base is currently in use)

RTK - Age: the age of the last RTK message received by this base station.

RTK - Link: the quality of the radio link of this base station.

RTK - Type: Indicated the [solution type](#) of the position (only available if this base is currently in use)

RTK - Dist: the distance between this base station and the rover. (Only available if this base is currently in use)

Other pages in the Status dialog:

Position

System

Log History

Scatter Plot

SVs

Scatter Plot

The Scatter Plots tab displays the current receiver position changing in time: either the current receiver vertical position or the horizontal position relative to the position in a local (northing, easting) coordinate system.

The buttons on the left of the plot are used to switch between horizontal and vertical plots, to zoom in and out, and to open properties.

Other pages in the Status dialog:

Position

System

Log History

Multi Base Status

SVs

SVs

The SVs page of the Status dialog displays a graphical representation of the position of the satellites on the sky or the S/N ratios.

Show GPS

Shows/hides the GPS satellites images.

Show GLNS

Shows/hides the GLNS satellites images. GLNS satellites are marked with the "+" sign.

SNR/Skyplot

Toggles the appearance of the dialog to the skyplot or the signal-to-noise ratio for the satellites.

List/Plot

Toggles the appearance of the dialog between the graphical representation to the table displaying the satellites parameters:

PRN: shows the number of the satellite

H/U: shows whether the satellite is healthy or unhealthy

EL: shows the elevation angle of the satellite

AZ: shows the azimuth of the satellite

SNR1: L1 signal to noise ratio

SNR2: L2 signal to noise ratio

USED: shows whether the satellite is used in position computation. You can select whether a satellite should be used or not by selecting the corresponding row for the satellite in the list and clicking on the USED column header. This will toggle the use of the satellite.

Other pages in the Status dialog:

Position

System

Log History

Multi Base Status

Scatter Plot

Mission Planning

The Mission Planning option enables you to examine the expected observation conditions (such as satellite visibility and PDOP). This can be done in order to find out the best timing for observations at the specified point.

To perform mission planning:

1. Select **Setup / Status** and the **Mission Planning** option from the pop-up menu.
2. Configure settings for observations in the **Mission Planning Setting** dialog. [More...](#)
3. Once the Mission Planning Setting dialog is closed the Mission Planning dialog will calculate and show the position of satellites in the first 10 minutes of the specified time on the **Sky Plot** (the celestial sphere).
4. The **Local** field displays the date and time (local time) of the calculation result.

5. The dialog also provides information about the given position as applied to the calculations, the *PDOP* value, and the number of *GPS* and *GLONASS*.
6. If required, you can hide all the GPS or GLONASS satellites from the view. To do this, uncheck the corresponding box.
7. Use the appropriate button to calculate and show the satellites every 10 minutes of the specified time:
8. Press > or < to move forward or backward, respectively
9. Press I< to return to the start time
10. Press II to pause at any 10-minute interval
11. To view different graphical satellite information, select a desired option from the drop-down selection list:

Sky Plot

Sat List

Sat Num

PDOP

Mission Planning Setting

To configure settings for Mission Planning:

1. Enter the coordinates of the current position in one of the two possible ways

- automatically by clicking 
- manually in the current coordinate system after clicking



2. Select the *Date*, *Start*, and *End Time* of observations as required.
3. If required, change the Elevation Mask from the default 15 degrees for a desired value.

Satellite List

The Satellite List option allows you to view graphically the availability of either GPS or GLONASS satellites changing in the specified time.

Satellite Number

The Satellite Number option allows you to view graphically the total number of GPS and GLONASS satellites changing in the specified time.

PDOP

The PDOP option allows you to view graphically the PDOP value changing in the specified time.



Start Base

The Start Base dialog contains information about the Base receiver and can be used for setting the Base Receiver.

Point

Enter the name of the point where the Base receiver is located. It can be entered or chosen from the map or the list of the job points.

Coordinates

The coordinates of the base position in the selected coordinate system.

Auto Pos

Enables you to measure the position of the current point. Once pressed, the button changes its name to Stop. Press it to stop logging the position. The average coordinates will be displayed. The Pos field appears and shows the number of the measurements used for averaging.

Ant Ht

The measured antenna height and type (vertical or slant) of measurement.

Start Base

Sets the receiver as a Base transmitting the selected coordinates.



The icon opens a pop-up menu of the following options.
[More...](#)

Multi Base

The Multi Base dialog sets the multi base mode for the RTK survey.

Base Station ID

The identifying number of the base, which is sent as part of the CMR+ messages. Each base in a network must have a unique ID.

Transmit Delay

Signal transmission delay from the current base. This parameter is set to ensure that the radio signals from multiple bases do not overlap. Each base should be set at least 250 milliseconds apart from any other. (At least 500 milliseconds for data transfer rates less than 9600 bps.)

Use Multi Base

Enables multi base mode for surveying.

Start Base pop-up menu

The pop-up menu can contain the following options:

Status

[Config Radio](#) depends on the configuration for the survey

Multi Base



Static Occupation

The Static Occupation dialog allows the configuration of the receiver for a Post-Processed static occupation of the survey marker.

Point

Enter the name of the point where the static receiver is located. It can be chosen from the map or the list of the job points, or can be entered manually.

Code

The code you want assigned to the point. It will be included in the raw GPS data file.

Ant Ht

The measured antenna height and type (vertical or slant) of measurement.

Duration

The length of time you want the receiver to log data to the raw GPS data file.

Start Occ

This button starts the logging of epochs into the raw GPS data file.



Localization

The Localization is used for transformation of the coordinates between a local (ground) system and other (WGS84) system, in which the job points are measured.

The Localization dialog contains a list of points used for localization. These are called control points. Their coordinates are known in both systems: local ("Known Point") and job coordinate system ("Measured Point"). Each point has a level of reliability specified

with the values of the residuals along the horizontal and the vertical axes and the Control parameters that shows the status of the point.

Type

Allows you to select the type of Localization (by the job coordinate system). The WGS84 selection is always available. Datum or Grid selections are available only if you selected a specific coordinate system in the Coordinate System dialog before visiting the Localization dialog. On Localization dialog it is possible to change the Localization type after control points were added.

Add

Opens the [Localization Point](#) dialog for adding control points.

Edit

Opens the [Localization Point](#) dialog to change the control point added.

Remove

Removes the highlighted points.

Details

Opens the Localization Results dialog.

Settings

Opens the Survey parameters dialog.

Related tasks:

- Basic Concept of Localization
- Localization with Stereographic Projection on WGS84
- Localization with Stereographic Projection on any Datum
- Localization with any Predefined or Created Projection
- One-point Localization
- Two-point Localization
- Three-point Localization
- Performing Localization
- Importing Localization Data to Other Job

Add Localization Point

The Add Localization Point dialog contains the coordinates of the control point added to localization.

Known Point

The Known Point field contains the coordinates of the point in the local (ground) coordinate system.

Point: sets the name of the control point. You can enter a new point, select a point from the map or from the list.

Use Horizontal: specifies that a point should be used for the horizontal localization.

Use Vertical: set if the point should be used for the vertical localization.

Measured Point

The Measured Point field contains the coordinates of the control point in the coordinate system that is set for the current job. When computing localization parameters these coordinates will be transformed to the local system. The type of transformation can be selected in [Localization dialog](#).

Point: Sets the name of the control point. You can enter a new point, select a point from the map or from the list.

Start Meas: Sets the control point to the current location. The Epoch Count field shows the number of the accepted epochs. The parameters of the logging are set through the Survey Parameters dialog. If a point with the same name already exists, the application will open the Point Check notification dialog. You can overwrite, rename, or store the point as a check point.

OK: Saves the point and returns to the Localization dialog with a newly added point.

Localization Results

The Localization Results dialog contains the calculated parameters of the localization: the global coordinates (Lat0, Lon0, h0), the corresponding local coordinates (N0, E0, Elev0), the scale parameter

(Scale), the rotation parameter (Az) and the plane slope angles corresponding to north and east directions.



Simulator

Allows you to setup the initial WGS84 position for GPS simulation.

If simulation moving speed is not zero, the current position starts to drift immediately. The current position is remembered between TopSURV runs.

Moving speed and direction can be changed in the main map or in the Topo dialog using arrows.



Known Point Initialization

The Known Point Initialization is used to initialize the receiver using the known coordinates for the Rover station. It is optionally used with single frequency receivers and for quality control on dual frequency receivers. By default, this option is absent in the menu. To show it,



from the Home menu, click

and then



. [More...](#)

Point

Enter the name of the point where the Base receiver is located. It can be entered or chosen from the map or the list of job points.

Coordinates

The coordinates of the rover position in the selected coordinate system.

Ant Ht

The measured antenna height and type (vertical or slant) of measurement.

Initialize

Initialized the receiver as a rover with the specified coordinates of [KPI Position](#).

KPI Position

The Position page displays:

- The total number of the available satellites. The lock icon signifies the number of tracked satellites. The star icon shows the number of satellites used in position determination.
- The current UTC time.
- The Residuals.
- The PDOP value; it is a factor depending solely on satellite geometry describing how the uncertainty in the coordinates will depend on the measurement errors. PDOP is proportional to the estimated position uncertainty.
- H and V stand for HRMS and VRMS, which are the RMS values of the horizontal and vertical coordinates, respectively.
- KPR Status: Shows if it is Initializing or Initialized.



mmGPS Initialization

The Init mmGPS+ dialog contains information about the calibration of the laser transmitter and initialization of the sensor.

Transmitter Data

Transmitter Position

Sensor



The icon in the upper-left corner of the dialog displays a pop-up menu of the following items:

- **Field Calibration:** Opens the [Calibration](#) dialog to set the transmitter to calibrate (i.e. to fix errors in incline in the self-leveling mechanism of the transmitter).
- **Known Point Offset:** Opens the [Known Point Offset](#) dialog.

Transmitter Position

The Trans Pos tab allows you to set up the transmitter's height and location at the job site.

The List contains the following items:

Name: The name of the transmitter.

ID: The channel of the transmitter.

Point: The point over which the transmitter is setup.

Resect

Opens the Resect dialog to perform resection for an unknown transmitter location.

Edit

Opens the Known Point dialog to select the point over which the transmitter is setup.

Delete

Removes the transmitter from the list.

The bitmap in the upper-left corner of the dialog displays a floating menu of the following items:

Field Calibration: Opens the Calibration dialog to set the transmitter to calibrate (i.e. to fix errors in incline in the self-leveling mechanism of the transmitter).

Known Point Offset: Opens the Known Point Offset dialog.

Transmitter Position

The Trans Pos tab allows you to set up the transmitter's height and location at the job site.

The List contains the following items:

Name: The name of the transmitter.

ID: The channel of the transmitter.

Point: The point over which the transmitter is setup.

Resect

Opens the Resect dialog to perform resection for an unknown transmitter location.

Edit

Opens the Known Point dialog to select the point over which the transmitter is setup.

Delete

Removes the transmitter from the list.

Sensor

The Sensor tab uploads transmitter calibration information to the sensor and sets up the sensor for receiving the transmitter's laser beam.

Receiver Port

The receiver port that connects the receiver and sensor.

Transmitter ID

The transmitter's channel. The ANY selection will allow the sensor to independently select the transmitter with the smallest error rate.

Sensor Gain

Sets the sensitivity of the sensor to the transmitter's laser beam.

Init Time Improvement

Check this box to improve the RTK fix time for the receiver.

Init Sensor

Starts the initialization process.

Resect mmGps+ Resect

The Resect tab is used to perform the resection calculation from the rover point to the point over which the transmitter is set.

The upper-right corner of the dialog displays information about the current state of measurement:

The mmGPS icon displays the sensor that receives the transmitter's beam.

The quality of the radio link.

The type of the position calculation method.

The RMS errors for horizontal and vertical coordinates, respectively.

The number of the satellites tracked and used in position calculation, respectively.

Meas

The number of measurement.

Known Point

Enable this when occupying a known point, and select a point to occupy using the map and list buttons.

Ht

The antenna's height and method of height measurement.

Start

Starts the measurement process. After pressing, the button changes the name to Stop, and the counter of the epochs collected appears.

Logging

Displays the number of GPS epochs used in the resection calculation during the measurement.

Resect mmGps+ Sensor

The Resect dialog is used to measure an unknown transmitter location using the rover and three or more points. The Sensor tab is similar to the Sensor tab on the Init mmGPS+ dialog and used to set up the sensor.

Receiver Port

Sets the receiver port that connects the receiver and sensor.

Transmitter ID

Displays the channel of the transmitter.

Sensor Gain

Sets the sensitivity of the sensor to the transmitter's laser beam.

Init Sensor

Starts the initialization of the sensor.

Init Time Improvement

Select to improve the RTK fix time for the receiver.

Known Trans Horz Pos

If selected, then after pressing the Init Sensor button, the Known Point dialog displays. Select the point over which the transmitter is setup.

Data

The Data tab is used to view the results of resection measurements. Data will display only after three or more points have been measured.

Re-Meas

Clears all data and restarts the resection process.

Accept

Opens the Add Point dialog to view the point information for the transmitter.

Transmitter

The Transmitter dialog sets the transmitter parameters.

Name

The name of the transmitter.

Com Port

The communication port of the controller used to connect to the transmitter.

ID

The channel of the transmitter.

Calibration Data

The status of calibration data.

Clear Data

Clear the ID and Calibration Data fields.

Get Data

Retrieves the transmitter's data.

Field Calibration

The Field Calibration dialog selects the transmitter for field calibration.

Transmitter Name

The name of the transmitter to calibrate.

Update Calibration Data

The Update Calibration Data dialog will be displayed after performing Field Calibration if it is determined that the transmitter leveling offsets need to be adjusted.

Com Port

The communication port of the controller used to connect to the transmitter.

Update Data

Sends the offset info to the transmitter.

Known Point

The Known Point dialog is used to select the known point over which the transmitter is setup and enter the transmitter height.

Point

The point the transmitter is installed over. It can be selected using the map or list buttons.

Transmitter

Name

Displays the name of the transmitter.

ID

Displays the transmitter's channel.

Ht

Sets the height of the transmitter from the ground to the mark on the transmitter's side and the method of height measurement in the specified units.

2m Fixed Tripod

This box can be checked if using a 2 meter fixed tripod.

Known Point Offset

The Known Point Offset is used to compute the height offset between the rover and a currently occupied known point. This can be used as an adjustment for the transmitter height.

Transmitter Name

Displays the name of the transmitter.

Point

The point to be occupied. It can be selected using the map or list buttons.

Height Offset

Displays the difference in height between the known measurement and the current rover measurement.

Epoch Count

Displays the number of GPS epochs used in the measurement.

Start

Starts the measurement process. After pressing, the button changes its name on Stop, and the counter of the epochs collected appears.

mmGPS+ Options

The mmGPS+ Options dialog allows modification of various mmGPS+ functions. The current status of the receiver's mmGPS+ engine is displayed as ON, OFF or DISABLED. You can change the status by using the combo box to turn the mmGPS+ engine ON or OFF.

Use weighted height computations

The mmGPS+ height can be computed using weights for the laser and GPS data. When this box is checked, a greater weight is applied to the laser measurement when the rover is closer to the transmitter or to the GPS measurement when the rover is further away.

Height Difference Limit

Set a limit for the difference between GPS and mmGPS+ height measurements. The mmGPS+ icon will change if the difference is over this limit.

Settings

Elevation mask sets the parameter rejecting low-elevation satellites while positioning.

Canopy Environment check box instructs the RTK engine to use less rigid thresholds when filtering out measurement outliers. This mode is recommended when working under a tree canopy or in other cases of high multipath.

Base Make at Rover allows you to designate Base Make (IGS Class) used by the Rover receiver to account for GLONASS biases. This also allows you to override Base Make automatically detected by the Rover receiver if this information is transmitted by the Base.



NOTICE

If the receiver is connected, the settings are applied upon closing the dialog.



Sessions

The Sessions dialog allows you to configure and edit automatic surveys and install them into TPS receivers. The receivers can each be given a descriptive name and added to a list, easing the task of controlling multiple-receiver surveys.

The 'X' Buttons

The left hand button can be used to remove a Session survey configuration from the Sessions list. The right hand button can be used to remove a receiver from the Receiver list.

The '->' Button

Use this button to add a Session survey configuration to a receiver in the Receivers list.

The 'Add' Buttons

The left hand button opens the [Session Setup](#) dialog in which you enter or edit the Session survey configurations. The right hand button allows the addition of a new receiver to the Receivers list.

Sessions

The Sessions dialog is accessed through the export menu item. It allows you to import automatic surveys from TPS receivers into the controller.

Refresh

This button refreshes the active sessions list from the current receiver.

Export

This button sends the selected session to the receiver.

Session Setup

Session setup allows you to program a session which can then be loaded into the receiver to automatically start logging data at a specific date and time, and whether the antenna is static or roving.

Site Name

The name of the site where the receiver will be placed for the survey.

Type

Type of survey, either static or kinematic.

Start Time

The day of week and the local time that the receiver will start the survey.

End Time

The day of week and the local time that the receiver will end the survey.

Interval

The time between successive epochs logged to the raw data file.

Min SVs

The minimum number of SVs to use when logging an epoch. Epochs containing fewer satellites will not be logged to the raw data file.

Ant Ht

The measured antenna height and type (vertical or slant) of measurement.

GPS Survey



Survey Folder

Survey types depend upon the current job configuration.

Survey GPS

Click an icon to start the desired survey:



[Topo](#)

Conducts a survey with GPS static points and determine inaccessible points by setting offsets from measured points: Offset Line, Azimuth & Offset and Offset Laser. Find out more on [Offsets](#).



[Auto Topo](#)

Conducts a survey with GPS dynamic points.



[X-Section](#)

Performs a survey of a road cross-section.



[Find Station](#)

Identifies the station by the distance, computed to the station, and the offset from the road.



[Tape Dimentions](#)

Calculates the periphery of structures using tape measurements, relative to the two known points that belong to one side of the structure.

Topo

The Topo dialog enables you to initiate a static survey.

The Topo page contains the initial data for the survey and displays the progress of the survey. In the upper right corner of the dialog the information about the receiver operation is located. It duplicates the information on the Status dialog.

Point

Displays the name of the point to be logged.

Code

Displays the code for the point. Pressing the "..." button in the Code field displays the menu:

String: switches on the String field on the Topo tab. String is a specifying parameter for a code that allows you to group the objects with one code according to some specified attribute. For example, the code "Pole" also has the "Jones" string. Processing the points, you will be able to select only the poles of Jones' and will not take into consideration all the other poles. **Multiple Codes:** opens the Multiple Code Strings dialog. **Control Code:** opens the Control code dialog. **Note:** opens the Notes dialog.

Ant Ht

The measured antenna height and type (vertical or slant) of measurement.

Epoch count

Shows the number of the epochs used in averaging the position.

Start

Starts the survey process. After pressing the button, the name changes to Accept and a new button Cancel appears along with the count of the epochs achieved. The point is automatically saved if it meets the criteria for Logging the point as specified in Settings.

Start Log (present for the survey modes that include PP)

Starts Raw data logging into the receiver.

Settings

Opens the Survey Parameters dialog.

Data

The Topo-Data page contains the information of the base and the last point that has been logged since this dialog was opened.

Map

The Map tab shows the stored points graphically. All the survey process can be done through this page as well. It contains the information similar to the [Topo](#) dialog.

Auto Topo

The Auto Topo dialog enables you to initiate a dynamic survey. The Auto Topo page contains the initial data for the survey and displays the progress of the survey. In the upper right corner of the dialog the information about the receiver operation is located.

Point

Displays the name of the point to be logged.

Code

Displays the code for the point. Pressing the "..." button in the Code field displays the menu:

String: switches on the String field on the Topo tab. (Also the "&" sign appears indicating string) String is a specifying parameter for a code that allows you to group the objects with one code according to some specified attribute. For example, the code "Pole" also has the "Jones'" string. Processing the points, you will be able to select only the poles of Jones' and will not take into consideration all the other poles. **Multiple Codes:** opens the Multiple Code Strings dialog.

Control Code: opens the Control code dialog. **Note:** opens the Notes dialog.

Ant Ht

The measured antenna height and type (vertical or slant) of measurement.

Log Now

Stores the current position of the receiver antenna.

Pause

Interrupts the survey. After pressing this button, the button changes its name to Resume.

Start

Starts the survey process. After pressing this button, the button changes its name to Stop and the Pause button becomes available.

Start Log (PP DGPS and PP Kinematic modes)

Starts Raw data logging into the receiver.

Settings

Opens the Survey Parameters dialog.

Raw Data

Lists all the coordinates/measurement information of the selected raw data record.

Raw Gps+

All the raw data collected is displayed in a list on this dialog. When a line is selected, the column titles reflect the data in that line. Double click on a line to see the Data in a separate dialog.

The Coordinates of the Base are displayed and the vectors to the base from the rover of the collected points. The vectors are only displayed for the points collected with fixed solutions.

First

Moves the cursor to the first observation in the raw data.

Last

Moves the cursor to the last observation in the raw data.

Add Notes

Displays a dialog to enter additional notes for an observed point.

Find by Point

Finds a point by its name or a part of the name.

Find by Code

Finds a point by its code.

Find Next

Finds the next point in the list that satisfies the same conditions as the previous Find.

GPS Offsets

The Offsets tab allows you to set the offset point for the measurement.

Line

Opens the Line dialog to define a point set by the offset from a line.

Az Dis Ht

Opens the Azimuth-Distance-Height dialog to define a point set by the offset from a point.

Laser

Present if Laser has been selected in the Configuration. Opens the Laser dialog for measurements to define a point.

Cross Section

The Cross-Section task allows you to perform the survey of the cross section. To start working, select the Survey->X-Section menu. The Cross Section dialog contains the settings of the station, where the cross section survey is to be performed if a Road is selected.

Road

Enter the name of the Road manually or select the road from the list.

CI Code:

Enter the code and attributes of the center line points. Insert manually, or select one from the drop-down list.

Station/Chainage

Sets the station where the cross section is surveyed. This field is shown only if the road is set.

Interval

The increment of distance toward the next station. This field is shown only if the road is set.

Cross Section

This dialog appears only if a Road has not been selected for the cross section.

Station/Chainage

Enter the Station/Chainage for the recorded cross section.

Find Station

The Measurement tab of the Find Station dialog is used for the identification of the station by computing the distance from the beginning of the road to the projection of the station to the road, and the offset of the station from the center line of the road.

Road

Type the name for the road or select it from the list.

Point

The name of the point to Find Station for or to store after taking a measurement.

Code

The code and attributes of the Point. Code can be entered manually or chosen from the drop-down list.

Ant Ht

Enter the height of the antenna reference point (ARP) above the mark. Also the measurement type for the height needs to be specified: slant or vertical.

Pt Sta

Computes the offsets of the selected point.

Curr Sta

Computes and displays the offsets to the current point.

Start

Starts the survey process. After pressing the button, the name changes to Accept and a new button Cancel appears along with the count of the epochs achieved. The point is automatically saved if it meets the criteria for Logging the point as specified in Settings.

Tape Dimension

The Tape Dim tab contains the settings for performing the survey.

Point

The name of the next point in the survey.

Code

The code and attributes of the Point. Code can be entered manually or chosen from the drop-down list.

Dist Left/Dist Right

Toggles between Dist Left and Dist Right values. These set the direction of the next movement, relative to the previous direction. The field below sets the distance to move.

Accept

Applies the taped distance to the perimeter line.

Finish

Opens the floating menu of two items:

Close Polygon: connects the first and the last two points with a line.

Calc Closure: calculates the difference between the last and the first points.

Ref Line

The Tape Dimension dialog allows you to calculate the periphery of structures, such as buildings, that have features perpendicular to each other. This is done using tape measurements relative to the two known points that belong to one side of the structure (wall of the building), forming the reference line.

The Ref Line tab contains information about the two points comprising the reference line.

Start Pt

Contains the properties of the starting point: the name (can be entered manually, or chosen from the map or list) and code. Also, the point can be measured by pressing the Meas button.

End Pt

Contains the properties of the ending point: the name (can be entered manually, or chosen from the map or list) and code. Also the point can be measured by pressing the Meas button.

X-Section

The X-Sect survey is performed from one side of the road to another in a plane perpendicular to the center line. If the road has not been set, you should define the plane. The points are surveyed similar to the Observations from the Topo Dialog.

Point

Displays the name of the point to be logged.

Code

Enter the Code and Attributes for the Point the first time a line is recorded. This will automatically update from the next line.

Ant Ht

The measured antenna height and type (vertical or slant) of measurement.

Epoch count

Shows the number of the epochs used in averaging the position.

Start

Starts the survey process. Pressing the button changes the name to Accept and a new button Cancel appears along with the count of the epochs achieved. The point is automatically saved if it meets the criteria for Logging the point as specified in Settings.

Along CL/Offset

The offset values for the current position get displayed if a Road has been selected.

Data

The X-Sect Data page contains the information of the base and the last point that has been logged since this dialog was opened. If an alignment has been defined the offset values get displayed as well.

Map

The Map tab shows the stored points graphically. All the survey process can be done through this page as well.

PTL Mode

The Point-To-Line mode (PTL) is a method of interpretation of the point coordinates. The coordinates are defined through the two reference points. The line trace through these points is set as one axis and its perpendicular as another.

Start Ref Point, End Ref Point

The names of the reference points. Select these points from the map or select from the list of points.

PTL Mode On

Enables the PTL mode if checked.

Laser Setup

Occ Point

The occupation point can be selected by either entering the name, by selecting it from the map or the list, or it can be obtained from the BS dialog (when there is an encoder).

BS Azimuth/BS Point

You can enter the BS Azimuth value, select the BS point, or obtain it from the BS dialog (when we have an encoder).

Laser HI

Height of the device above the Occ Point.

Point

Name of the Point being measured.

Code

Code of the point being measured.

BS Meas (when we have encoder)

Takes you to the Laser BS Meas dialog.

There is a message window which guides you on what to do and displays the measurement values.

Optical Survey Setup

Setup Optical (Total Station) Folder

Click an icon to perform the task:



[Localization](#)

Calculates localization parameters of the mathematical coordinate transformation between an original coordinate system, in which the job points are measured or given, and a local coordinate system, in which control points are known. [Find out more...](#)



[Backsight](#)

Sets up a Total Station survey with a reference direction.



[Resection](#)

Computes the coordinates of an occupation point, where the instrument is set up, using measurements to two (or more) points with known coordinates.



[Benchmark](#)

Computes the elevation of an occupation point, where the instrument is set up, using measurements to two (or more) points with known elevations.



[Remote Ctrl](#)

Transmits commands from the controller to the motorized total station.

BS Survey

The Backsight Survey dialog contains the parameters of the Backsight station.

The BS Setup page contains following parameters:

Occ. Point

The name of the point where the total station is located.

The Occ. Point floating menu allows access to the: **Resection**: opens the Resection dialog that allows you to determine the occupation point coordinates by solving the resection task using the known point coordinates.

Elevation: opens the Elevation dialog.

HI

Set the height of the instrument above the mark.

HR

Set the height of the target above the mark.

BS Point (BS Azimuth)

Set the backsight point location or the direction to it.

BS Circle

Displays the horizontal circle reading corresponding to the backsight point. The bitmap next to the BS Circle field brings up the floating menu that recommends setting the BS Circle value to zero or azimuth, or to change the value by +/- 90 or 180 degrees.

Measure distance to BS

Set if the distance to the backsight point should be measured.

Fixed HR at BS

Set if the height of the backsight point is fixed for the whole set of measurements. This is useful when one target is mounted at the BS for the duration of an occupation and another is used for the sideshots.

Check BS

Opens the Check Backsight dialog for the backsight point checking.

HC Set

Sets the horizontal circle as defined in the BS Circle field.

Meas BS

Measures the Backsight point.

Settings

Opens the Mode dialog.

The bitmap on the upper-left corner brings up the following pop-up menu list: *Edit Points*: opens the Points list.

Edit Raw: opens the Raw TS dialog.

Inverse: opens the Inverse COGO dialog.

Intersection: opens the Intersection COGO dialog.

The **Data** page displays the available values of the backsight point parameters: Local coordinates (east, north and height),

Angle right

Azimuth

HA (Horizontal Angle)

VA (Vertical Angle)

SD (Slope Distance)

There are two fields in the top of the page where you can see the height of the instrument and the azimuth.

Check Backsight

The Check Backsight dialog contains information about the backsight point errors. There are two fields in the top of the page where one can see the height of the instrument and the azimuth.

Check distance to BS

Set if it is necessary to check the distance to the backsight point along with the angle measurement (when pressing the Check button).

Check

Checks the errors in angle and distance measurements and displays them on the dialog.

HC Set

Sets the horizontal circle to the selected value.

Remote Control

From the Remote Control dialog, you can control the total station through the radio. It shows the current values of the total station measurements and provides a set of tools for the control.

The button with arrows switches the keyboard control on and off and shows the current status of the switch.

Qlock

Sends the "Quicklock" or "Turn Around" command which will cause the Total Station to search for the RC-2. RC-2 is the Remote Control System 2 for optical communications. For instructions on how to operate the RC-2 device, consult the instruction manual for RC-2.

Search

Make the instrument search for the prism.

Lock

Locks onto the prism or tracks it.

Turn

Opens the Rotate dialog, which allows the Total station to turn to various angles or points.

Stop

Makes the total station stop tracking the prism and go into a "Standby" mode. The Data Indicator above the Qlock button shows the current state of the Total Station. There are four types: no data, querying status, turning, and receiving data.

All the observations can be done in the remote mode as well if the chosen instrument chosen is robotic.

Robotic Arrows

The buttons enable you to turn the total station on devices without arrow keys.

Each button corresponds to a direction to turn, plus the button in the center can be used to stop turning.

Resection

The method of resection allows you to define the horizontal coordinates for the occupation point. Two points with distance measurements are the minimum required to determine the occupation coordinates and the backsight constant. With angle-only measurements, 3 points are required. Additional points can also be measured, in which case a least-squared weighing is used.

Point

The known point name.

Code

The known point code. The code can be entered or chosen from the drop-down list.

HR

The height of the rod.

Meas

Takes the sideshot to the point.

Resection Options

The resection options dialog controls the input parameters and options for the implementation of the least squares solution.

Resection Type

Whether you are performing a 2D or 3D resection.

Resection Method

When performing a 3D resection, this determines whether the least squares solution is split into horizontal and vertical solutions or performed as a single 3D solution.

Use Default Measurement Accuracy

Sets the system default values for measurement accuracy.

Distance

Error in the distance measurement.

PPM

Part per million error in the distance measurement.

Horz Angle

Error in the horizontal angle measurement.

Vert Angle

Error in the vertical angle measurement.

Optical Survey

Survey Optical (Total Station)

Click an icon to start the desired survey:



[Topo](#)

Conducts a survey with sideshot points and determines inaccessible points by setting Offsets from measured points. Find out more on [Offsets](#).



[Auto Topo](#)

Collects points by Time and Distance only with Robotic instruments.



[X-Section](#)

Obtains the coordinates of points that lie on a plane perpendicular to a road center line. This type of survey is typically performed by moving from one side of a road to the other in the cross-sectional plane, and then crossing back in the opposite direction at a different location along the road.



[Find Station](#)

Identifies the station by the distance, computed to the station, and the offset from the road.



[Tape Dimensions](#)

Calculates the periphery of structures using tape measurements relative to the two known points that belong to one side of the structure.



[Missing Line](#)

Emulates the total station measurement from one point to another and stores the result to the Raw Data database.



Scanning

Collects points by scanning (with or without images) with Robotic and motorized reflectorless instruments.



Monitor

Measures one or more prisms repeatedly and uses the measurements to detect changes in the position of the prisms. The measurements are recorded into the raw data file.

Topo Survey

Sideshot-Direct

The Sideshot-Dir dialog contains the initial data for performing single sideshots and displays the information during survey. The measurement to a single point is taken using the Direct position of the Total Station.

Point

Sets the current point name. During the survey the numerical part of the name changes automatically by one.

Code

Sets the Code for the current point. This can be entered or chosen from the drop-down list.

The bitmap next to the Attributes List bitmap brings up the following list:

String: displays a control to enter the string for the point.

Multiple Code: opens the Multiple Code Strings dialog.

Control Code: opens the Controls dialog.

Note: opens the Notes dialog.

PTL Mode: opens the PTL Mode dialog.

HR

Sets the height of the target above the mark (rod height).

BS Setup

Opens the Backsight Survey dialog for setting the backsight point.

Meas

Takes a measurement and logs the point.

Sideshot-Direct/Reverse

The measurement to a single point is taken using the Direct Position and the Reverse Position of the Total Station (i.e., Plunge - Flip and Rotate the Total station by 180 degrees to get the reverse measurement). One set consists of one direct and one reverse measurement. These measurements are used to eliminate the Vertical circle centering errors.

This dialog behaves similar to the [Sideshot-Direct](#) dialog except that one measurement constitutes a set of readings rather than a single one.

Ang/dist Sets-Dir/Rev

In this method for the measurement to a single point, the instrument will use the specified Angle sequence to perform repeated measurements. The sequence of four measurements constitutes one set. One measurement is the backsight in Direct phase or the Foresight in Reverse phase in two positions of the Total Station. These measurements are used to eliminate centering errors in the horizontal and vertical circles.

This dialog behaves similar to the [Sideshot-Direct](#) dialog except that one measurement constitutes a set of readings rather than a single one.

Offsets

The Offsets page contains a set of tools for defining the offsets.

Hz Angle

Defines a point using the horizontal angle from one point and the distance to another.

Hz-Vt Angle

Defines a point using the horizontal and vertical angles.

Dist. Offset

Defines a point giving you the ability to add or subtract distances, horizontally and vertically.

2 Line ISection

Determines a point by the intersection of the two lines. Each line is defined by two points or two measurements.

Line & Corner

Determines a point on the corner using one line defined by two points and a horizontal angle measurement.

Line & Offset

Determines a point that is in a distance from a line defined by two points.

Plane & Corner

Determines a point (Corner) by a plane defined by three points and horizontal and vertical angle measurements.

Station and Offset

The Station and Offset dialog allows the backsight or occupation point to be determined by the station, offset and elevation in relation to a road.

Road

The referenced alignment can be a road or horizontal alignment.

Station

Enter the station along the road where this point should occur.

Offset

Enter the offset from the road where this point should occur.

Elevation

Enter the elevation of the point.

HA Offset

The Sideshot page of the Horizontal Angle Offset dialog contains data for defining a point using the horizontal angle from one point and the distance to another.

Point

Name for the offset point to be stored.

Code

Code for the offset point to be stored. Can be entered or selected from the drop-down list.

HR

Sets the target height above the mark (rod height).

Settings

Opens the Mode dialog.

Side and Center

Measure to Center and obtain the vertical angle and horizontal angle measurements. A Side measurement provides VA, HA, and distance measurements. With these two sets of measurements, the computation can be made for a point at the center of a tree.

Hz/Vt Angle Offset

The Survey Offsets dialog in the Hz-Vt Angle mode contains data for defining a point using the horizontal and vertical angles and a distance.

Point

Name for the offset point to be stored.

Code

Code for the offset point to be stored. This can be entered manually or chosen from the drop-down list.

HR

Sets the target height.

Distance

Measures the slope distance to target.

HA/VA

Combines the horizontal angle and vertical angle measurements with distance logged in Distance step to determine the point location.

Distance Offset

The Distance Offset dialog contains data for the definition of a point giving the ability to add or subtract distances, horizontally and vertically.

Point

Name for the offset point to be stored.

Code

Code for the offset point to be stored. This can be entered manually or chosen from the drop-down list.

HR

Sets the target height above the mark (rod height).

The Distance Offsets field contains the three parameters of the offset:

Down sets the height of the point relative to the current position.

Toward sets the distance between the current point and the projection of the offset point on the line of sight.

Right sets the distance between the offset point and its projection, taking into consideration its location relative to the line of sight.

Meas

Performs the measurement.

Hidden Point

The Measurement tab of the Hidden Point dialog allows you to define a point on the ground surface with a slanted rod touching the ground point. The rod has two targets.

Point

Name for the offset point to be stored.

Code

Code for the offset point to be stored. This can be entered manually or chosen from the drop-down list.

HR

Sets the target height above the mark (rod height).

Rod Pt1

Measures the first target on the rod.

Rod Pt2

Measures the second target on the rod.

Two Line Intersection

The Intersection dialog contains data for determining a point by the intersection of the two lines. Each line is defined by two points or two measurements.

Point

Name for the offset point to be stored.

Code

Code for the offset point to be stored. This can be entered manually or chosen from the drop-down list.

HR

Sets the target height above the mark (rod height).

Line 1 Pt1

Obtain measurements to determine the first point defining the first line.

Line 1 Pt 2

Obtain measurements to determine the second point defining the first line.

Line 2 Pt 1

Obtain measurements to determine the first point defining the second line.

Line 2 Pt 2

Obtain measurements to determine the second point defining the second line.

Line and Corner

The Line and Corner dialog contains data for determining a point on the corner using one line defined by two points.

Point

Name for the offset point to be stored.

Code

Code for the offset point to be stored. This can be entered manually or chosen from the drop-down list.

HR

Sets the target height above the mark (rod height).

Line Pt1

Obtains measurements to determine the first point defining a line.

Line Pt2

Obtains measurements to determine the second point defining a line.

Corner

Obtains the horizontal angle to locate a point on the line at the corner.

Line and Offset

The Line and Offset dialog contains data for the determining a point distance from a line defined by two points.

Point

Name for the offset point to be stored.

Code

Code for the offset point to be stored. This can be entered manually or chosen from the drop-down list.

HR

Sets the target height above the mark (rod height).

The Distance Offsets field contains the three parameters of the offset: *Down*: sets the height of the point relative to the current position.

Toward: sets the distance between the current point and the projection of the offset point on the line of sight.

Right: sets the distance between the offset point and its projection, taking into consideration its location relative to the line of sight.

Line Pt1

Obtains measurements to the first point on the line.

Line Pt2

Obtains measurements to the second point on the line.

Plane and Corner

The Plane and Corner dialog helps you to determine a point (Corner) by a plane defined by three points and an angle measurement.

Point

Name for the offset point to be stored.

Code

Code for the offset point to be stored. This can be entered manually or chosen from the drop-down list.

HR

Sets the target height above the mark (rod height).

Plane 1

Obtains measurements to determine the first point in a plane.

Plane 2

Obtains measurements to determine the second point in a plane.

Plane 3

Obtains measurements to determine the third point in a plane.

Corner

Obtains horizontal and vertical angle measurements to determine the point in a plane at the corner.

Note: Three points defining the plane must not be colinear (all on the same line).

Auto Topo

This function is activated only with Robotic instruments and allows you to collect points by Time and Distance. To open the Auto Topo dialog, select Survey->Auto Topo in the Robotic mode.

Point

Displays the current point name.

Code

Displays the current point code. The code can be entered manually or chosen from the drop-down list. Attributes and the notes etc can also be set for the point by selecting from the menu next to the code.

HR

The height of the rod (target).

Start

Starts the survey process. After pressing, the button changes the name to End.

Log Now

Immediately stores the current position.

Stop

Makes the total station stop tracking the prism and go into "Standby" mode.

Turn

Opens the Rotate dialog which allows the Total station to turn to various angles or points.

Lock

Lock onto the prism or "track" it.

Search

Makes the instrument search for the prism.

Qlock

Sends the "Quicklock" or "Turn Around" command which will cause the Total Station to search for the RC-21.

Elevation (Multiple)

The method of elevation allows you to define the vertical coordinate using the coordinates of two (or more) known points.

Point

The known point name.

Code

The known point's code.

HR

The height of the rod.

Meas

Takes the sideshot to the point.

Multiple Backsight

Multiple backsight points allow you to perform more precise measurements.

Point

The known point name.

Code

The known point's code.

HR

The height of the rod.

Meas

Takes the sideshot to the point.

Multi Set Page

The page contains the data collected during the measurements, grouped by sets (one set for Multiple mode contains two measurements; one set of the Repeat mode contains four measurements).

The columns are:

Set: the name of the set

Res HA: Difference of each HA measurement within the set from the average of all the HA's in the set

Res VA: Difference of each VA measurement within the set from the average of all the VA's in the set

Res SD: Difference of each SD measurement within the set from the average of all the SD's in the set

HA: Horizontal Angle measurement within the corresponding set

VA: Vertical Angle measurement within the corresponding set

SD: Slope Distance measurement within the corresponding set

Remove

Deletes all measurements from the set.

Accept

Saves the measured point.

Add

Brings you to the sideshot page to measure a new set of angles.

Find Station

The Measurement tab of the Find Station dialog is used for the identification of the station by computing the distance from the beginning of the road to the projection of the station to the road, and the offset of the station from the center line of the road.

Road

Type the name for the road or select it from the list.

Point

The name of the point to Find Station to store after taking a measurement.

Code

The code and attributes of the Point. The code can be entered manually or chosen from the drop-down list.

HR

Sets the target height above the mark (rod height).

BS Setup

Opens the Backsight Survey dialog for setting the backsight point. The information displayed is the same as has been entered.

Pt Stn

Computes the offsets of the selected point.

Cur Stn

Takes a shot to the point and computes and displays the offsets.

Meas

Takes a shot to the point, stores it, and computes and displays the offsets in the Results tab.

Missing Line

The Missing Line dialog emulates the total station measurement from one point to another and stores the result to the Raw Data database.

The Start and End points can be entered manually, chosen from the map or from the list, or measured through the Meas button.

Tape Dimension

The Tape Dim tab contains the settings for performing the survey.

Point

The name of the next point in the survey.

Code

The code and attributes of the Point. The code can be entered manually or chosen from the drop-down list.

Dist Left/Dist Right

Toggles between Dist Left and Dist Right values. These set the direction of the next movement, relative to the previous direction. The field below sets the distance to move.

Accept

Applies the taped distance to the perimeter line.

Finish

Opens the floating menu of two items:

Close Polygon: connects the first and the last two points with a line.

Calc Closure: calculates the difference between the last and the first points.

Reference Line

The Tape Dimension dialog allows you to calculate the periphery of structures, such as buildings, that have features perpendicular to each other. This is done using tape measurements, relative to the two

known points that belong to one side of the structure (wall of the building), forming the reference line.

The Ref Line tab contains information about the two points comprising the reference line.

Start Pt

Contains the properties of the starting point: the name (can be entered manually, or chosen from the map or list) and code. Also the point can be measured by pressing the Meas button.

End Pt

Contains the properties of the ending point: the name (can be entered manually, or chosen from the map or list) and code. Also the point can be measured by pressing the Meas button.

Xsect-Direct

The X-Sect survey is performed from one side of the road to another in a plane perpendicular to the center line. If the road has not been set, you should define the plane. The points are surveyed similar to the Observations from the [Sideshot-Direct](#) Dialog.

Cur Sta

Takes a shot of the point and computes and displays the offsets.

Xsect-Direct/Reverse

The X-Sect survey is performed from one side of the road to another in a plane perpendicular to the center line. If the road has not been set, you should define the plane. The points are surveyed similar to the Observations from the [Sideshot-Direct/Reverse](#) Dialog.

Cur Sta

Takes a shot of the point and computes and displays the offsets.

Remote Rotate

The Rotate dialog contains the settings of the remote total station rotation.

Rotation Angles

Sets the values of the horizontal and vertical rotation angles.

Turn

Sends the data to the total station.

Rotate to Point

Select a point by typing its name, or choosing it from the map or the list. Insert the HR value (height of rod or target), and press the **Turn** button.

Plunge TS

Press to plunge the instrument (rotate the telescope and the body by 180 degrees).

Remote Scanning

This function is activated only with Robotic instruments and allows you to scan with Robotic Total Stations. To open the Scanning dialog, select Survey->Scanning in the Robotic mode.

Point

Displays the name of the point. This can be chosen from the map or drop-down list.

Code

Displays the current point code. The code can be entered manually or chosen from the drop-down list. Attributes and the notes etc can also be set for the point by selecting from the menu next to the code.

Orientation

Selects the type of plane (Horizontal, Vertical or Inclined) in which to scan.

Next

Opens another Scanning dialog to set spacing and start scanning.

Back

Opens the first set of options for Remote Scanning.

Spacing

Displays the distance between points.

Scanning

In the Scanning dialog select a desired scan type: either Scan with Image or Scan w/o Image.

If Scan w/o Image is selected, select the Orientation of the scan - Vertical, Horizontal or Incline.

Select Scan

The Select Scan dialog displays the settings for a scan session.

Session

Sets a Session name.

Image

Sets an Image file. Select a previous Image or browse for a new one (Images are stored as JPEG with the *.jpg file extension.)

Camera

Sets the Camera information. If the Image exists in the Job, the Camera information will be selected automatically; otherwise, select a previous Camera or browse for a new one (Cameras are stored as a text file with the *.cmr extension.)

View

Opens the View Scan dialog.

Back

Returns to the previous dialog.

Next

Once all fields are filled, clicking the button opens the Orient dialog.

View Scan

The View Scan dialog displays the image along with orientation and scanned points for completed scan sessions.

Orientation

The Orient dialog associates a position on the image (x, y) with known N, E, Z coordinates.

There are buttons to zoom in, zoom out, display the whole image, and switch on/off the keyboard arrow keys that duplicate the arrows on the dialog.

The bitmap next to the Meas button displays the menu of three items (Meas, From Map, From List).

Tap on Orientation Pt: Tap on the image in a rough area of where the orientation point is located. The image will zoom to this point and show a crosshair. The position of the crosshair can be adjusted.

Select or meas Orient Pt: select a known point from the Point List or Map, or measure a new point.

Calc

When a minimum of four orientation points are established, clicking the button computes the image orientation and displays the results.

Orientation Results

The Orient Res dialog displays the results of the image orientation.

Accept

Continues to the Scanning dialog to select areas for scanning.

Remove

Removes the selected point to adjust the orientation calculation. If four points still remain, the new results are displayed. If there are less

than four orientation points, then the Orientation Results dialog will close automatically to continue the orientation procedure.

Scan

To select one or more areas for scanning, you can:

- Draw a rectangle by pressing the stylus on the dialog for the start point and dragging it to the end point. When the stylus is lifted, the area is set.
- Draw a polygon by pressing the stylus down at each vertex. Lines will be drawn connecting each vertex to the previous one. Press the stylus near the first vertex to close the area.

Start

When the areas are set, pressing the button begins the scan. The Interval dialog opens so you can set the scanning parameters.

Clear

Erases all drawn areas.

Settings

Opens the Mode dialog. The main use is to set the instrument to "Non-Prism" mode, which is required for scanning and also to change the measurement mode (Fine, Coarse).

Scan

As the total station measures points within the predefined area, each point will be displayed on the image.

Stop

Immediately stops the scan.

Interval

The Interval dialog sets the starting point, and horizontal and vertical intervals for scanning.

Start Point

The starting point name.

Interval

Enters the scanning intervals either as Angle or number of points.

HA

Horizontal interval.

VA

Vertical interval.

Estimate Time

Before scanning begins, the Estimate Time dialog displays the scanning information including the total number of points to be scanned and an estimate of the time it will take to complete the scan. If the estimated time is too long, click Cancel and enter larger intervals. Click OK to begin scanning points.

Monitor

The Monitor function measures one or more prisms repeatedly and uses the measurements to detect changes in the position of the prisms. The measurements are recorded into the raw data file.

Optionally, the raw measurements or the computed points can be outputted to a file or communication port in either the FC-6 or GTS-7 formats. The output format and destination is accessed from the Monitor Options dialog when configuring the total station.

The Monitor dialog is used to control the monitor survey.

Points

The point name.

Interval

Interval listed as the Cycle Time. If a prism cannot be found after a period of 15 seconds, the total station will rotate to the next point in the sequence.

Auto

If the Auto combo box is set to ON, the total station automatically rotates to the next point in the sequence and records a measurement. If it is set to OFF, the total station rotates to the point, but allows you to verify or correct the centering to the prism prior to taking a measurement. The monitor function will always complete the entire sequence, even if the measurements take longer than the cycle time.

Start

Initiates the sequence of measurements, which repeats at the desired interval.

Qlock

Sends the 'Quicklock' or 'Turn Around' command that will cause the Total Station to search for the RC-21.

Search

Make the instrument search for the prism.

Lock

Lock onto the prism or 'track' it.

Turn

Opens the Rotate dialog that allows the Total station to turn to various angles or points.

Stop

Makes the total station stop tracking the prism and go into 'Standby' mode.

The Data Indicator above the Qlock button shows the current state of the robotic Total Station. There are four types:

- no data
- querying status
- turning

Monitor Options

Log To

Select from options None, File, or communication ports.

If Log To File or a communication port is chosen, select from the following:

Output Type

Select whether to output *Raw Data* or *Coordinates*.

Output Format

For *Raw Data*, select whether to output to a FC-5, FC-6/GTS-7 or GTS-6 format.

For *Coordinates*, only the GGA format is available.

File Name

If Log To File is chosen, enter the name and location of the file to log to.

Comm Settings

If a serial COM port is selected, enter the baud rate, parity, data and stop bits settings for the comm port.

Store As Check Point

When checked, the measurements are stored as Check Points to the original points in the monitor list; otherwise, they are stored as normal points.

Monitor Point List

The Monitor Point List dialog allows you to monitor points and create a point list to monitor.

Point List

The pre-existing points list. Can be chosen from the list or entered manually.

List of Points

The list of currently selected points.

The Up and Down arrows to the left of List of Points allows you to move the highlighted point up or down in the order of the points.

The arrows symbol switches on/off the keyboard arrow keys that

duplicate the arrows on the dialog.

The X symbol deletes the highlighted point from the list.

The symbol to the bottom right of the map can be used to toggle between the point list and the plot with the point list.

HR

The rod (target) height.

Next

Opens the Survey dialog to monitor.

Level Survey

Create Level Run

Enter information needed to create a Level Run.

Name

Enter a name for the Level Run.

Note

Enter a description for the Level Run.

Level Run

This dialog displays information regarding the Digital Level Run in progress.

The items to be displayed and the order of items to be displayed can be selected by clicking Display Settings on the top left menu.

Point Id

You can select the point from the map, list, or enter the name.

Code

You can enter the code for the point to be measured.

BS

Click on BS to take a Backsight shot.

SS

Click on SS to take a Sideshot measurement.

FS

Click on FS to take a Foresight measurement.

Show SumBS-SumFS

If this option is turned on (Top Left Menu), then the SumBS-SumFS will be displayed below the Level Run information.

Shots

Guides you through the sets needed to be taken for the measurement.

Meas

Click Meas to take a shot.

Stake SS

This dialog helps you to stake an SS point for the level run.

The dialog displays the BS Point (already measured) and the SS point. You have the option to select a different SS point from the map or list. Also displayed are the rod ht and the horizontal distance for the BS and SS points.

The Height of Instrument is also displayed.

Meas

Takes a measurement to the SS point and displays the elevation and cut/fill values.

Click Ok to save the measurement to the Level Run. Cancel quits the dialog without saving the value.

Two Peg Test

The Two Peg Test dialog guides you through a series of measurements to help determine any error in the line of sight through the level when the bubble is centered.

Center yourself between the two points to measure and take a measurement to Peg1, and then to Peg2. Move the instrument to one of the pegs and then take the shots again to Pegs 1 and 2. The results are displayed.

Meas

Click Meas to take the measurement for the displayed prompted Peg.

Locate Peg2

Measures the horizontal distance to Peg2 and compares it with the already taken measurement to Peg1. This measurement is not used in the error computations.

Two Peg Test Results

The results of the Two Peg testing appear on this dialog after all measurements are taken. The dialog displays all the shots taken and the computed error.

Settings

Select the columns to be displayed for a level run from this dialog. The order of the columns to be displayed can be changed by selecting the display column and clicking the up and down arrow.

Staking



Stake folder

Click an icon to perform the task:



[Points](#) GPS

[Points](#) Optical (Total Station)

[Points](#) Optical (Level)

Stakes design points with known elevation.



[Lines](#) GPS

[Lines](#) Optical (Total Station)

Determines points along desired lines formed by design points.



[Offsets](#)

With offsets, you can stake a Line, Intersection, 3 Pt Curve, Curve, and Spiral.



[Surface](#)

There are three types of Stake Surface: Elevation, Road, and DTM.



[Elevation](#)

Only for Optical Level mode. Stakes the elevation of a point.



[Point in Direction](#)

Stakes a point using a known point, the azimuth, and the offsets from the azimuth line.



[Point List](#)

Stakes points in a point list.

[Point List Optical \(Level\)](#)

Stakes the list's design points to determine the elevation and compute a cut/fill value at every point in the list.



[Curve](#)

Stakes points along a horizontal curve.



[Real-Time Road](#)

Stakes points on a road in real time.



[Road](#)

Stakes points on a road.



[Slope](#)

Stakes points near a slope on the desired alignment.



[Linework](#)

Stakes points on a linework selected either by CodeString, from a linework list, or from the map.

Stake Point

The Stakeout Point dialog contains the initial data for the point stakeout.

Design Point

Enter the point to stakeout. This can also be chosen from the map, the list, or a new point.

Code

Enter the code for the design point.

Antenna Ht (for GPS)

Shows the default height of the antenna reference point (ARP) above the mark. You can edit the antenna type, the value of the antenna height, and the type of height in the Antenna Setup dialog. To do this, click the Ant Ht button, and select Edit.

HR (for TS)

Enter the reflector height.


Stake Report

Shows the name of the current stake report if it is set.

Stake

Opens the Stake dialog, assisting the stakeout process.



The icon  on the upper-left corner opens the pop-up menu for additional options. [More...](#)

Stake pop-up menu

Status: opens the Status dialog

Config Radio: opens the Configure Radio dialog

BS Setup: opens the BS dialog

Config Link (only for the Robotic mode): opens the Configure Link dialog

Remote Control (only for the Robotic mode): opens the Remote Control dialog

Edit Points: opens the Points dialog

PTL Mode: if checked, the design point for stakeout is a PTL point. The From Job list will display only the job points having PTL coordinates for selection.

Inverse: opens the Two-Point Inverse dialog

View Report: opens the current report

Chats/Create New: opens the Chat dialog

Stake DL Point

Select the BS Point and Design point to stake.

BS Point

Select the BS point to be used for the backsight measurement.

Design Point

Select the point to stake.

BS

Takes the BS measurement.

Stakeout

Directs you to the Stake dialog to stake the design point.

Stake Line

The Stake Line dialog contains the initial data for the line stakeout.

Start Point

Sets the starting point of the reference line.

End Point/Azimuth

Sets the direction of the reference line by either specifying another point or the azimuth.

Ht Comp

The type of height computations to use for the stakeout point. This can be one of the following:

Ht of Start Pt (height of starting point): The stakeout point will have the same height as the starting point of the line.

Interpolate Ht: The height of the stakeout point will be computed through linear interpolation using the height of the starting and ending points of the line.

Antenna Ht (for GPS)

Shows the height of the antenna reference point (ARP) above the mark. You can edit the antenna type, the value of the antenna height, and the type of height in the Antenna Setup dialog. To do this, click the Ant Ht button, and select Edit.

HR (for TS)

Enter the reflector height.

Stake

Opens the [Stake](#) dialog, assisting the stakeout process.

Stake

The Stake dialog is designed to assist in the stakeout process. The stake dialog contains a number of flexible features which allow you to tailor and customize your staking requirements. The main dialog consists of an instrument panel along the top, stake panel along the bottom, and a view. Depending on the current staking application there are a number of different view options which provide different graphical aids for staking. With the exception of the data view there are also four selectable data fields to display specific stakeout information.

Instrument Panel

The Instrument panel along the top of the dialog displays GPS/Optical instrument specific iconic information. This information can be displayed or hidden by pressing the arrow button on the left of the dialog.

Stakeout Panel

The Stakeout Panel along the bottom of the dialog displays a number of buttons used to provide information and facilitate staking.

Design Button: The design button on the left provides the information on the current design point. Pressing the button will display a pop-up list detailing the design point information.

Arrow Buttons: The arrow buttons to the right of the design button are displayed if the staking application permits multiple point locations. Pressing the buttons will advance forward and backward through the different design locations.

Reading Button (for TS): The read button located to the right of the arrow buttons is used to make an observation.

Store Button: The storage button located to the far right is used to save the current staked observation.

Data Fields

All views except the Data view have four selectable data fields used to display specific staking information. To change one of these data fields simply press on the field and select it from a list of all the available fields for the current stake module. The Data view always contains all the available data fields.

Views

Each of the staking modules has a number of different views to provide different aspects to help the staking process. To access the different views press and hold on the stake dialog until the view pop-up appears for a new selection.

Data View

The Data view is accessible on all stakeout modules. The Data view provides a detailed list of all data fields available for the current staking module.

Map View

The Map view is also accessible on all stakeout modules. When staking in the map view, the background image of the stakeout is the job's map. A map menu panel is available, which provides the map controls, such as zoom.

Normal View

The Normal view is available whenever you are staking known design coordinates. This view provides a directional way of locating the design locations. If the distance to the design is more than 3 m, a blue arrow will point to the target direction with the current location in the center of the dialog. If the distance to the target is less than 3 m, the graphic shows the target point in the center and the current location. As soon as the target becomes closer than the Horizontal Distance

Tolerance value the graphic shows a bull's-eye target point on the dialog.

Overhead View

The Overhead view is also available whenever you are staking known design coordinates. This view is similar to a map view and shows the current location and design location.

Cross Section View

The Cross Section view is available when staking roads. This view shows the current stake location in a vertical display as well as the road cross section. A map menu panel is available which provides the map controls, such as zoom.

Surface View

The Surface view is available when staking DTM. This view shows the surface and current stake location. A map menu panel is available, which provides the map controls, such as zoom.

Stakeout DL

This dialog helps you stake a Point or Elevation.

The dialog displays the BS Point (already measured), the Point to Stake, or Elevation to Stake. Also displayed is the height of the instrument.

Meas

Takes a measurement to the Rod and displays the elevation and cut/fill values.

Store

Stores the last measured stake point.

Vertical Offset DL

Vertical Offset

Enter the Vertical Offset for the measurement.

Stake Offsets

Click an icon to perform the task:



[Line](#)

Stakes a line with offsets in the Horizontal and Vertical directions.



[Intersection](#)

Stakes the intersection point of two lines parallel to two other lines at specified offsets.



[3Pt Curve](#)

Creates a curve to stakeout by selecting three points.



[Curve](#)

Stakes a curve (section of an arc) at a specified horizontal and vertical offset from the curve.



[Spiral](#)

Stakes points at specified Horizontal and Vertical offsets with respect to a specified spiral.

Stake Line & Offsets

Perform a stakeout of a line with offsets in the Horizontal and Vertical directions.

Start Point

The starting point of the line. The line is defined by the azimuth, the azimuth to another point, or the End Point of the line.

End Point/Azimuth

The direction of the line set through either the azimuth of the line or the ending point of the line.

Ht Comp

The type of height computations for the stakeout point:

Ht of Start Pt (height of starting point): The stakeout point has the same height as the starting point of the line.

Interpolate Ht: The height of the stakeout point will be computed through linear interpolation using the height of the starting and ending points of the line. (This is unavailable when the direction of the line is set through azimuth.)

Num Subs

The number of subdivisions you want to subdivide the line. For instance, a value of 3 indicates the stakeout of four points by subdividing the line into three equal segments.

Include Transition Point

Check mark and enable if the transition point should be included in spite of the station distance. [More...](#)

Start Sta

The starting station (chainage) of the line.

Next

Opens the [Station & Offsets](#) screen.

Transition Points

The Transition Points dialog allows you to select which available transition points are to be included in the stakeout.

Selections to include:

Horz end point: The node point between horizontal segments.

Horz angle point: The horizontal angle point, used only in combination with *Horz end point*.

Horz Radius point: The horizontal radius point - *Center point*.

Horz intersect: Horizontal intersection of start and end tangent.

Horz midpoint on curve: The middle point of a horizontal curve.

Vert end point: The node point between vertical segments.

Vert high point: The highest vertical point.

Vert low point: The lowest vertical point.

Station & Offset

The Station & Offset dialog allows you to define parameters for staking offset locations.

Station/Real-Time button

The Station/Real-Time button allows you to toggle between staking known and unknown staking locations. For station, enter the starting station location. The two arrows to the right allow you to decrease or increase the station by the specified interval.

Interval

The station interval.

Right Offset/Left Offset

The right or left horizontal offset to be applied.

Up/Down

The Up or Down Height offset to be applied.

Back

Returns to the previous initialization dialog.

Stake

Starts the stakeout module for the designated offset locations. [More...](#)

Intersection & Offsets / Line 1

The Intersection & Offsets dialog enables you to stakeout out the intersection point of two lines parallel to two other lines at specified offsets. The first dialog defines one line (Line 1) and the offset of the first parallel line. The second dialog field enables you to define another line (Line 2) and the offset of the second parallel line. The intersection point of these two parallel lines defines the stakeout point.

This dialog contains the parameters of the first line:

From Point

Starting point of the Line 1.

Az to Pt/Azimuth

The direction of the line. It can be set through the azimuth of the line, azimuth from the start point to the point selected.

Right Offset/Left Offset

The right or left offset of the stakeout point with respect to the line.

Intersection & Offsets / Line 2

This dialog contains the parameters of the second line:

From Point

Starting point of the Line 2.

Az to Pt/Azimuth

The direction of the line. It can be set through the azimuth of the line or the azimuth from the start point to the point selected.

Right Offset/Left Offset

The right or left offset of the stakeout point with respect to the line.

Intersect Ht

The height of the intersection point.

Store Point

The name of the intersection point.

Antenna (in the GPS+ case)/HR (in the Optical mode)

The antenna height/The rod (target) height.

Stake

Opens the [Stake](#) dialog.

Three Pt Curve

You can create a curve to stakeout by selecting three points. The dialog changes its appearance depending upon the first point chosen.

You can manually enter, or select from the list or map the following sets of points:

- **PC Point, Curve Point, PT Point**
- **RP Point, PC Point, PT Point.**

In the second case the distance between **RP Point** and **PC point** should be equal to the distance between **RP Point** and **PT point**. The radius, and the PC and PT points define two curves - one with delta less than or equal to 180 degrees (Small curve) and the other with delta greater than or equal to 180 degrees (Large curve). Values of **Small** or **Large** can be selected from the **Curve** drop-down box to indicate which of these two curves should be used for computations.

PC Point

The Point of Curve, the starting point of the arc.

PT Point

The Point of tangent to the curve.

RP Point

Radius Point for the curve.

Curve Point

Any point on the curve.

Curve

Specify whether to use the Small or Larger curve.

SS

Specify the Start Station.

Next

Opens the [Station & Offsets](#) screen.

Stake Curve & Offsets

The Curve & Offsets dialog function enables you to stakeout a curve (section of an arc) at a specified horizontal and vertical offset from the curve.

PC Point

The Point of Curve, the starting point of the arc.

Tangent Azi

The azimuth of the Tangent of the curve (arc) at the PC point.

Radius/ Deg Curve/ Deg Chord

The radius parameters of the curve.

Length/Chord/Tangent/Mid Ord/Extern/Delta

Is the length parameter of the curve.

SS

The starting station (chainage) of the line.

Stake Spiral & Offset

The Stake Spiral & Offset dialog is used to stakeout points at specified Horizontal and Vertical offsets with respect to a specified spiral.

TS Point

Tangent to Spiral point. This is the starting point of the spiral.

Tangent Azi

The azimuth of the tangent to the spiral at the point TS.

Radius/Deg Chord/Deg Curve

The radius parameter of the spiral at the ending point.

Length/Sp Const

The length of the spiral at the ending point or the Spiral Constant, the constant of the spiral.

Turn

Specifies whether the spiral turns right or left.

Dir

The direction of "moving":

TS -> SC = TangentSpiral->Spiral Circle. This is the incoming spiral

to the internal circle.

CS -> ST = Circle Spiral-> Spiral Tangent. This is the outgoing spiral from the circle to the Tangent.

SS

The starting station (chainage) of the line.

Stake Surface

Stake Surface enables you to stake a surface as a known fixed elevation.

Select one of three types of Stake Surface as required: [Elevation](#), [Road](#), or [DTM](#).

Stake Surface Elevation

To stake a surface of a fixed elevation:

- Select **Elevation** by clicking the selection button.
- Enter the elevation value in the field. To set the elevation of a

desired point as a fixed elevation, click the list selection



button or map selection



button and select the point from the list or the map.

- Enter the GPS antenna height in the **Ant Ht** field (in the GPS+ case) / the reflector (target) height in the **HR** field (in Optical mode)
- Click **Stake** to start stakeout.
- If required, check the **Create Surface** box. A **Cut/Fill** or **Elevation** model can be generated from 3 or more staked points. The DTM created from Create Surface is saved as TIN file. Click Next to


specify the name for a new file. By default it will be *newTIN.TN3*.



Click  on the Create TIN dialog to start the stakeout.

- If required, check the **Use Alignment** box. The Use Alignment option enables you to use an existing alignment to report stations and offsets. Click Next to select the name of the alignment. Click



 on the Roads dialog to start the stakeout.

- If required, check the **Define Boundary** box. The Define Boundary option enables you to specify a boundary (polygon) from known points. Click Next to do this in the Surface Boundary dialog.

Surface Boundary

To define a surface boundary:

1. In the **Points/Point List/Linework/Area** field, select the current method of selection of data required to create the boundary.
 - For **Points**, in the **Select Pts** drop-down list, choose an option to select multiple points in the job for creating the boundary:
 - **All** - all the job points.
 - **By Range** - points from a range. [More...](#)
 - **By Code** - points of a selected code. [More...](#)
 - **By Code String** - points of a selected code string. [More...](#)
 - **By Radius** - points around a selected point at a certain distance. [More...](#)
 - **By Layer** - points on a selected layer. [More...](#)
 - **From Map** - points selected graphically from the map [More...](#)
 - **From List** - points from a list of points. [More...](#)


- For **Point List**, press the List selection button and select an existing point list in the job. [More...](#) The list name will appear in the field. The name can also be entered into the field and added to the point selection by pressing the ok button.
 - For **Linework** and **Area**, press either the Map selection button and select an existing linework/area from the map ([more...](#)) or press the List selection button and select an existing linework/area from the list ([more...](#)). The name will appear in the edit field. The name can also be entered into the field and added to the point selection by pressing the ok button.
2. The list will display the points currently selected, and the plot will display the created surface boundary.

Icons you can use


MAGNET Field general buttons and icons are described [here...](#)

Stake Surface Road

To stake a surface of an existing Road:


- Select **Road** by clicking the selection button.
- Click the list selection button  and select the name of the road from the list.
- Enter the GPS antenna height in the **Ant Ht** field (in the GPS+ case) / the reflector (target) height in the **HR** field (in Optical mode).
- Click **Stake** to start the stakeout.
- If required, check the **Create Surface** box. A **Cut/Fill** or **Elevation** model can be generated from 3 or more staked points. The DTM created from Create Surface is saved as a TIN file. Click Next to specify the name for a new file. By default it will be **newTIN.TN3**.



Click the button  on the Create TIN dialog to start the stakeout.

Stake DTM

To stake a surface of an existing DTM:


- Select **DTM** by clicking the selection button.
- Click the list selection button  and select the DTM in the disk. [More...](#)
- Enter the GPS antenna height in the **Ant Ht** field (in the GPS+ case) / the reflector (target) height in the **HR** field (in Optical mode).
- Click **Stake** to start stakeout.
- If required, check the **Create Surface** box. A **Cut/Fill** or **Elevation** model can be generated from 3 or more staked points. The DTM created from Create Surface is saved as a TIN file. Click Next to specify the name for a new file. By default it will be **newTIN.TN3**.



Click  on the Create TIN dialog to start the stakeout.

- If required, check the **Use Alignment** box. The Use Alignment option enables you to use an existing alignment to report stations and offsets. Click Next to select the name of the alignment. Click



 on the Roads dialog to start the stakeout.

Open DTM

Current DTM

The currently selected DTM.

DTM List

List of available DTMs.

Created

The date and time the selected DTM was created.

Modified

The date and time the selected DTM was last modified.

Browse

Click on Browse to select a DTM not listed in the above list.

Open

Open the selected DTM.

Stake Point in Direction

The Stake Point in Direction dialog enables you to perform the stakeout of a point, using the known point, the azimuth, and the offsets from the azimuth line.

From Point

The starting point. Type the name manually, or select it from the list or from the map.

Azimuth/Az to Pt

The azimuth can be set by value, or as the direction to another known point.

Angle Offset

The angle offset from the azimuth line.

Hz Dist

The distance offset along the angle offset line.

Vert Dist

The height offset.

Store Pt

Check this field if it is desired to store the computed point to the data set.

Ant Ht (in the GPS+ case) / HR (in the Optical mode)

The GPS antenna height/The reflector (target) height.

Stake

Opens the [Stake](#) dialog to perform the stakeout.

Stake Point List

The Stake Point List dialog enables you to stakeout existing points, create a point list to stakeout, select the starting stakeout point, and stakeout in direct or reverse order.

Point List

The pre-existing points list. This can be chosen from the list or entered manually.

List of Points

The list of currently selected points.

The Up and Down arrows to the left of the List of points enables you to move the highlighted point up or down in the order of the points.

The arrows symbol switches on/off the keyboard arrow keys that duplicate the arrows on the dialog.

The symbol to the bottom right of the map can be used to toggle between the point list and the plot with the point list.

Antenna Ht (in the GPS+ case) / HR (in the Optical mode)

The antenna height/The rod (target) height.

Reverse Order

Check to perform a stakeout starting in reverse order from the end of the Point List.

Stake

Opens the [Stake](#) dialog.

Stake DL Point List

The Stakeout Point List dialog enables you to stakeout existing points, select the starting stakeout point, and stakeout in direct or reverse order.

BS Point

Select the BS point to be used for the backsight measurement.

Point List

Select or enter the name of a point list to stake.

List of Points

The list of currently selected points.

The Up and Down arrows to the left of the List of points enables you to move the highlighted point up or down in the order of the points.

The arrows symbol switches on/off the keyboard arrow keys that duplicate the arrows on the dialog.

The symbol to the bottom right of the map can be used to toggle between display of the points list and the plot with the points list.

Stakeout in Reverse Order

Check to perform a stakeout starting from the end of the Points List.

BS

Takes the BS measurement.

Stakeout

Opens the Stakeout dialog.

Stakeout Elevation

The Stakeout Elevation dialog enables you to stakeout a given elevation.

BS Point

Select the BS point to be used for the backsight measurement.

Elevation

Select or enter the name of a point list to stake.

BS

Takes the BS measurement.

Stakeout

Opens the Stakeout dialog.

Stake Curve

This dialog enables you to stake a curve (section of an arc) by specifying two points.

PC Point

The Point of Curve, the starting point of the arc.

PT Point

The Point of Tangency, the ending point of the arc.

Radius/ Deg Curve/ Deg Chord

The radius parameters of the curve.

Turn

Specifies the direction of the arc.

Curve

Determines if the smaller or larger part of the arc between the points is used.

Stake Real-Time Road

The Real-Time Road dialog enables you to select the road / horizontal and vertical alignment for stake in real time. The dialog displays the plan of the selection.

Road / H Alnt / HV Alnt

The road / horizontal and vertical alignment to be staked. This can be entered manually or chosen from the list.

Start Sta

The starting point of the stakeout, the distance from the beginning of the road.

Ant Ht (in the GPS+ case) / HR (in the Optical mode)

The GPS antenna height/The reflector (target) height.

Next

Opens the [Stk Road](#) dialog.

Stake Road (Slope)

This dialog shows cut/fill for template slopes, and enables you to edit the cut/fill slope values.

Template Slopes

Select this radio button to apply the template cut/fill slope values.

Enter Slopes

Select this radio button and enter the cut/fill slope values as required.

Stake

Opens the [Stake](#) dialog to perform the stakeout.

Stake Road

The Stake Road dialog enables you to select the road for stakeout and displays the plan of the chosen road.

Road

The road to be staked. This can be entered manually or chosen from the list.

Start Sta

The starting point of the stakeout, the distance from the beginning of the road.

Antenna (in the GPS+ case)/HR (in the Optical mode)

The antenna height/The rod (target) height.

Include transition point

Press the transition point button to bring up a dialog which will allow you to select which transition points you wish to include. [More...](#)

Next

Opens the [Stake Alignment](#) dialog.

Stake Road Alignment

The Stake Alignment dialog displays the properties of the cross section on the stakeout station and helps you stakeout of all of the desired points.

Station

The station where the stakeout is performed. The arrow buttons change the station number by the value of Station Interval.

Stn Interval

The interval of the station increment.

Segment Pt

The point code of the current segment. The arrow buttons in this field move the current segment point along the cross section. This will reflect on the scheme in the bottom of this dialog.

Right/Left Offset

The horizontal offset from the current segment point.

Up/Down Offset

The vertical offset from the current segment point.

From the drop-down list:

- Specify the offset location
- **Centerline**: both the horizontal and vertical offset starts at the center line.
- **Intersect Left**: the vertical offset starts at the segment point; the horizontal offset starts at the point of intersection of the line parallel to the left segment with the cross-section.
- **Intersect Right**: the vertical offset starts at the segment point; the horizontal offset starts at the point of intersection of the line parallel to the right segment with the cross-section.
- **Segment**: the horizontal offset starts at the beginning of the segment; the vertical offset starts at the center line.

- **Surface Left:** the horizontal left offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.
- **Surface Right:** the horizontal right offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.

Next

Opens the [Stk Road](#) dialog.

Stake Slope

The Stake Slope dialog enables you to select the road for stakeout and displays the plan of the chosen road.

Road

The road to be staked. This can be entered manually or chosen from the list.

Start Sta

The starting point of the stakeout, the distance from the beginning of the road.

Antenna (in the GPS+ case)/HR (in the Optical mode)

The antenna height/The rod (target) height.

Include transition point

Press the transition point button to bring up a dialog which will allow you to select which transition points you wish to include. [More...](#)

Next

Opens the [Stake Alignment](#) dialog.

Stake Slope Alignment

The Stake Alignment dialog displays the properties of the cross section at the stakeout station and helps you stakeout the catch point (the point where the slope crosses the surface of the terrain) and/or the offset of the catch point.

Station

The station where the stakeout is performed. The arrow buttons change the station number by the value of Station Interval.

Stn Interval

The interval of the station increment.

Hinge Point

The hinge point code. The hinge point is a point of rotation of the Cut/Fill Slopes. The arrow buttons in this field move the hinge point along the cross section. This will reflect on the scheme in the bottom of this dialog.

From the drop-down list:

Specify offsets location

- **Centerline:** both the horizontal and vertical offset starts at the center line.
- **Intersect Left:** the vertical offset starts at the segment point; the horizontal offset starts at the point of intersection of the line parallel to the left segment with the cross-section.
- **Intersect Right:** the vertical offset starts at the segment point; the horizontal offset starts at the point of intersection of the line parallel to the right segment with the cross-section.
- **Segment:** the horizontal offset starts at the beginning of the segment; the vertical offset starts at the center line.
- **Surface Left:** the horizontal left offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.
- **Surface Right:** the horizontal right offset starts at the beginning of the segment; the vertical offset starts at the point on the surface of the segment that corresponds with the horizontal offset.

Next

Opens the [Stk Slope](#) dialog.

Stake Linework

To start a linework stake, select Stake / Linework menu.

Linework / Code toggles through two linework selections:

- **Code**: allows linework selection by CodeString.
- **Linework**: allows linework selection from the job lineworks (listed in the dialog) or a polyline selected from the Map. If the line is a background line, copy the line to the job, update the list of lineworks and select it in the list.

Include transition point

Press the transition point button to bring up a dialog which will allow you to select which transition points you wish to include. [More...](#)

SS

The starting point of the stakeout, the distance from the beginning of the linework.

Antenna (in the GPS+ case)/HR (in the Optical mode)

The antenna height/The rod (target) height.

Next

Opens the [Station & Offsets](#) dialog.

Station & Offsets

The Station & Offsets dialog contains the settings for the stakeout session.

Station

The station along the line being staked. The two arrows to the right enable you to decrease or increase the station by the interval specified in the Stn Interval shown in the next line.

Stn Interval

The station staking interval.

Right Offset/Left Offset

The right or left offset of the stakeout point with respect to the line at the station shown on the Station field.

Up/Down

The Up or Down Height offset with respect to the height of the line at the station.

Angle Pts

This option enables you to stake one of the three possible offset locations when they stakeout to an angle point:

- **Offset Bk**: the stake location will be on the (back) segment before the angle point.
- **Offset Ahd**: the stake location will be on the (ahead) segment after the angle point.
- **Bisector**: when bisector is selected, the proposed stake location will be on the bisectrix of the angle at the computed offset from the angle point.

Curve Pts

This option enables you to stake one of the four possible locations when they stakeout to a curve point:

- **Offset**: the stake location will be on the curve at the offset distance from the curve point.
- **RP**: the radius point.
- **PI**: the point of intersection of tangents to the curve drawn at the start and end curve points.
- **MOC**: the point in the middle of the curve.

Stake

Opens the [Stake](#) dialog to perform the stakeout.

Design Offsets

The Height dialog is available in the Stakeout Point and Stakeout PointList in the upper-left menu by selecting **Set Ellipsoidal ht**, **Set**

Elevation, or **Set Z** depending on the coord. sys., and display type. The dialog enables you to change the height of the current point.

Design Height/Elevation

Check the control to apply the Design Height/Elevation for the point to be staked and enter the elevation to be used.

Road Offset

Check the control to apply the Road Offset to the height of the point to be staked and enter the offset value to be used.

DTM Offset

Check the control to apply the DTM Offset for the DTM selected to be staked and enter the offset value to be used.

Set References / Surface and Point References

This dialog is accessible through the Stakeout Views and the Store Point dialog when the type of staking uses cross sections (for example roads). The dialog displays the current cross section, graphically displayed with all points shown with check marks, the corresponding label to each point, and lines connecting the points.

Each point and line is selectable and will be marked with a green color if selected.

Pressing the close dialog button will store the references. All selections can be cleared through:

Remove selected

Removes all selected references.

Initial Point Name

The Initial Point Name dialog enables you to specify the starting name for the points calculated for the stakeout task.

First Point

The name of the first point.

Code

Select the code and attributes of the points. The code can be chosen from the list or entered manually.

Design Pt/Layer

Display Store Pt Info

Check this control to display the staked point before storing it.

Layer

Select the layer to which this point is to belong.

Store Point

Displays information regarding the Stake Point about to be stored and allows you to add or edit information.

Stake Tab

The stake tab displays information regarding the staked point about to be stored in the database.

Name

The name of the point that will be stored in the database.

HR or Ant Ht

The height of the target or GPS antenna used to stake the point.

Vertical/Slant

Specifies whether the entered antenna height is slant or vertical when performing GPS staking.

Layer

Specifies the layer associated with the staked point.

Data Tab

The data tab displays the stakeout information pertaining to the staked point.

Advance

Specifies whether to advance to the next stake point location.

Design Tab

The design tab displays information regarding the design point about to be stored in the database.

Name

The name of the point that will be stored.

Code

The feature code and attribute information associated with the point.

String

The string the feature code is associated with when the code type is a line or area.

Layer

Specifies the layer associated with the point.

Note

Specifies the note associated with the point.

Pt Inc/Dec

Specifies the increment or decrement of the name of the next design point.

Offset from CP

Offset from CP displays information about the offset from the catch point. This dialog appears after the point has been stored.

HD Offset from CP to OP

Horizontal Distance from the Catch Point to the Offset Point.

Cut/Fill at OP wrt CP

Cut/Fill between the Catch Point and the Offset Point.

Cut/Fill at CP wrt HP

Cut/Fill between the Hinge Point and the Catch Point.

Cut/Fill Slope (1:n)

Design Slope between the Hinge Point and the Catch Point.

Elevation

Elevation of the Offset Point.

Slope Dist from HP to IP

Slope Distance from the Hinge Point to the Intersection Point.

VD Offset from HP to IP

Vertical Distance from the Hinge Point to the Intersection Point.

Intersection Point

The Intersection Point (IP) is the point between the vertical line at the Hinge point Cut/Fill slope at the Offset Point.

Select Value

The select value dialog allows you to select which values are to be displayed in the stake dialog. In the dialog, only select the value you want displayed and press the green check mark to exit the dialog. You will be returned to the stakeout dialog, and the value you selected will now be displayed in the desired label.

Applications



Apps Folder

Click an icon to use an application on your device:



Take Photo

Starts the Camera application to take pictures.



Web Browser

Starts Internet Explorer to visit a web address you want.



Photo Viewer

Starts the Pictures & Videos application to view the pictures attached to the current job.



Files

Opens File Explorer to manage the files.

How To

Localization in MAGNET Field

When you need to obtain points' coordinates in different Grid coordinate systems or a Datum predefined or created in MAGNET Field, simply select a desired coordinate system. MAGNET Field will use its own mathematical algorithms to transform coordinates from the current system to the selected one.

For example, a MAGNET Field job is configured for RTK survey in a certain grid coordinate system, for example, SPC83-Texas (Central). Point(s) collected on this grid can be transformed to any datum or any grid. To do this, select a desired grid, for example, SPC83-Texas (North), in the Coordinate System screen. After selecting the grid, MAGNET Field will display the point coordinates in the selected coordinate system. See an example of transformation into other grid coordinate system [here](#).

When transforming GPS points' coordinates measured in WGS84 coordinate system into a Ground coordinate system, those algorithms of transformation, which are applied to predefined or user-created grids and datums, do not work. In this case MAGNET Field has no predefined relation between two coordinate systems. Set up Localization for coordinate transformation from WGS84 to Ground (and vice versa).

Related topics:

- : [Basic Concept of Localization](#)
- : [Localization with Stereographic Projection on WGS84](#)

- : [Localization with Stereographic Projection on any Datum](#)
- : [Localization with any Predefined or Created Projection](#)
- : [One-point Localization](#)
- : [Two-point Localization](#)
- : [Three-point Localization](#)
- : [Performing Localization](#)
- : [Importing Localization Data to Other Job](#)

Basic Concept of Localization

Localization in MAGNET Field is a calculation of transformation parameters between WGS84 and a ground coordinate system. To perform localization, you need to have two independent sets of coordinates for the same point or few points in the MAGNET Field. An independent set of coordinates is a set of such point coordinates that do not have a relation between each other. To perform localization in MAGNET Field, you need to select coordinates in the GROUND coordinate system ("Known Point") and in the GRID coordinate system or WGS84/DATUM coordinate system ("Measured Point") for the same point in the current job. Such a point is called Localization Point.

In MAGNET Field, horizontal localization and vertical localization are performed separately. You determine which calculation the Localization Point uses by selecting the corresponding check boxes "Use Horizontal" and/or "Use Vertical". See an example of using a localization point in both localizations [here](#).

In the common case, when you select three and more localization points for the given MAGNET Field job and these points take

part in both localizations, MAGNET Field will calculate and use seven parameters for transformation of all job points:

- In the horizontal plane (find out the plot [here](#))
- offset vector (DX, DY) between the origins of coordinate systems,
 - rotation angle between these coordinate systems, and
 - scale factor.
- In the vertical plane
- one shift (HO), and two slopes (Hx, Hy).

If a geoid is set in the job, MAGNET Field will use this geoid for calculating orthometric elevations.

Add the desired geoid for calculating orthometric elevations ([add geoid](#)). Calculating orthometric elevations without a geoid for points in Ground coordinate system can lead to errors in orthometric elevations.

The current version of MAGNET Field enables you to perform the horizontal localization in three ways:

1. Using only the stereographic projection on WGS84 (Find out [more...](#)).
2. Using only the stereographic projection on any datum (Find out [more...](#)).
3. Using any predefined or created projection (Find out [more...](#)).

Localization with Stereographic Projection on WGS84

If you perform a task of transformation of WGS84 coordinates into Ground coordinates for a network where the maximum dis-

tance between the local points is less than 5 kilometers, you can use the simplest localization. To do this type of localization, set Projection to None in the [Coordinate System dialog](#) before entering localization point(s).

In this case MAGNET Field will ONLY use an oblique stereographic map projection on WGS-84 as an intermediate step. The Localization dialog will have only WGS84->Local type in the Type field.

Localization with Stereographic Projection on any Datum

If you know a datum for creating a local coordinate system, you can select this datum in the [Coordinate System dialog](#) before selecting localization point(s).

In this case the Localization screen will have two types in the Type field. If you select Datum->Local localization type, MAGNET Field will use an oblique stereographic map projection on the selected Datum as an intermediate step.

Localization with any Predefined or Created Projection

If you have information about the projection type for creating a local coordinate system, you can select this projection in the [Coordinate System dialog](#) before selecting localization point(s).

In this case you select Grid->Local localization type, and MAGNET Field will use this projection and corresponding datum in the process of calculation of localization parameters.

To calculate the localization parameters between two coordinate systems is a more rigorous method than using the stereographic projection for an unknown local projection. This way enables you to increase the distance between localization points (up to some hundred of kilometers depending on the type of the projection) without loss in transformation precision.

One-Point localization

To calculate 7 parameters between a datum and a local ground you have to select no less than 4 localization points. Only in this case MAGNET Field will calculate all of the needed parameters and residuals for localization for each point.

However, as soon as you add ONLY ONE localization point, MAGNET Field will calculate transformation parameters: only horizontal and vertical offsets between two coordinate systems and Combined Scale factor. Rotation between two coordinate systems cannot be computed. This value is set to zero. The components of the deflection of vertical are set to zero as well. Using these parameters, MAGNET Field will transform measured points (in the WGS84 coordinate system) to the ground coordinate systems (see our example [here](#)).

The horizontal (rH) and vertical (rV) residuals for this localization point are equal to zero (see our example [here](#)), because coordinates of the "Measured Point" in the ground coordinate system are equal to the coordinates of the "Known Point" and vice versa (see our example [here](#)).

[Plot A](#) displays a Total Station network in the Ground coordinate system, and [plot B](#) displays a GPS network in WGS-84 coordinate system. The networks have some common points. In an example with one localization point, we will use points "C2" (for

Total Station network) and point "C-2_WGS-84" (for GPS network).

[Plot C](#) shows that, if both the coordinate systems have non-zero rotation angle, the accuracy of transformation with only one localization point can be very poor.

Two-Point Localization

As soon as you add TWO localization points, MAGNET Field will calculate the horizontal (DX, DY) and vertical (DH) offsets, azimuth (rotation) and scale factor (see our example [here](#)):

In our example with two localization points, we will use points "C2" and "C4" (for Total Station network) and points "C-2_WGS-84" and "C-4_WGS-84" (for GPS network). Two points of localization are enough to calculate all transformation parameters in the horizontal plane. The horizontal coordinates of the "Measured Point" in the ground coordinate system are equal to the coordinates of the "Known Point" and vice versa (see our example [here](#)). The horizontal (rH) residuals for these points are not calculated and set to zero. The vertical (rV) residuals for these localization points are calculated (see our example [here](#)). But the components of deflection of vertical are set to zero.

Find an example of two-point localization with non-zero rotation [here](#).

Three-Point Localization

As soon as you add THREE localization points MAGNET Field will calculate the horizontal (DX, DY) and vertical (DH) offsets, azimuth (rotation), scale factor, and components of the deflection of vertical (see our example [here](#)).

Also, the horizontal (rH) residuals for these localization points are calculated. Three points of localization are enough to calculate all transformation parameters in the vertical plane. The vertical (rV) residuals for these points are not calculated and equal zero (see our example [here](#)).

Performing Localization

Learn localization on a practical example.

- : [User Task](#)
- : [Before Rover Measurements](#)
- : [After Rover Measurements](#)

User Task

In the field you will measure a set of points from several benchmarks. Five different benchmarks are used as base stations for this project. The maximum and minimum distance between two benchmarks is 114 and 16 kilometers, respectively. The rover points will be determined from the nearest base station in the RTK mode. See a map of the project [here](#).

All GPS measurements are performed in the WGS84 coordinate system. All rover points need to have the coordinates in projection "31 UTM IGN" (for Spain). The error of converting coordinates from WGS84 into "31 UTM IGN" should not exceed 5 cm.

The coordinates of the benchmarks are known and given in the "31 UTM IGN" for the corresponding datum "EURO50_IGN."

The user tries to apply the transformation algorithms for pre-defined grids and datums in MAGNET Field (in our case, between WGS84 and "31 UTM IGN"), but obtains the errors more

than 80 cm for plane coordinates and more than 1 meter for elevation for this network.

The user decides to use localization in MAGNET Field.

Before Rover Measurements

To preform localization, you need two sets of the coordinates.

The first is a set of the benchmark coordinates in the "31 UTM IGN." This set will be used as a set of GROUND coordinates. The user has this data and only needs to import this set to a MAGNET Field job.

The second is a set of the coordinates of the benchmarks in the WGS84 coordinate system. In our example, we do not have this set and we need to obtain this data.

NOTE: The error of converting coordinates from WGS84 into "31 UTM IGN" depends on the errors of two coordinate sets and the way of transformation in MAGNET Field. If we assume that transformation in MAGNET Field does not bring an additional error, and the errors of both sets are of equal accuracy, then we obtain the errors of the benchmarks coordinates in WGS84 less

than $\sqrt{25/2} = 3,5\text{ cm}$. Such an error of benchmarks coordinates in WGS84 allows the user to convert coordinates from WGS84 into "31 UTM IGN" with the error not exceeding 5 cm.

Given the long distances between the benchmarks, the user carries out measurements of all five points simultaneously within three hours. Then raw data collected from five receivers is imported to MAGNET Tools software for post-processing and adjustment. See the adjusted network of benchmarks [here](#).

The error of adjusted coordinates does not exceed 12 mm in plane and 16 mm in height, which meet the specified accuracy of transformed coordinates (see the results [here](#)).

These adjusted coordinates can be used as:

- Coordinates of the base stations to work in RTK mode
- Set of coordinates in WGS84 for localization

The user exports these coordinates (from the MAGNET Tools job) in text file format and selects "dd mm ss.sss" type for Lat/Lon coordinates, because MAGNET Field supports this type. To obtain this file click Job->Export and select Custom Text Format in the Export window. Click the Save button and select the desired Lat/Lon type in the Custom Format Properties window. See an example of creating a file of WGS84 coordinates in MAGNET Tools [here](#).

The user imports these coordinates to a created MAGNET Field job.

Importing the Coordinate Sets to a MAGNET Field Job

After obtaining both (WGS84 and Ground) sets of coordinates, if you know the format of the file, you can import these sets to a created MAGNET Field job.

[Importing the WGS84 set](#)

[Importing the Ground set](#)

To import the WGS84 set of adjusted coordinates (the Lat/Lon/H file) to the MAGNET Field job:



1. Click the Exchange icon and then From File



2. In the [From File screen](#), select the Topcon Text Custom file format and click Next to continue importing.
3. Navigate to the desired file in the From Text screen and

click  .

4. Select the comma delimiter for this file (see the file created in MAGNET Tools [here](#)) in the Text File Format and click Next.
5. Select the WGS84 datum and WGS84(Lat/Lon/Ell ht) coordinate type of the imported file in the Coordinate System screen and click Next.
6. Select the format of Lat/Lon in the Units Format dialog

and click  .

The Import Status screen displays the import has finished successfully.

The Point screen displays the coordinates of the WGS84 set.

The next step is to import a GROUND set of coordinates to the current job. See the original file of the benchmarks coordinates in the "31 UTM IGN" projection [here](#).

NOTE: For localization to work properly the user SHOULD IMPORT these points as points in the GROUND coordinate system and should not indicate the GRID ("31 UTM IGN" projection) coordinate system during the import procedure.

1. To import this file into the MAGNET Field job, in the [From File](#), select the "NEZ(*.csv)" format.
2. Select the GROUND coordinate type in the Coordinate System dialog to import the set of these coordinates.
3. After the import finishes successfully, the [Point screen](#) displays the coordinates of both sets.

Setting the Desired Projection


You need to set the projection, which will be used in localization.

1. Click the Configure icon  and then the Coordinate




System icon

2. To add a desired projection to the list of projections in the

Coordinate System dialog, click  in the Projection line and navigate to the corresponding projection in the Pre-Defined panel of the Projections dialog.

3. Click the arrow to move the projection to the Active panel

and click  to close the screen.

Then this projection appears in the list of projections. Select the projection [here](#).

Adding the Geoid File

The last thing you can do before starting field measurements of the rover points is to add the corresponding geoid file. In the Co-

ordinate System dialog, click  in the Geoid line and click


Add, to add the corresponding file. See an example of adding the appropriate geoid file [here](#).

After Rover Measurements

Measure all rover points from the corresponding base stations and after completing all measurements, perform the localization procedure to transform rover points from the WGS84 coordinate system to the Ground coordinate system. In the given case the ground coordinate system matches the "31 UTM IGN" projection.

Creating Localization Points



1. Click Setup and then Localization
2. Check that the type of localization is Grid->Local.
3. Click Add, and select a point in the Ground coordinate system from the list.
4. Select a point in the WGS84 coordinate system from the list.
5. After clicking  on the [Add Localization dialog](#), the Localization dialog displays the first localization point.
6. Perform the above steps and add three more localization points. You can see on the Localization dialog, that the horizontal and vertical residuals for localization points are not more than 6 mm and 10 mm, respectively. All measured rover points, located inside the polygon formed by the benchmarks, have the same error of transformation from WGS84 into the Ground coordinate system. The Points screen displays all points in the GROUND coordinate system.

In the same example, ONLY for TEST, select the WGS84->Ground type of localization. MAGNET Field will use the stereographic projection on WGS84. This time the error of transformation will be more than 1.9 meters (in horizontal localization) for such distances between the localization points.

Importing Localization Data to Another Job

If you want to import localization data from one job to another job, you can activate the automatic import procedure of localization data to a job.

1. In the job that contains localization data, click Configure



and then Global



2. In the New Jobs tab of the Global Settings dialog, select

"Always import" and click



to save the changes and close the window.

3. Then create a new job. For this, click Job



and then



New Job

. Enter the job name and click






to finish the configuration.

4. MAGNET Field automatically exports the localization data from the previous job to the current job.

Grid to Ground Transformation

MAGNET Field 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 job. The other method performs scaling and rotation relative to the origin of the Grid coordinate system.

To get started with transformation:

1. Click the Configure icon  and then the Coordinate System icon .
2. Select the desired projection through which the link will be found with some Ground coordinate system. Only after selecting the projection the option of Grid to Ground transformation will become available.
3. To activate the Grid to Ground (or vice versa) transformation select the Use Grid/Ground check box.
4. Press  to select a desired transformation method (from "Origin Pt", "Avg Job Ht" and "Scale Factor") and set the corresponding parameters for this method.

Find out more:

[Creating Ground Projection Relative to a Point](#)

[Creating Ground Projection Relative to the Origin of Grid System](#)

Parameters of transformation from the Grid to Ground coordinates can be used in the GPS stake of road points. For example, to stake a point at the distance of 100 meters from some point, you have to create a ground coordinate system, which will work as a base coordinate system in GPS stake calculation. To do this, select the corresponding Grid and enter the average height of a desired portion of the road. The created ground coordinate system enables you to stake points at special distances in the grid system.

Creating Ground Projection Relative to a Point

If you know the coordinates of a point in both coordinate systems (Grid and Ground) and also the rotation of these systems, then to find the relation between Grid to Ground coordinate systems, select "Origin Pt" from the Parameters list on the Grid/Ground Parameters screen.

This method calculates an offset vector in the horizontal plane between coordinates of a point (called the origin point) in the grid and ground coordinate systems and computes the ground coordinates from the grid coordinates using this offset. If a rotation angle is present between these coordinate systems, MAGNET Field can rotate a grid or ground coordinate system relative to this point. Also MAGNET Field takes into account a scale factor between these coordinate systems. See the plot [here](#).

After determining the relation between both coordinate systems, MAGNET Field will calculate ground coordinates from the grid coordinate system and vice versa.

See an example of using this method [below](#).

Example of Using "Origin Pt"

The current MAGNET Field job contains two sets of measured points:

- One network of points measured by a GR-3 receiver from a reference station in Grid coordinate system, for example, SPC83 -Ohio(North).
- Another network of points measured by a Topcon Total Station (GTS-220) in the Ground coordinate system with the arbitrary choice of zero BS azimuth.


These networks have:



- A common point - the point CP2 of the GPS network and point CP2_TS of the TS network. This point is the origin point for our transformation.
- A common line - the line between CP2 and CP6 points of the GPS network, and the line between CP2_TS and CP6_TS of the TS network. The azimuths of this line in different networks will be used to calculate the rotation angle between both coordinate systems.

See Map View for the different networks [here](#).

To perform Grid to Ground transformation for these networks:



1. Click , and select the desired Grid system [SPC83 -Ohio(North)] in the Projection field of the Coordinate System screen.


2. Check the Use Grid / Ground box to use this transformation, and press  to open the Grid/Ground Parameters screen.
3. Select "Origin Pt" in the Parameters field to activate this method.
4. Select the origin point in the Grid coordinate system (CP2 point) from the list.
5. Remove the coordinates of the selected point in the fields Northing and Easting, which MAGNET Field automatically writes in the Grid coordinate system.
6. Type in the values of the Ground coordinates of the origin point (see the Grid/Ground Parameters screen [here](#)).
7. Clicking  in the Grid/Ground Parameters screen:
 - Calculates a combined scale factor for this point.
 - Combines the GPS point with the TS point. After that, in the Ground coordinate system, the GPS point will have horizontal coordinates of the corresponding TS point, and in the Grid coordinate system, the TS point will have horizontal coordinates of the corresponding GPS point.
 - Performs grid to ground transformation (and vice versa) taking into account the scale factor.

The [Map](#) displays the networks either in the Ground or Grid coordinate system.

To take into account the rotation between these two networks in this transformation:

1. As we see from [Map View for the different networks](#), the grid azimuth is set by direction of the line CP2 - CP6, and the ground azimuth is set by direction of the same line in ground coordinate system (the line CP2_TS - CP6_TS).


MAGNET Field calculates the corresponding azimuth when you select the start and end points of the line.

2. Click  in the Azimuth Rotation field. The Compute Rotation screen allows the calculation of Grid and Ground azimuth to obtain the rotation angle between two coordinate systems (see [Grid to Ground Transformation Without Rotation](#)).
3. Click the Compute button in the Ground line. In the Compute Azimuth screen, select the corresponding points (that define the common line in the Ground coordinate system) from the list.
4. Click the Compute button in the Grid line. In the Compute Azimuth screen, select the corresponding points (that define the common line in the Grid coordinate system) from the list.
5. The final rotation angle between two coordinate systems for our example is displayed in the Rotation field. Click



to save this calculation.

6. The Grid/Ground Parameters screen contains all needed values to calculate the relation between the Grid and

Ground coordinate systems (see [here](#)). Click  in this screen.

7. The Grid to Ground transformation is successfully performed. Find a plot [here](#) that displays the error of transformation taking into account the scale factor and rotation for the given example.

Creating Ground Projection Relative to the Origin of Grid System

If you know the value of the scale factor between grid and ground coordinate systems or the average height of the network,

then, in the Grid/Ground Parameters screen, you can select "Scale Factor" or "Avg Job Ht".

This method calculates plane ground coordinates by scaling, off-setting, and rotating grid coordinates. Find a graphic explanation of transformation only by scaling [here](#), only by rotating [here](#), and only by shifting [here](#).

To find a relation between Grid and Ground coordinate systems:

1. If the scale factor is known, select "Scale factor" in the Grid/Ground Parameters screen, type in a desired value, and select the correct direction (Grid to Ground or Ground to Grid) for this value.
2. If the average height of the network is known, select "Avg.Job Height" in the Grid/Ground Parameters screen and type in the desired value of the height in the Avg.Job Height field.

The Scale Factor will be automatically calculated from:

$Scale_Factor = (1 + Avg.Job\ Height / Mean_Earth_Radius)$, where $Mean_Earth_Radius = 6371000.0\ m$

3. In both cases you can enter the rotation and offsets:
 - If the angle of rotation is known, type in this value into the Azimuth Rotation field. MAGNET Field performs rotation of the Ground relative to the origin of the Grid coordinate system.
 - To shift the Ground system from the selected Grid, type in the desired plane offsets on the Northing Offset and Easting Offset fields.

The final coordinates in the Ground will be calculated from: $N_{ground} = N_{grid} + Northing_Offset$ and $E_{ground} = E_{grid} + Easting_Offset$

Offsets in MAGNET Field

When surveying with GPS receivers and Total Stations (TS), you may determine points using different types of offsets.

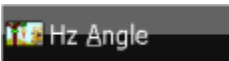
If performing a survey with a GPS receiver, select the GPS device type in the [Connections](#) dialog.

If performing a survey with a TS instrument, select the Optical device type in the [Connections](#) dialog.

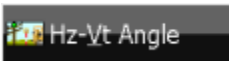
Offsets for TS Survey

Offset points are available for surveying only for the Sideshot-Direct measurement method. Select this method for the [Topo](#) survey in the [Survey Parameters](#). The Offset tab will additionally display in the [Sideshot-Direct](#) screen to enable determination of any of eight types of offset points.

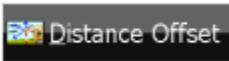
Follow the link to find out more:



[Horizontal Angle Offset](#)



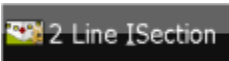
[Horizontal/Vertical Angle Offset](#)



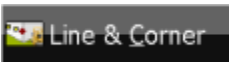
[Distance Offset](#)



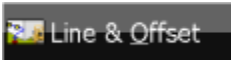
[Hidden Point](#)



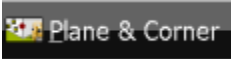
[Two Lines Intersection](#)



[Lines and Corner](#)



[Line and Offset](#)






[Plane and Corner](#)

Horizontal Angle Offset

What task does this offset type perform?- Determination of horizontal (2D) coordinates of an inaccessible center of pipe / tree / pillar using distance and angle measurements.

To do this determination:

1. Enter the name of the determined point in the Point field of the Measurement tab of the [Sideshot-Direct](#) screen.
2. Open the Offset tab, and click  in the Offsets.
3. The Measurement tab displays. Take two measurements in any order:
 - 1)  Click the Side button, and measure the distance and horizontal angle to the side of the pipe / tree / pillar. The prism is located on the side of the pipe / tree / pillar.
 - 2)  Click the Center button, and measure the horizontal angle to the center of the pipe / tree / pillar.

You can see the plot of measurements for the Horizontal Angle Offset [here](#).




Note: The offset point lies on the perpendicular to the line Station- Prism at the Prism point.

The [Points](#) screen will display the coordinates of this offset (center) point. The vertical measurements to this offset point are not considered, and $Hoffset = Hside$

Horizontal/Vertical Angle Offset

What task does this offset type perform? - Determination of the horizontal and vertical (3D) coordinates of an inaccessible point distance and angle measurements.

To do this determination:

1. Enter the name of the determined point in the Point field of the Measurement tab of the [Sideshot-Direct](#) screen.
2. Open the Offset tab, and click  in the Offsets.
3. The Measurement tab displays. Take two measurements in the following order:
 - 1)  Click the Prism button, and measure the distance and horizontal angle to the prism. The prism is located near the inaccessible point.
 - 2)  Click the HA/VA button, and measure the horizontal and vertical angle to the inaccessible point.

You can see the plot of measurements for the Horizontal/Vertical Angle Offset [here](#).



Note: The offset point lies on the perpendicular to the line Station- Prism at the Prism point.

The [Points](#) screen will display the coordinates of this offset point.

Distance Offset

What task does this offset type perform?- Determination of the horizontal and vertical (3D) coordinates of an inaccessible point using distance and angle measurements, and additional distance offsets measurements, for example performed with the tape.

To do this determination:

1. Enter the name of the determined point in the Point field of the Measurement tab of the [Sideshot-Direct](#) screen.
2. Open the Offset tab, and click  in the Offsets.
3. The Measurement tab displays. Click  to take measurements to the Prism.
4. Measure offsets from the Prism to the determined point, and enter their values in the corresponding fields of the Enter Distance Offsets screen. You can define the direction of the given offset in two ways: either click on the button of the current selection or use the minus sign "-" for the current value. For instance,



The directions of the offsets are explained in the figure that you can find [here](#).

Note 1: The offset point lies on the perpendicular to the line Station- Prism.




Note 2: $Hoffset_point = Hprism_point + (Up/Down_offset)$.

The [Points](#) screen will display the coordinates of the offset point.

Hidden Point

What task does this offset type perform?- Determination of the horizontal and vertical (3D) coordinates of an inaccessible point using distance and angle measurements to two prisms located on the rod.

To do this determination:

1. Enter the name of the determined point in the Point field of the Measurement tab of the [Sideshot-Direct](#) screen.
2. Open the Offset tab, and click  in the Offsets.
3. The Measurement tab displays. Enter the distance from the rod's bottom to Prism 2 in the HR field.
4. Take two measurements in any order:
 - 1)  Click the Prism1 icon and measure the distance, vertical and horizontal angle to the first prism of the rod.
 - 2)  Click the Prism2 icon and measure the distance, vertical and horizontal angle to the second prism of the rod.

Find the plot of measurements for the Hidden Point Offset [here](#).

The [Points](#) screen will display the coordinates of this offset (hidden) point.


Two Lines Intersection

What task does this offset type perform?- Determination of the horizontal and vertical (3D) coordinates of an inaccessible point as an intersection of two auxiliary lines. You create these lines (by two points) and perform distance and angle measurements of the line's points.





Before performing any measurements, complete the following preparation tasks:

1. Select any two points (Pt1-1 and Pt2-1), from which the desired inaccessible offset point is seen. See the plot [here](#). When selecting the location of these points, bear in mind that the internal angle formed by the two lines should not be less than 30 degrees and more than 150 degrees.
2. Set two more points (Pt1-2 and Pt2-2) along the lines "Pt1-1 - offset point" and "Pt2-1 - offset point", respectively. See the plot [here](#).

To do this offset determination:

1. Enter the name of the determined point in the Point field of the Measurement tab of the [Sideshot-Direct](#) screen.
2. Open the Offset tab, and click  in the Offsets.

3. The Measurement tab displays. Take four measurements in any order:

- 1)  Click the Line1Pt1 button and measure the distance, vertical and horizontal angle to the first point of the first line.
- 2)  Click the Line1Pt2 button and measure the distance, vertical and horizontal angle to the second point of the first line.
- 3)  Click the Line2Pt1 button and measure the distance, vertical and horizontal angle to the first point of the second line.
- 4)  Click the Line2Pt2 icon and measure the distance, vertical and horizontal angle to the second point of the second line.

You can see the plot of measurements for the Two Lines Intersection Offset [here](#).

Note 1: The height of the prism for all measured points is unavailable in the Measurement tab and should be set in the [Back-sight](#) screen.

Note 2: The height of the offset point is calculated as the mean of the heights of both lines for this point. See the graph [here](#).

The [Points](#) screen will display the coordinates of the offset (intersection) point.

Line and Corner





What task does this offset type perform? - Determination of the horizontal and vertical (3D) coordinates of an inaccessible point,

as intersection of an auxiliary line and a plane. You create a line (by two points) and a vertical plane passing through the offset point. You perform distance and angle measurements of the line's points and angle measurements of the offset point.

Before any measurements, complete the following preparation tasks:

1. Select any two points (Pt1-1 and Pt2-1), from which the desired inaccessible offset point is seen. See the plot [here](#). When selecting the location of these points, bear in mind that the internal angle formed by the two lines should not be less than 30 degrees and more than 150 degrees.
2. Set point Pt2-2 along the line "Pt2-1 - the offset point" and set up the TS at point Pt1-1. See the plot [here](#).

To do this offset determination:

1. Enter the name of the determined point in the Point field of the Measurement tab of the [Sideshot-Direct](#) screen.
2. Open the Offset tab, and click  in the Offsets.
3. The Measurement tab displays. Take three measurements in any order:
 - 1)  Click the Line1Pt1 button and measure the distance, vertical and horizontal angle to the first point of the line.
 - 2)  Click the Line1Pt2 button and measure the distance, vertical and horizontal angle to the second point of the line.
 - 3)  Click the Corner button and measure the vertical and horizontal angle to the offset point.

You can see the plot of measurements for the Line and Corner Offset [here](#).

Note 1: The height of the prism for all measured points is unavailable in the Measurement tab and should be set in the [Back-sight](#) screen.

Note 2. The height of the offset point is the height of the line for this offset point (calculated by extrapolation along the “Pt2-1 - Pt2-2” line).

The [Points](#) screen will display the coordinates of this offset point.

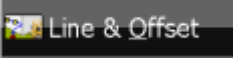


Line and Offset

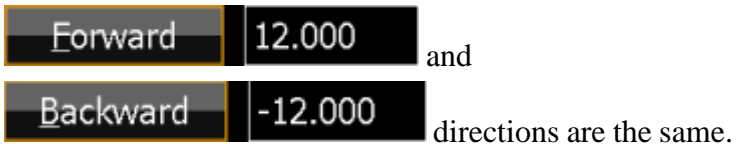
What task does this offset type perform? - Determination of the horizontal and vertical (3D) coordinates of an inaccessible point, using an auxiliary line and additional distance offsets measurements, for example, made by the tape. You create a line (by two points), then perform distance and angle measurements of the line's points and distance measurements (from this line) to the offset point.

Before any measurements, you have to select any two points (Pt1 and Pt2) near the inaccessible point. The line which is created by these points will be an auxiliary line. See the plot [here](#).

To do this offset determination:

1. Enter the name of the determined point in the Point field of the Measurement tab of the [Sideshot-Direct](#) screen.

2. Open the Offset tab, and click  in the Offsets.
3. The Measurement tab displays. Take two measurements in any order:
 - 1)  Click the LinePt1 button and measure the distance, vertical and horizontal angle to the first point of the line.
 - 2)  Click the LinePt2 button and measure the distance, vertical and horizontal angle to the second point of the line.
4. Measure the offsets from the second point (Pt2) to the determined point and enter their values in the following fields of the Enter Distance Offsets screen. You may define the direction of the given offset in two ways: either click on the button of the current selection or use the minus sign "-" for the current value. For instance,



The directions of the offsets are explained in the figure [here](#).

Note 1: The height of the prism for all measured points is unavailable in the Measurement tab and should be set in the [Back-sight](#) screen.

Note 2: The offset point lies on the perpendicular to the line "Pt1 - Pt2".

Note 3: 3D coordinates of the offset point are calculated relative to line "Pt1 - Pt2" (calculated by extrapolation along the "Pt1 - Pt2" line).

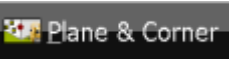


The [Points](#) screen will display the coordinates of the offset point.



Plane and Corner

What task does this offset type perform? - Determination of the horizontal and vertical (3D) coordinates of an inaccessible point, as an intersection of a line of site and a plane defined by three points. You create three auxiliary points, then perform distance and angle measurements to these points and angle measurements to the offset point.

Note that the user creates three auxiliary points in the same plane where the inaccessible point is located. All four points must not be on the same line. Find the plot [here](#).

To do this determination:

1. Enter the name of the determined point in the Point field of the Measurement tab of the [Sideshot-Direct](#) screen.
2. Open the Offset tab, and click  in the Offsets.
3. The Measurement tab displays. Take four measurements in any order:
 - 1)  Click the Prism1 button and measure the distance, vertical and horizontal angle to the first prism of the plane.
 - 2)  Click the Prism2 button and measure the distance, vertical and horizontal angle to the second prism of the plane.

- 3)  Click the Prism3 button and measure the distance, vertical and horizontal angle to the third prism of the plane.
- 4)  Click the Corner button and measure the vertical and horizontal angle to the offset point.

1. You can see the plot of measurements for the Plane and Corner Offset [here](#).

Note: The height of the prism for all measured points is unavailable in the Measurement tab and should be set in the [Backsight](#) screen.

The [Points](#) screen will display the coordinates of the offset point.

Offsets for GPS Survey

The Offsets tab is always presented when you open the [Topo](#) screen for the GPS survey. The Offsets tab contains up to three offset types. The Offset Laser is available only if a laser distance meter device is used.

Click the link to find out more:



[Offset Line](#)



[Azimuth and Offsets](#)



[Offset Laser](#)






Offset Line

What task does this offset type perform?- Determination of the horizontal and vertical (3D) coordinates of an inaccessible point, using two measured points and additional distance offsets measurements, for example, performed with the tape.

To do this determination:

1. Enter the name of the determined point and the rover antenna height in the Point field of the [Topo](#) tab.

Note: Be sure that the current type of position calculation method corresponds to the precision of the determined point.

2. Open the Offsets tab, and click  in the Offsets.
3. Select the Start and End points from the map (click ) or from the list (click ) , or measure them (click ) in the [Line](#) screen.
4. Measure offsets from the End point to the determined point and enter the values. Use one of two ways to define the direction of the given offset: either click on the button of the current selection or use the minus sign "-" for the current value (see examples [here](#)). The directions of the offsets are explained in the figure [here](#).
5. Click  to save the calculated coordinates of the offset point. The [Points](#) screen will display the coordinates of the offset point.

The offset point lies on the perpendicular to the line "Start Point - End Point".

Hoffset_point = Hpoint2 + (Up/Down_offset)


Azimuth and Offsets




What task does this offset type perform? - 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.

To determine a point with the Azimuth & Offsets task:

1. Type the name of determined point and the rover antenna height in the Point field of the [Topo](#) tab.


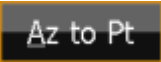



Note: Be sure that the current type of position calculation method corresponds to the precision of the determined point.


2. Open the Offsets tab, and click  in the Offsets.

3. Select Start Point from the map (click ) or from the list (click ) , or measure it (click ) in the Line screen.

4. Define the direction to the offset point in the Azimuth - Distance - Height screen. Use one of two methods to de-

fine the offset point in horizontal plane (the hand symbol points out that there is a choice):




- 1)  The horizontal angle is determined by the azimuth to the offset point. Find the plot [here](#).
 - 2)  The horizontal angle is determined by the azimuth to a point (selected from the list/map). The offset point lies on the line "Start Point" - "Selected Point". Find the plot [here](#).
5. Measure the vertical offset from the Start Point, and enter the value in the corresponding field of the Azimuth - Distance - Height screen. Use one of three methods to define the offset point in a vertical plane (the hand symbol points out that there is a choice):
- 1)  The zenith angle is measured (from an index with 0 directed towards the zenith). Find the plot [here](#).
 - 2)  The vertical angle is measured (relative to 0 that coincides with horizontal). Find the plot [here](#).
 - 3)  The vertical distance between the offset point and the horizontal passed through the start point. Find the plot [here](#).
6. Measure the horizontal distance offset from the Start Point and enter the value in the corresponding field of the Azimuth - Distance - Height screen.






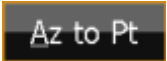

- Click  to calculate and save the coordinates of the offset point. The [Points](#) screen will display the coordinates of the offset point.

Offset Laser

What task does this offset type perform? - Determination of the horizontal and vertical (3D) coordinates of an inaccessible point, using distance and angle measurements to the point from a laser range finder. MAGNET Field enables you to use an external laser range finder. Before any measurement, set the type of the used range finder in job configuration.

To work with an external laser range finder:

- Click the Configure icon .
- Click the Survey icon .
- Click  in the [Rover Receiver](#) screen.
- Check the External laser option, and select which device to connect the laser rangefinder to: Controller or Receiver.
- Click Parameters in the Peripherals dialog to set communication parameters between the controller and external laser range finder.
- Before starting measurements with the laser range finder, make sure that the current coordinate system in the given MAGNET Field job is datum, grid, or localization.
- Make sure that the job contains the coordinates of the point where the laser range finder will be located. This point is called "Occ point" for this offset type.

8. Enter the name of the determined point in the Point field of the [Topo](#) tab.
9. Open the Offsets tab and click  in the Offsets.
10. Select the name of the external laser range finder from the list in the Bluetooth Devices screen. Click  in the dialog.
11. Select the Occupation Point from the map (click ) or from the list (click ) in the Config Laser screen.
12. Either enter the azimuth to the offset point (if  is selected). Find the plot [here](#).
13. Or select a point from the list/map (if  is selected). In this case the horizontal angle will be determined by the azimuth to the selected point. The offset point will be on the line "Occupation Point"- "Selected Point". Find the plot [here](#).
14. Enter the laser range finder height in the corresponding field.
15. Set the laser to the desired point, and press the Fire button on the laser range finder to measure the slope distance and vertical angle to the point. After measurements are successfully performed, MAGNET Field displays the Store Point screen with the calculated coordinates of the offset point.
16. Click  to save the offset point in the MAGNET Field job. The [Points](#) screen will display the coordinates of the offset point.