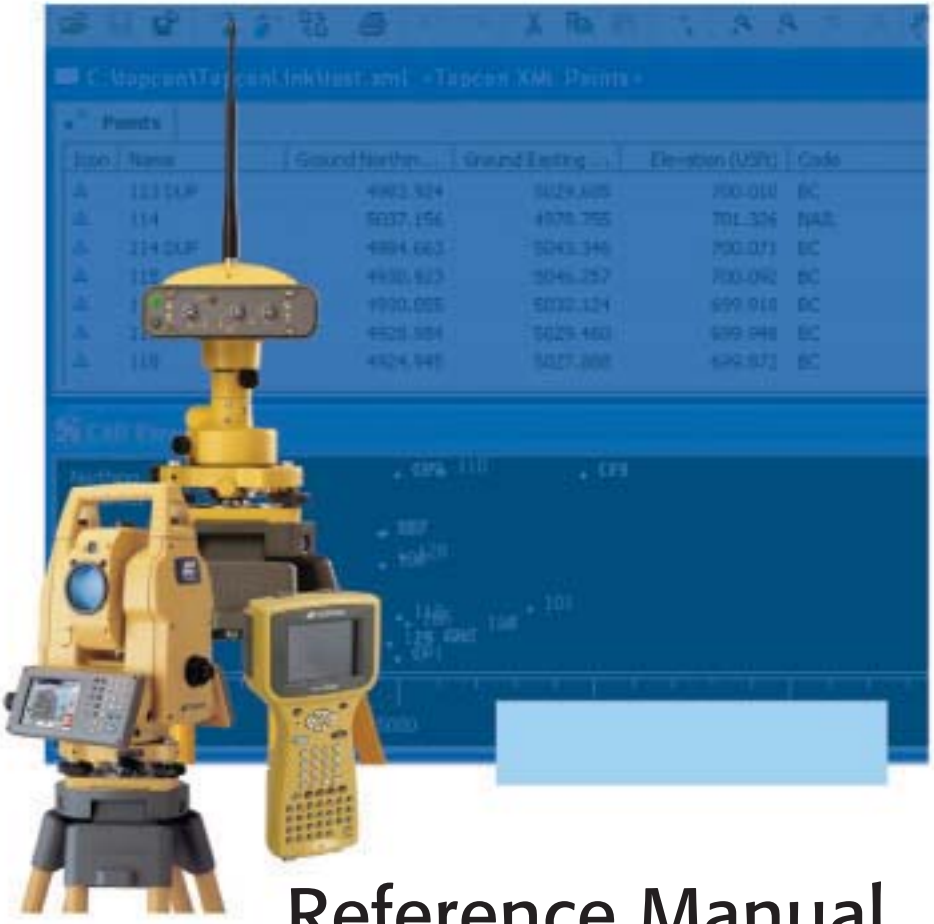
TOPCON

Topcon Link

Data Import/Export Software



Reference Manual

TOPCON
POSITIONING SYSTEMS

Topcon Link Reference Manual

Part Number 7010-0522
Rev M

November, 2010

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Preface

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Manual Conventions

This manual uses the following conventions:

Example	Description
File ▸ Exit	Click the **File** menu and click **Exit**.
Connection	Indicates the name of a dialog box or screen.
Frequency	Indicates a field on a dialog box or screen, or a tab within a dialog box or screen.
Enter	Press or click the button or key labeled **Enter**.

Further information to note about the configuration, maintenance, or setup of a system.

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, or personal safety.

Notification that an action has the potential to adversely affect system operation, system performance, data integrity, or personal health.

Notification that an action *will* result in system damage, loss of data, loss of warranty, or personal injury.

Under no circumstances should this action be performed.

Introduction

Welcome to Topcon Link, a full-featured data import/export and conversion utility for Topcon instruments. Topcon Link contains features and functions to perform the following activities:

- Import data files from all Topcon and Sokkia instruments.
- Convert all Topcon and Sokkia data files and many industry-standard data files to corresponding file formats.
- Open and display data in easy to use tables and screens.
- Provide basic editing tools for some data types.
- Export coordinate files to a Topcon and Sokkia total station, and export any data file to a Topcon and Sokkia controller.

Topcon Link supports all proprietary Topcon and Sokkia file formats as well as a number of industry formats. Any format can be converted to desired Topcon and Sokkia format for export to Topcon and Sokkia instruments. Many files can be converted between third party and proprietary formats.

Installing Topcon Link

Topcon Link software comes either on a CD (as a standalone application with TopSURV software), and also available as free download from the TPS website to install on a computer. The InstallAware® Wizard will save the earlier versions of Topcon Link already installed, and will install the latest version in the folder the user selects.

The CD version of Topcon Link contains all projections, datums and geoids. The version downloaded from the Topcon web site comes without the projections, datums and geoids. They will be downloaded from the Internet and installed on our computer during the installation process. Make sure that your computer has Internet access during installation.

Table 1-1 lists the recommended system requirements needed to install this software on a computer.

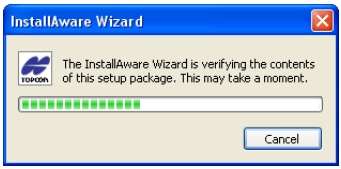
Table 1-1. Topcon Link System Requirements for Installation

• Microsoft® Windows XP/Vista/7(32 bit and 64 bit) operating system • Processor compatible with Intel® Pentium® 1000 MHz or faster	• 512 MB of RAM (1000MB recommended) • 100 MB of available hard-disk space

Before connecting the receiver's USB port to the computer's USB port, the TPS USB driver must be installed on the computer. The driver is available on the TPS website: (http://www.topconsupport.com/documents/view/1743).

1. Navigate to the Topcon Link executable file or insert the software CD-ROM.
   - If downloading the software from the TPS website, save the downloaded compressed file to an accessible location and extract the Topcon Link executable file.
   - If downloading the software from a TPS software CD, insert the CD into the computer's CD-ROM drive.

2. The InstallAware Wizard starts up:



3. Click **Next** to start the installation process.
4. Check the '*I accept the terms of the license agreement*' box, to continue the installation (Figure 1-1). Type *User Name* and *Company Name* information, then click **Next** (Figure 1-1)

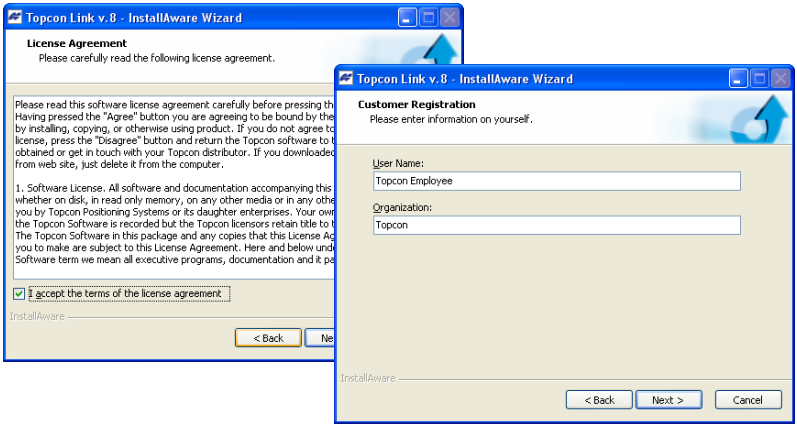
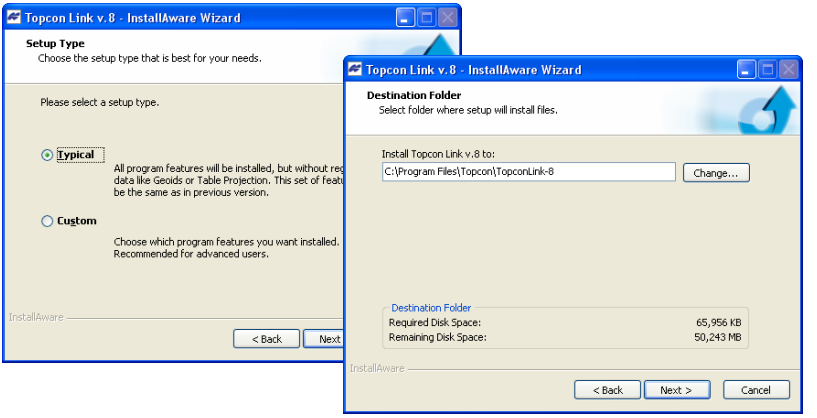


Figure 1-1. Review License Agreement and Enter User Information

5. Select a needed setup type. Depending on the user's selection, either all program features or only highlighted features will be installed. If the user selects *Typical* type and presses **Next**, the installation software will do the following:

- automatically select all available datums and projections (except the following *Table Projections*:
  - *rdtrans 2004* and *rdtrans* for Netherlands
  - *LB72* for Belgium
  - *KKJ* for Finland
  - *USTNO2* for United Kingdom)

- display the next installation dialog (Figure 1-2)



A B

Figure 1-2. Typical Setup Type

If the user selects the *Custom* type and press **Next**, the *Custom Setup* dialog displays (Figure 1-3).

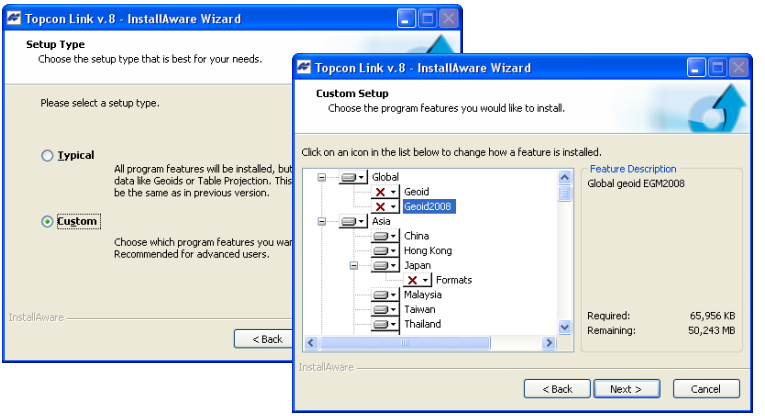


Figure 1-3. Custom Setup Type

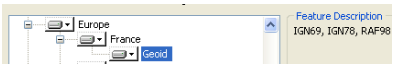
NOTICE

The typical installation does not allow one to install a geoid on the computer. As against of the typical installation, the custom installation allows one to install the highlighted

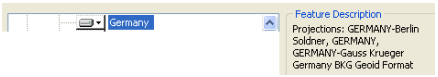
geoid for the corresponding projection(s)/datum(s) of the given region.

The user can highlight only those features (projection or projection and geoid), which needed for the given job area. Such regional selection allows one to economize the computer's disk size.

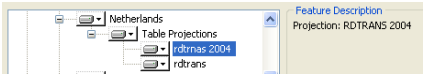
This dialog box contains the list of projections:

- with regional geoids 

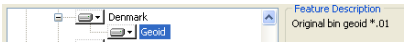
or

- without regional geoids 

or

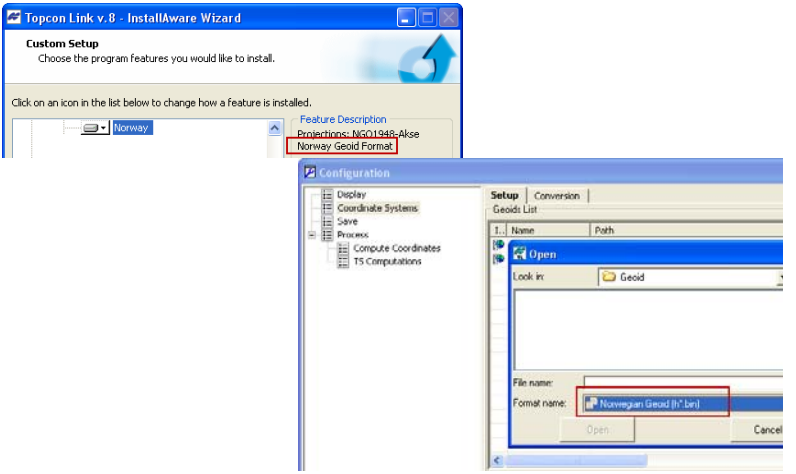
- with table projection 

The *Feature Description* displays the list projection(s)/ formats/ geoid(s) which consist the highlighted item. To see what the feature contains, select the desired feature:



If the selected projection contains a list of projection(s) and a geoid file format, Topcon Link will be installed with the selected projection(s) and format for adding the corresponding geoid to the Topcon Link (but not a geoid file). In the given case:

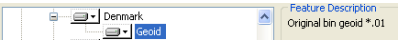
– the *Setup* tab of the *Coordinate System* item of the *Configuration* dialog box will display the installed geoid file format in the list of geoid:

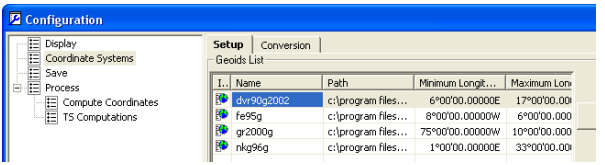


– the installed projection(s) will be displayed in the list of projections for conversion:

If the selected projection contains a list of projection(s) and the geoid, Topcon Link will be installed with the selected projection(s), format for adding the corresponding geoid and the corresponding geoid(s) into the user's computer. In the given case:

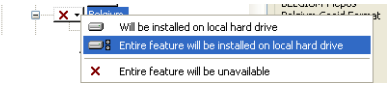
– the *Setup* tab of the *Coordinate System* item of the *Configuration* dialog box will display the geoid file format in the list of geoid and installed geoid(s):





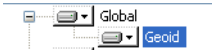
– the installed projection(s) will be displayed in the list of projections for conversion: 

To add/remove the desired regional projection or geoid to/from the installing, click the desired feature and select the corresponding command from the pop-up menu:



The following rules is used for adding projection and geoid:

1. It is not possible to highlight a geoid without highlighting of the corresponding projection:

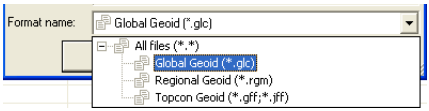
or


2. It is possible to highlight only the desired projection: 

NOTICE

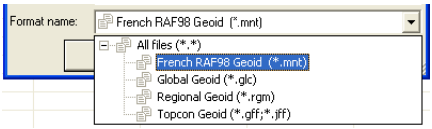
Without reference to the selected projection type, Topcon Link installation will install all datums

If the user did not select any geoid file in the process of installation, after finishing Topcon Link installation process it is possible to add (using *Configuration* dialog box) **only** the following geoids (global (*.glc), custom regional (*.rgm) and topcon geoid (*.jff and/or *.gff) files):



It the user selected some regional geoid file in the process of installation, after finishing Topcon Link installion process it is possible to add (using *Configuration* dialog box) **only** the following

geoids (selected official geoid, global (*.glc), custom regional (*.rgm) and topcon geoid (*.jff and/or *.gff) files):



NOTICE

Without reference to the selected projection/geoid type, Topcon Link installation saves geoid(s), which were added in the previous version to the geoid list

To add the desired geoid(s) or the desired projection(s) after finishing Topcon Link installion process, the user needs to do the steps is described in “How to add a feature after installation” on page 1-10

To continue Topcon Link installation, click **Next**.

3. Either keep the default installation folder or click **Browse** to select a different folder in which to install the Topcon Link. Click **Next** to continue (Figure 1-2 on page 1-4, picture B)).
4. If desired, type in a new folder in which to add program icons. For automatically creating Topcon Link shortcut check the ‘*Create on Desktop*’ box. Then click **Next** (Figure 1-4).
5. Click **Next** to start the installation process (Figure 1-4)

6. Topcon Link is installed on the computer (Figure 1-4)

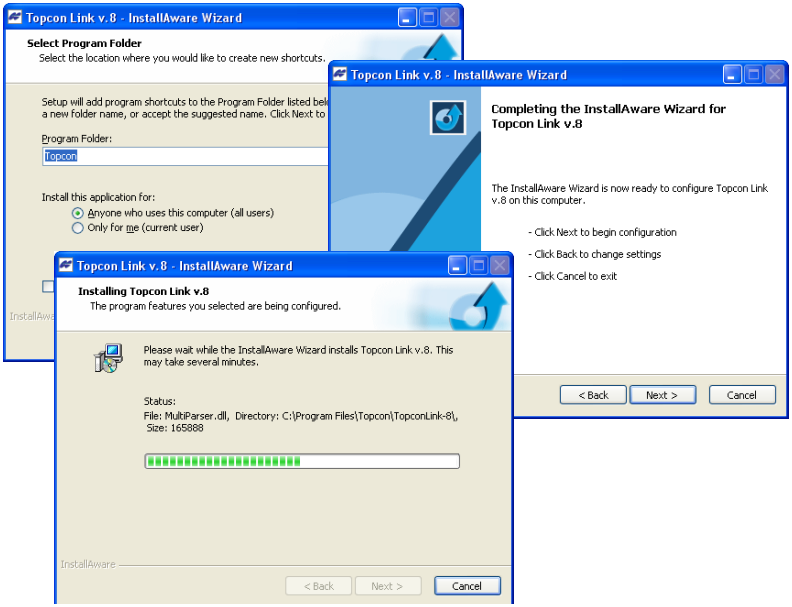


Figure 1-4. Select Program Folder and Installation Progress

7. Click **Finish** to exit the installation.
8. Before the user can use Topcon Link, we recommend restarting your computer.
9. Create a shortcut on the computer's desktop for easy access (Figure 1-5).

Figure 1-5. Topcon Link Desktop Shortcut

How to add a feature after installation

The user can add any features from *Custom Setup* window after finishing Topcon Link installion process and restarting Windows. To do it, make the following steps:

1. Click **Settings ▸ Control Panel ▸ Add or Remove Programs**
2. Select *Topcon Link v.8* in the *Add or Remove Programs* and click *Change* (Figure 1-7):

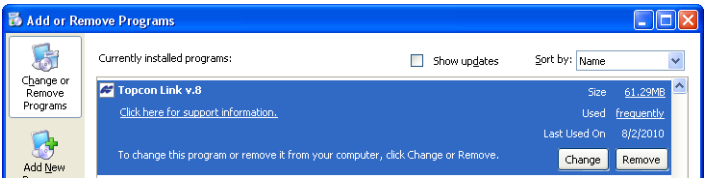


Figure 1-6. Add and Remove Programs

3. Select *Modify Available Options* and click **Next** (Figure 1-8)

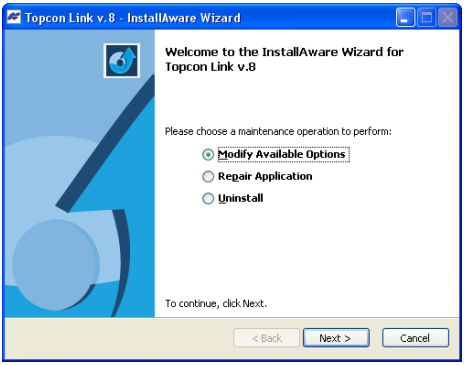


Figure 1-7. InstallAware Wizard

4. Highlight the desired features (projection or projection and geoid) in the *Custom Setup* window (Figure 1-9)

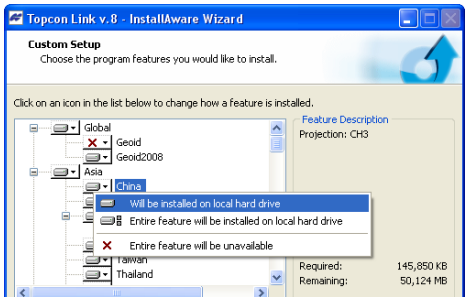


Figure 1-8. Custom Setup Window

Installing Microsoft ActiveSync for Use With CE-based Devices

ActiveSync® is free software from Microsoft® that establishes a connection between a computer (with operation system Windows XP) and an external device. ActiveSync is used for file transfers and software downloads between a computer and mobile device running the Windows® CE operating system, such as a hand-held controller or CE-based Total Station.

After installing ActiveSync, it will be associated with a port on the computer. This means that the port will be considered “busy”, and may need to be freed up for use with other devices.

ActiveSync will start automatically when connecting a CE-based device (such as, Topcon’s FC-120/FC-200/FC-2000/FC2200/FC2500, GMS-2/GMS-2Pro, or GTS-720/GTS-750/GPT-7000/GPT-7000i/ GPT-7500/GPT-9000)or Sokkia’s SHC 2500 or SRX/SET X).

1. Log on to the Microsoft website (www.microsoft.com) to download ActiveSync. Install the program onto the computer.

2. After installing ActiveSync, start the application and click **File ▸ Connection Settings**. Apply the following settings based on the number of ports on the computer (Table 1-2).

NOTE

Refer to the help topics in ActiveSync for more details on connecting with devices.

Table 1-2. About ActiveSync Connection Settings

ActiveSync Settings for Computers With One Port	ActiveSync Settings for Computers With Two or More Ports
If using a port for multiple purposes, select either "Work Network" or "The Internet". In this case, ActiveSync will free up the port for other uses after disconnecting a device. 	If multiple ports are available, the default settings are sufficient. In this case, ActiveSync will retain use of the port after disconnecting a device. If using a USB cable to connect the device to the computer, select the option. 

NOTICE

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

Getting Acquainted

The Topcon Link interface is designed for easy, integrated use with a PC-compatible computer, a connected Topcon instrument, and industry-standard data types. The following sections introduce the various functions available in Topcon Link for transferring, viewing, configuring/converting, and editing data files.

Main Screen

The main screen has the following components (Figure 1-9):

- Title bar – contains the program name and the name of the currently active file.
- Menu bar – contains drop-down menus for all functions.
- Toolbar –contains shortcut buttons to frequently used functions.
- Work area – displays dialog boxes, job file information, and pop-up menus.
- Status bar – displays informative messages about Topcon Link and various files, as well as pop-up boxes for quickly changing units and coordinate systems (inactive if no file is open).

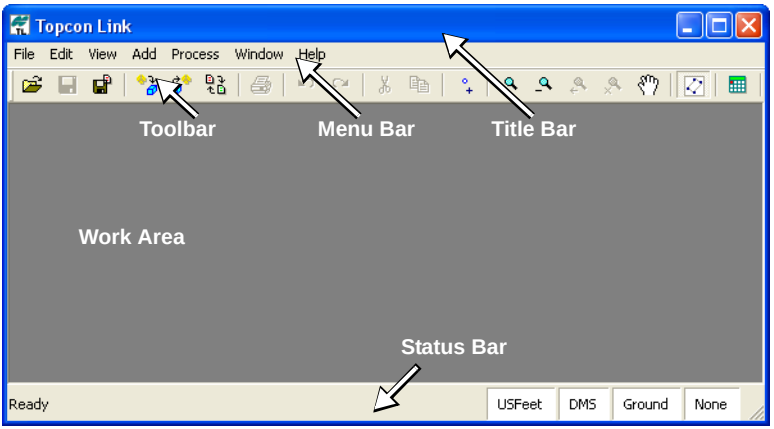


Figure 1-9. Topcon Link Main Screen Components

Menu Bar

The menu bar (Figure 1-10) provides access to all available options.

Figure 1-10. Topcon Link Menu Bar

Table 1-3 briefly describes the functions in each drop-down menu.

Table 1-3. Topcon Link Menu Options

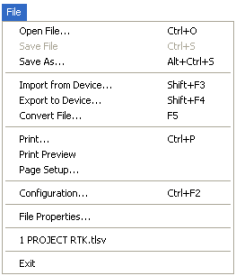
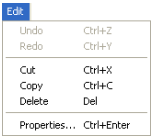
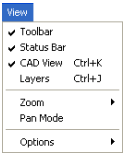
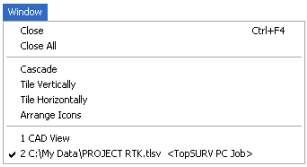
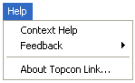
Menu	Functions
File menu 	• opens and saves a file • imports and exports data from a device • converts a file from one format to another compatible format[a] • prints information from an active file • displays configuration parameters • displays file properties • displays recently accessed files • closes Topcon Link
Edit menu 	• allows an undo or redo of the last operation • cuts, copies, or deletes selected data • adds a point • displays the properties for selected data
View menu 	• displays or hides the CAD view and/or layers view • displays or hides the Topcon Link toolbar and/or status bar • sets the pan or zoom mode • sets view options for the tabular and CAD views
Add menu 	• adds a point
Process menu 	• computes coordinates • sets processing properties

Table 1-3. Topcon Link Menu Options (Continued)

Menu	Functions
Window menu 	• closes the current window or all open windows • arranges open windows in a cascade (stacked) or tile (adjacent) order • arranges icons • shows all open windows, and selects a window to be active
Help menu 	• accesses the Topcon Link context help • accesses customer feedback options for sending bug reports and questions to TPS support • access the Topcon GPS website on the Internet • access the Topcon University website on the Internet • displays version, publisher, and build date information for Topcon Link

a. Compatible formats - the formats containing the common data

Toolbar

The toolbar for Topcon Link (Figure 1-11) contains buttons for frequently used functions.

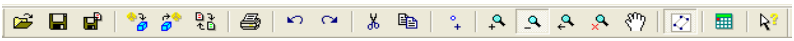


Figure 1-11. Topcon Link Toolbar

Upon startup, the toolbar displays beneath the menu bar. To display or hide the toolbar, click View ▸ Toolbar.

Table 1-4 describes the various buttons available on the toolbar.

Table 1-4. Topcon Link Toolbar Button Functions

Button	Description
	Open File – Opens an existing file. 1. Click the button to display the Open dialog box. 2. Navigate to and select the desired file. 3. Click Open.

Table 1-4. Topcon Link Toolbar Button Functions (Continued)

Button	Description
	Save – Saves a file to the current directory.
	Save As – Saves the current file with a new name and/or in a new directory and/or to save in other compatible format.
	Import File from Device – Imports files from Topcon and Sokkia GPS+ receivers, Topcon memory cards, Topcon and Sokkia controllers, Topcon and Sokkia Total Stations (CE-based, robotic, conventional), or Topcon and Sokkia digital levels See Chapter 4 for details.
	Export File to Device – Exports data to a Topcon and Sokkia controller or Total Station and Sokkia (CE-based, conventional, robotic). See Chapter 8 for details.
	Convert files between formats – Converts data in a file from one format to another compatible format. See “Converting A File” on page 5-2 for details.
	Print – Prints the current window or table.
	Undo – Reverses the last action.
	Redo – Returns the last action.
	Cut – Removes the selected object(s).
	Copy – Copies the selected object(s).
	Add point –Adds a point to the current file. 1. Click the button to display the Add point dialog box. 2. Enter the point name, coordinates, and codes for the new point. 3. Click Ok. See “Add a Point” on page 6-2 for details.
	Zoom In – Changes the pointer to a magnifying wand for zooming in on a clicked area of the CAD view. You can also click and drag a square around the area to zoom in on.

Table 1-4. Topcon Link Toolbar Button Functions (Continued)

Button	Description
	Zoom Out – Changes the pointer to a magnifying wand for zooming out on a clicked area of the CAD view. You can also click and drag a square around the area to zoom out on.
	Zoom back – Returns the CAD view to the previous zoom magnification.
	Restore All – Fits all data in the active CAD view into the viewable extents of the view.
	Pan – Changes the pointer to a “hand” with which to “grab” and dynamically move the CAD view.
	CAD View – Available for TopSURV PC Jobs, displays design data (points, linework, roads, and surface).
	Compute coordinates of points – Calculates the point coordinates in the current file. See “Computing Point Coordinates for Raw Data and Field Software Files” on page 7-1 for more details.
	Context Help – Displays a pop-up tip with information about the selected view, button, field, etc. 1. Click the button. The pointer changes to a question mark. 2. Click the object you want additional information on. A pop-up tip gives further information. 3. Click outside the pop-up tip to close it.

Status Bar

The status bar (Figure 1-12 on page 1-18) displays:

- various informative messages about current Topcon Link activities and opened file.
- the information boxes provide quick information about the current linear/angular units and coordinate type/system used in the file. These boxes also provide drop-down lists for quickly

converting the linear or angular units used in the file, or the coordinate type or system used in the file.

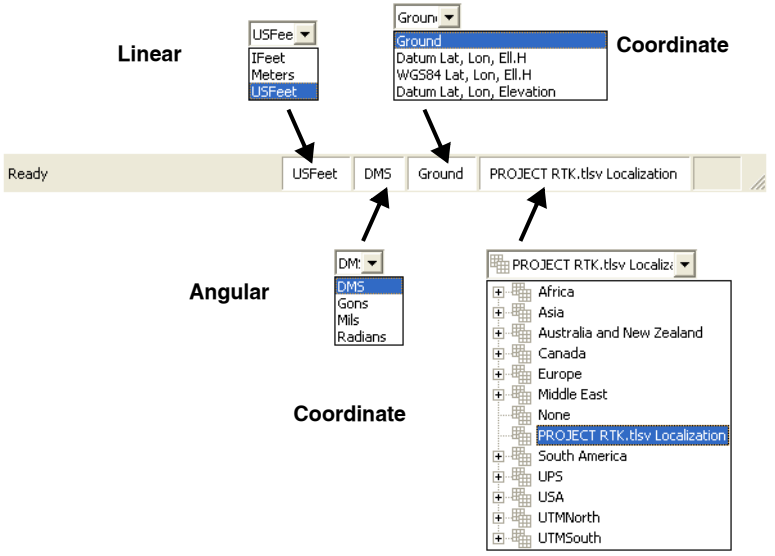


Figure 1-12. Topcon Link Status Bar

Topcon and Sokkia Device Directories in Windows Explorer

The Topcon Link installation process also installs device directories on the computer's hard drive (Figure 1-13). These directories are used to easily access data on a connected device for import/export activities.

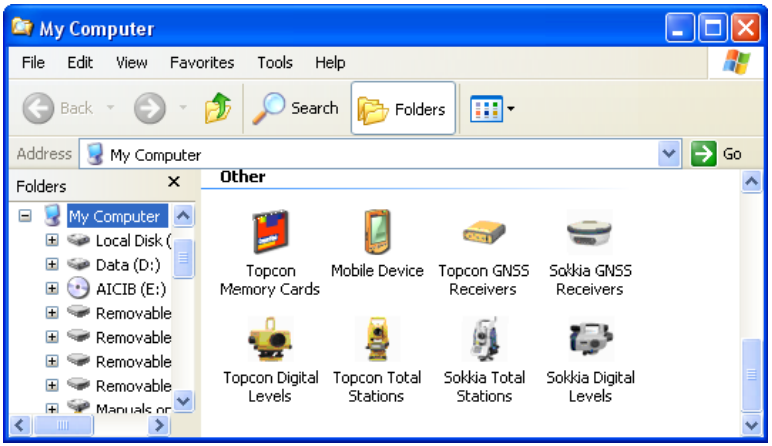


Figure 1-13. Topcon Device Folders in Windows Explorer

NOTE

On computers with Windows XP, the "Mobile Device" folder displays after installing Microsoft ActiveSync.

On computer with Windows Vista, the "Windows CE" folder automatically displays after connecting a external device with Windows CE.

This device directory displays the contents of the connected TPS controller or TPS CE-based total station.

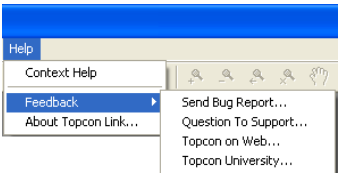
After connecting a device to the computer, open Windows Explorer and navigate to the My Computer window. Click the device icon/ directory to transfer data files.

NOTICE

Because some devices require special settings or setups to use this feature, see the appropriate section in Chapter 2 for more details.

Sending Feedback and Bug Reports to Topcon Support

The Feedback option in the *Help* menu offers a way to provide feedback and direct connection with the Topcon GPS website (http://www.topconpositioning.com/) and Topcon University website (http://www.topconuniversity.com/):



These options require Internet access.

To send a bug report:

Click **Help ▸ Feedback ▸ Send Bug Report**. An email opens with short descriptions of the current version of Topcon Link and OS of the computer, and log files for Topcon Link are automatically attached. Describe activities being performed when the "bug" occurred and send the e-mail to TPS Support:

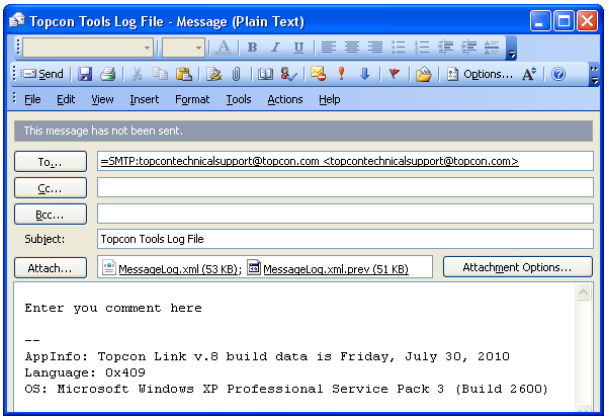


Figure 1-14. Example E-mail for the Send Bug Report Option

To ask a question:

Click **Help ▸ Feedback ▸ Question To Support**. Enter any questions, describing activities in detail, and send the email to TPS Support:

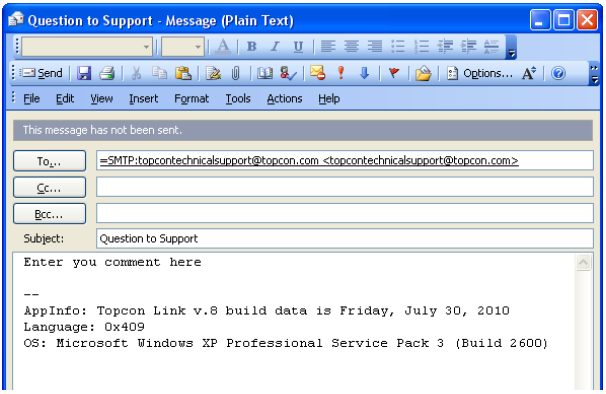


Figure 1-15. Example E-mail for the Question to Support Option

Notes:

Setting up Topcon Link for Transferring Data

Topcon Link provides two methods for transferring data between the computer and a connected device: via the Topcon Link interface or the installed directories in Windows® Explorer. See “Adding Devices” on page 2-1for a quick look at what each device requires for data transfers.

- For Topcon and Sokkia Total Stations and Topcon and Sokkia Digital Levels, the instrument’ information and connection parameters must be set up before it’s files can be viewed. The instrument setup will only need to be done once per computer.
- For Topcon Memory Cards (flash cards used for data storage in a Topcon receiver), the card must be formatted before data can be recorded. The card will need to be formatted once.

Adding Devices

Depending on the device, an initial device setup may be required before a successful data transfer can be completed. The following table briefly describes the setups required for transferring data between a computer and a connected device (Table 2-1 on page 2-2). See the sections below for specific details.

Table 2-1. Required for Connected Topcon and Sokkia Devices

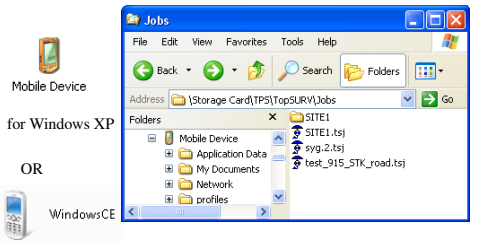
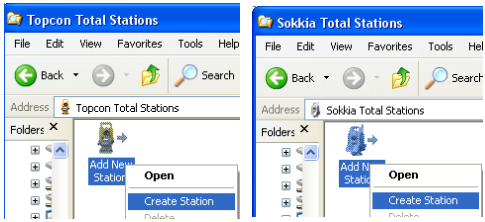
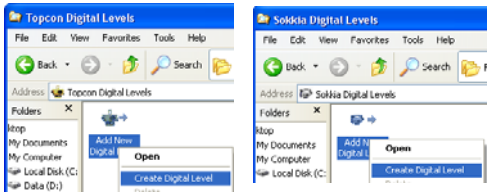
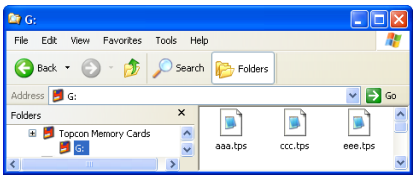
Topcon GPS Receivers	
No further setups are required. Click the receiver icon to search connected GNSS receivers. After detecting the receivers, select the corresponding receiver to view logged raw data files.	
Sokkia GPS Receiver	
No further setups are required. Click the receiver icon to search connected GNSS receivers. After detecting the receivers, select the corresponding receiver to view logged raw data files. The Sokkia GNSS receiver node contains three independent COM ports. Clicking on a port will display all logged GNSS raw data files. The user can simultaneously import different raw files from each COM port to the computer	
Topcon and Sokkia Controllers	
Microsoft® ActiveSync needs to be installed on the computer with Windows XP. For details, see “Installing Microsoft ActiveSync for Use With CE-based Devices” on page 1-11“. Click the icon to connect with Controller. After connecting to the controller, navigate to the TopSURV/SSF folder and select the desired job.	

Table 2-1. Required for Connected Topcon and Sokkia Devices

Topcon and Sokkia Total Stations	
Parameters for the total station must be set up using Windows Explorer or the Topcon Link Import from device function. See “Adding a Topcon Total Station Device” on page 2-4 for details.	
Topcon and Sokkia Digital Levels	
Parameters for the digital level must be set up using Windows Explorer or the Topcon Link Import from device function. See “Adding a Topcon Digital Level Device” on page 2-8 for details.	
Topcon Memory Cards	
The receiver’s memory card must be formatted as a “Topcon Memory Card”. After connecting to the computer’s card reader, the memory card icon displays as red or gray. • A red icon indicates compatible formatting. • A gray icon indicates formatting is required. See “Formatting a Topcon Memory Card” on page 2-12 for details.	 

Adding a Topcon Total Station Device

Before Topcon Link or Windows Explorer can read data on a Topcon Total Station, the device must be added to the directory.

1. Navigate to the ***Topcon Total Station*** directory (Figure 2-1 on page 2-4).
   - From Topcon Link – **Click File ▸ Import from Device**. In the left pane, double-click the ***Topcon Total Station*** directory.
   - From Windows Explorer – Open the ***My Computer*** window. Double-click the ***Topcon Total Station*** directory.

   The procedure will be the same whether using Topcon Link or Windows Explorer.
2. Double-click **Add New Station** (Figure 2-1).

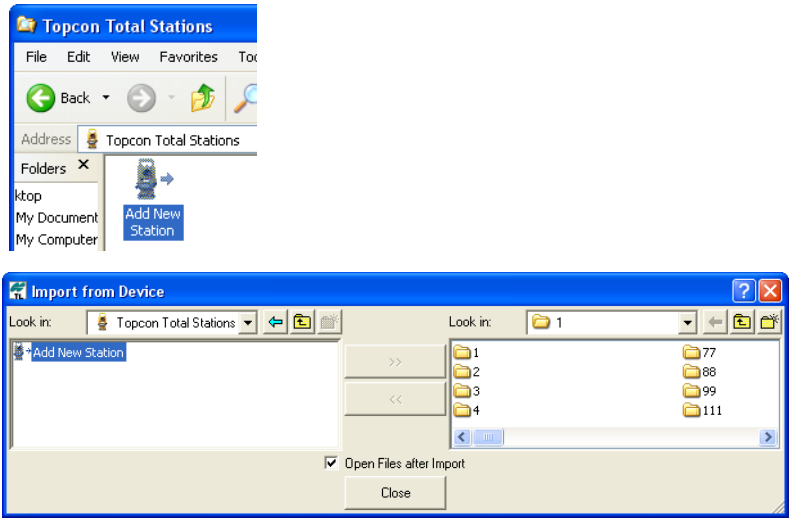


Figure 2-1. Add a New Topcon Total Station

3. On the *General* tab, enter and select the following information (Figure 2-2 on page 2-5):
   - Name – enter a unique name for the device
   - Notes – enter any necessary notes
   - Port – select the COM Port the device typically connects to
   - Model – enter the model number

4. On the *Advanced* tab, select the baud rate, parity, data bits, stop bits, and protocol used for communication with the Total Station (Figure 2-2). Refer to the Topcon Total Station operator's manual for details.

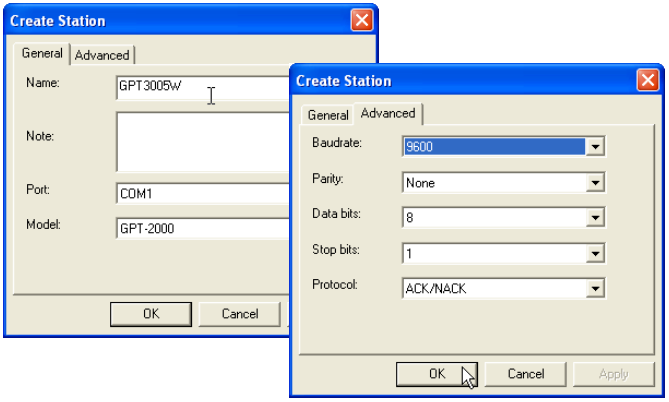


Figure 2-2. Enter Topcon Total Station Device Information

5. Click **OK** to save device information to the computer.

   When connecting to this device, you will select the created device and then follow the instructions on the Total Station.

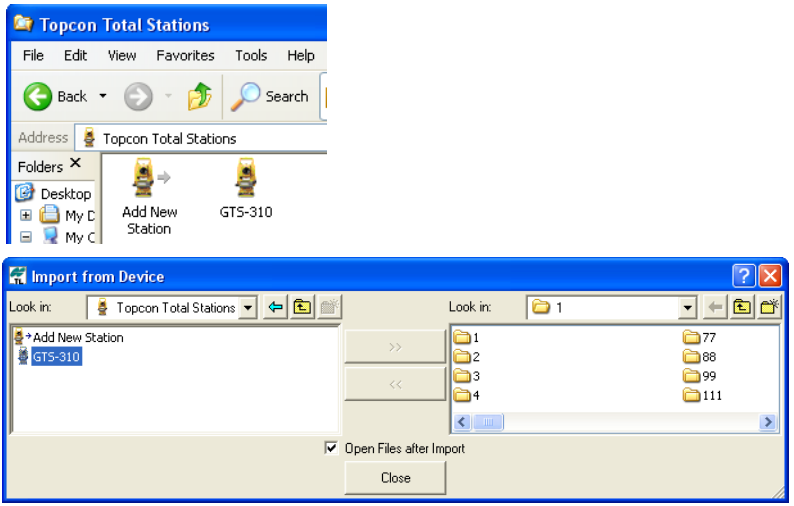


Figure 2-3. Created Topcon Total Station

Adding a Sokkia Total Station Device

Before Topcon Link or Windows Explorer can read data on a Sokkia Total Station, the device must be added to the directory.

1. Navigate to the ***Sokkia Total Station*** directory (Figure 2-1 on page 2-4).
   - From Topcon Link – **Click File ▸ Import from Device**. In the left pane, double-click the ***Sokkia Total Station*** directory.
   - From Windows Explorer – Open the ***My Computer*** window. Double-click the ***Sokkia Total Station*** directory.

   The procedure will be the same whether using Topcon Link or Windows Explorer.
2. Double-click **Add New Station** (Figure 2-1).

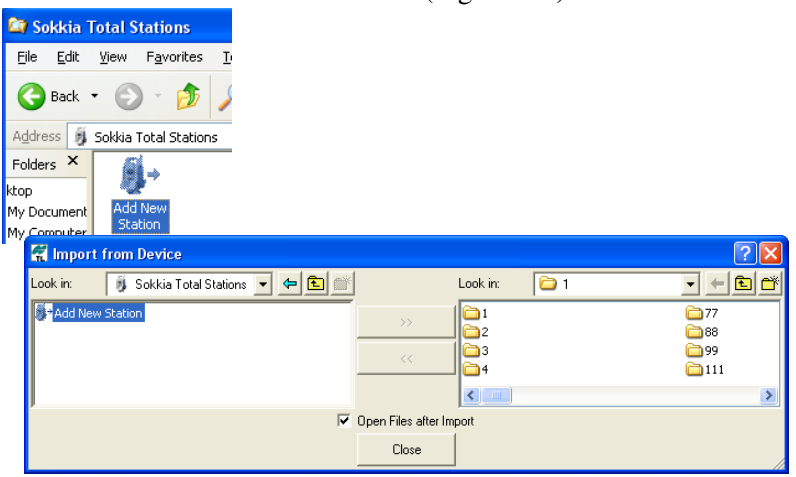


Figure 2-4. Add a New Sokkia Total Station

3. On the *General* tab, enter and select the following information (Figure 2-2 on page 2-5):
   - Name – enter a unique name for the device
   - Notes – enter any necessary notes
   - Port – select the COM Port the device typically connects to
   - Model – enter the model number
   - SRD Format -select the corresponding format for your device from the SDR 20 and SDR 33 formats:

4. On the *Advanced* tab, select the baud rate, parity, data bits, stop bits, and set checksum (*Set* or *Not Set*) and flow control (*None* or *Xon/Xoff*) used for communication with the Sokkia Total Station (Figure 2-2). Refer to the Sokkia Total Station's documentation for details.

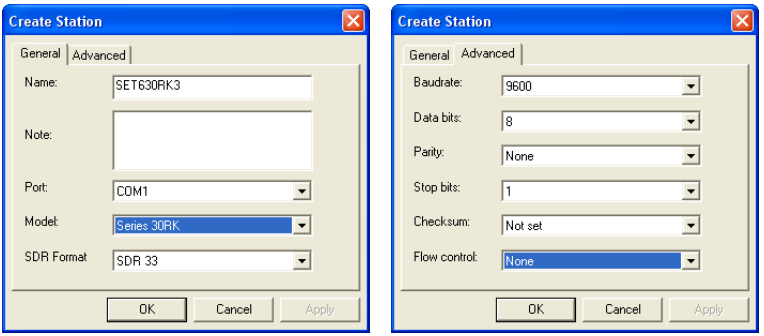


Figure 2-5. Enter Sokkia Total Station Device Information

5. Click **OK** to save device information to the computer.

   When connecting to this device, you will select the created device and then follow the instructions on the Sokkia Total Station.

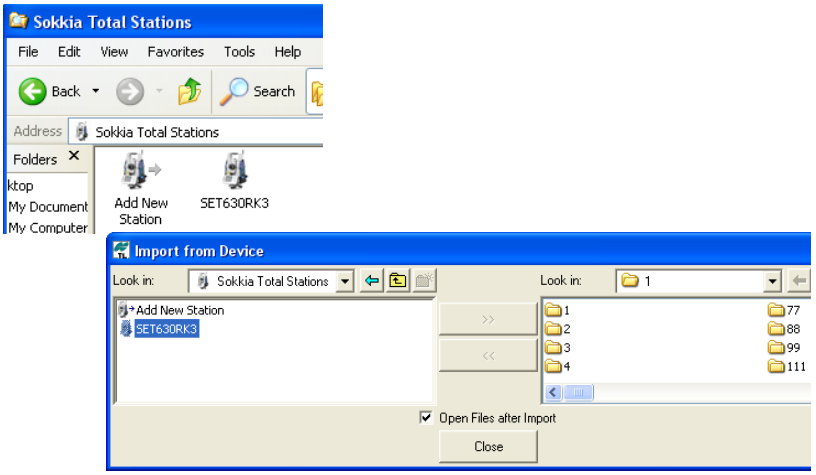


Figure 2-6. Created Sokkia Total Station

Adding a Topcon Digital Level Device

Before Topcon Link or Windows Explorer can read data on a Digital Level, the device must be added to the directory. Topcon Link supports the following Topcon Digital Level types: DL-101C, DL-502, DL-503. Refer to the digital level operator's manual for connecting the computer and device.

1. Navigate to the ***Topcon Digital Level*** directory (Figure 2-7).
   - From Topcon Link – Click **File ▸ Import from Device**. In the left pane, double-click the ***Topcon Digital Level*** directory.
   - From Windows Explorer – Open the ***My Computer*** window. Double-click the ***Topcon Digital Level*** directory.

   The procedure will be the same whether using Topcon Link or Windows Explorer.
2. Double-click **Add New Digital Level** (Figure 2-7).

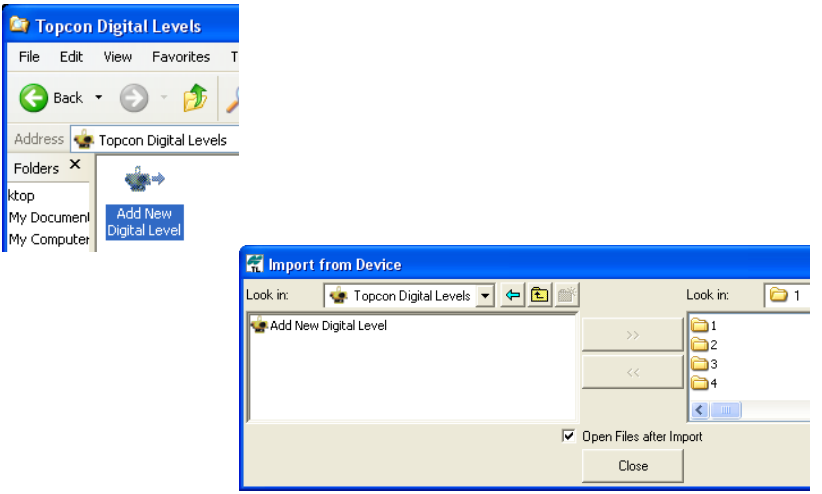


Figure 2-7. Add a New Topcon Digital Level

3. On the *General* tab, enter and select the following information (Figure 2-2 on page 2-5):
   - Name – enter a unique name for the device
   - Model - select the desired Digital Level model
   - Port – specify the COM Port the device typically connects to

- Baud rate and Parity – select the baud rate and parity used for communication with the Digital Level.

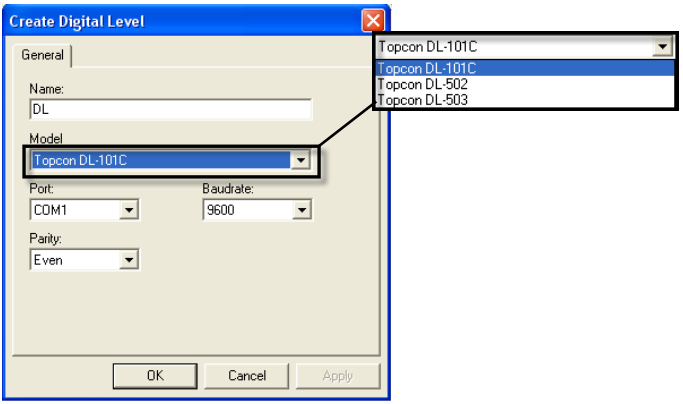


Figure 2-8. Enter Topcon Digital Level Device Information

4. Click **OK** to save the device information to the computer.

   When connecting to this device, you will select the created device and then follow the instructions on the Topcon Digital Level.

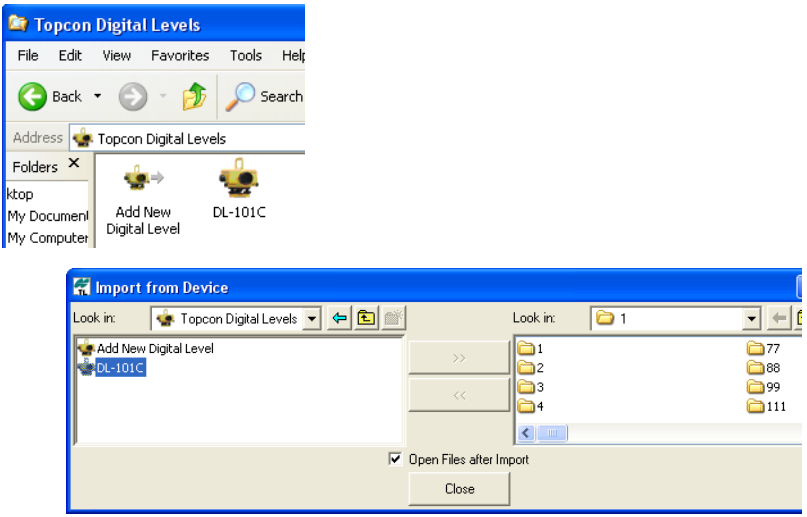


Figure 2-9. Created Topcon Digital Level

Adding a Sokkia Digital Level Device

Before Topcon Link or Windows Explorer can read data on a Digital Level, the device must be added to the directory.

1. Navigate to the ***Sokkia Digital Level*** directory (Figure 2-7).
   - From Topcon Link – Click **File ▸ Import from Device**. In the left pane, double-click the ***Sokkia Digital Level*** directory.
   - From Windows Explorer – Open the ***My Computer*** window. Double-click the ***Sokkia Digital Level*** directory.

   The procedure will be the same whether using Topcon Link or Windows Explorer.
2. Double-click **Add New Digital Level** (Figure 2-7).

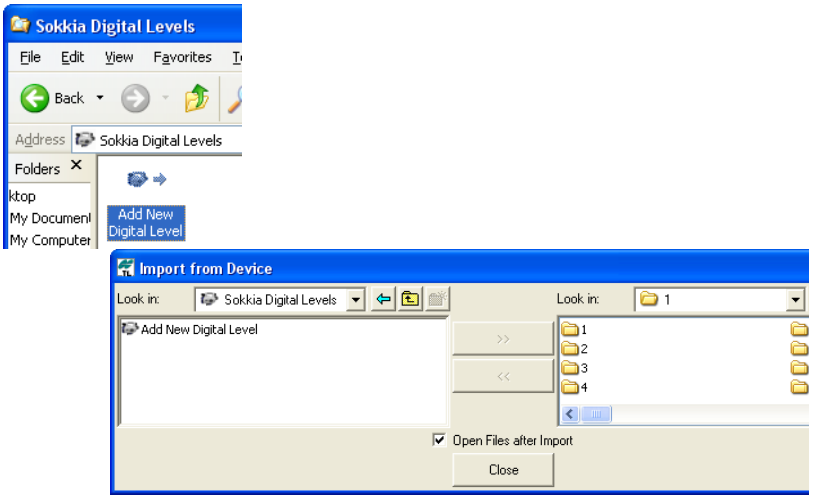


Figure 2-10. Add a New Sokkia Digital Level

3. On the *General* tab, enter and select the following information (Figure 2-2 on page 2-5):
   - Name – enter a unique name for the device
   - Note - enter any necessary notes
   - Port – select the COM Port the device typically connects to
   - Model - enter the model number
   - SDR Format - select the corresponding data format for your device from the SDR20 and SDR 33 formats

4. On the *Advanced* tab, select the baud rate, parity, data bits, stop bits, and set checksum (*Set* or *Not Set*) and flow control (*None* or *Xon/Xoff*) used for communication with the Sokkia Total Station (Figure 2-2). Refer to the Sokkia Digital Level's documentation for details.

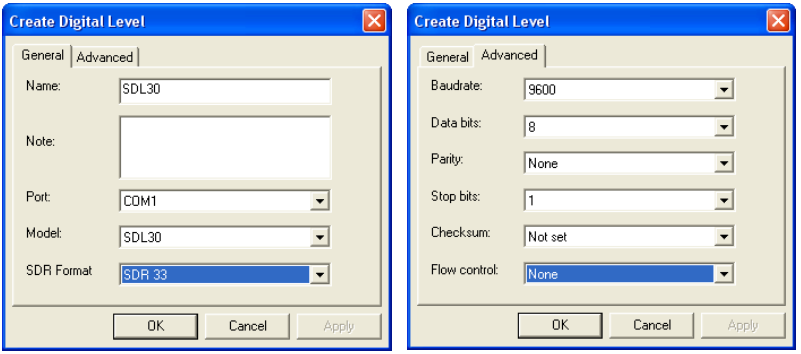


Figure 2-11. Enter Sokkia Digital Level Device Information

5. Click **OK** to save the device information to the computer.

   When connecting to this device, you will select the created device and then follow the instructions on the Sokkia Digital Level.

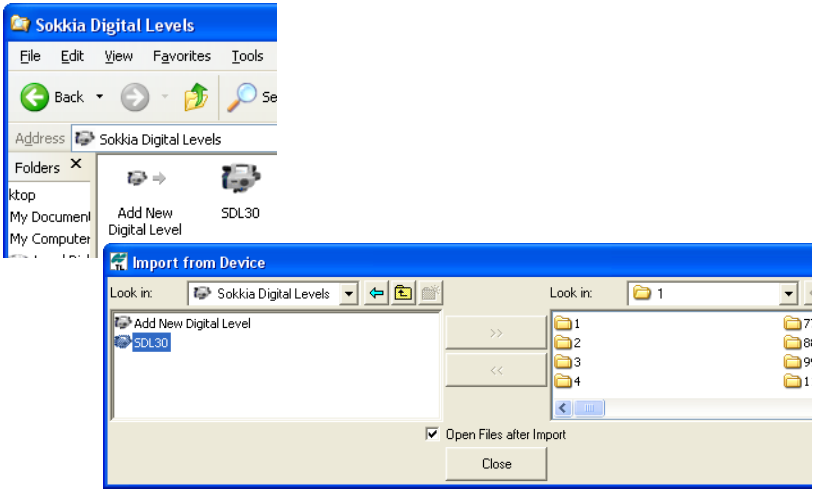


Figure 2-12. Created Sokkia Digital Level

Formatting a Topcon Memory Card

Before Topcon receiver can record data to a Topcon Memory Card the card must be formatted. Formatting a Topcon Memory Card prepares it for data recording.

- A card removed from a Topcon receiver has already been formatted. The device icon is red.
- A card from another device will need to be formatted before being used with a Topcon receiver. The device icon is gray

Formatting an SD card will erase all data.

.If a Topcon Memory Card is already installed in a Topcon receiver, the device will have formatted the card. For some devices—such as the GR-3 and NET-G3—the card can be manually inserted and removed. While cards typically remain in the receiver once inserted, it can be removed for accessing via a card reader connected to the computer. The length of time required to format a card depends on the size of the card and the device formatting the card. For example, Topcon Link formats a card in a couple of minutes while the GR-3 can take around half an hour.

1. Navigate to the Memory Card device directory (Figure 2-13 on page 2-13).
   - From Topcon Link – Click **File ▸ Import from Device**. In the left pane, double-click the *Topcon Memory Card* directory.
   - From Windows Explorer – Open the ***My Computer*** window. Double-click the *Topcon Memory Card* directory.

   The procedure is the same whether using Topcon Link or Windows Explorer.
2. Right-click the gray card icon and click **Format** to format the flash card for access by Topcon programs (Figure 2-13 on page 2-13).

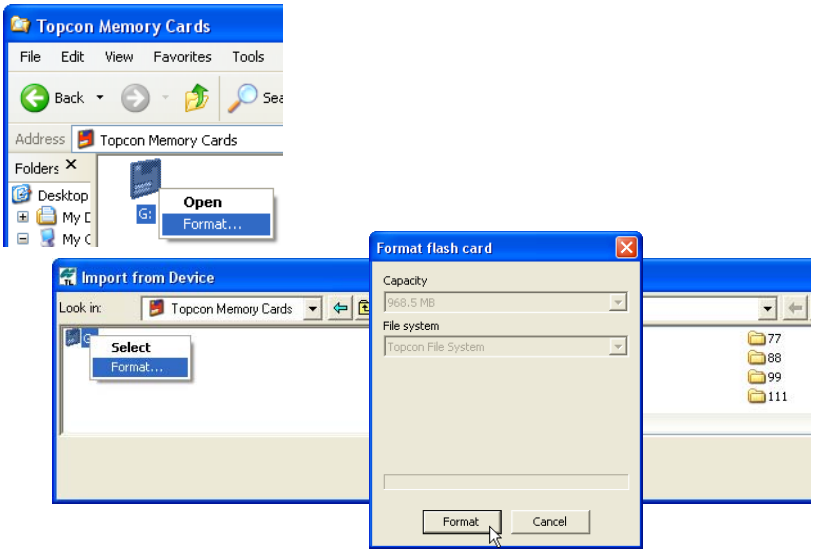


Figure 2-13. Format Memory Card

When selecting a formatted memory card device, you will view its data in the corresponding screen/pane.

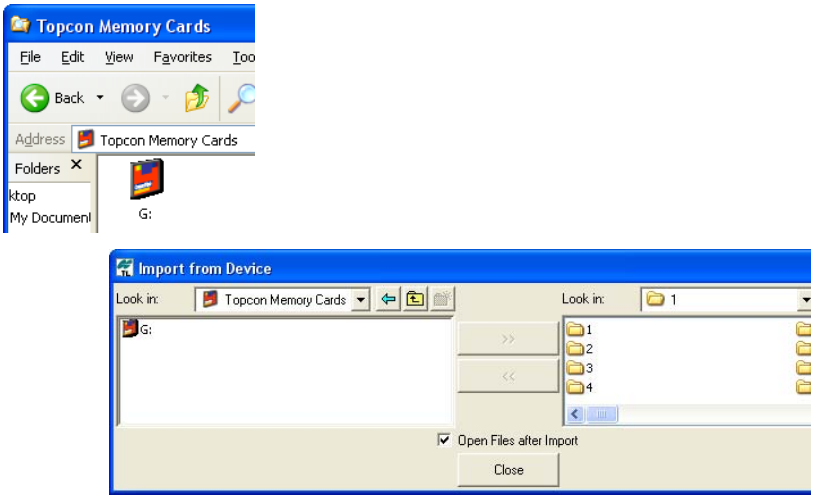


Figure 2-14. Formatted Memory Card Device

Adding a Geoid

When working with data in Topcon Link, a geoid may be required to ensure correct elevation of the GPS network points. A geoid transforms the ellipsoidal heights measured by GPS to heights based on a physical reference surface. When working with coordinate data, you may want add a geoid, or you can create a regional geoid

NOTICE

Make sure:
- The geoid used to take point measurements is loaded into Topcon Link before opening a file
- The geoid covers the area where file's points are located
- The geoid used to take point measurements is loaded into Topcon Link before opening a file.
The orthometric heights will be equal to ellipsoidal heights if a geoid file is not downloaded to Topcon Link and/or the geoid does not cover the area where file's points are located and/or if the geoid used to take point measurements is missing.

1. Click **File** ▸ **Configuration** and click **Coordinate Systems** in the menu tree.
2. Click **Add**.

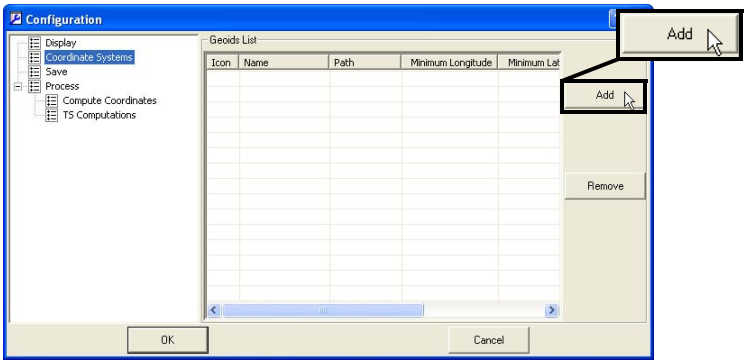


Figure 2-15. Add Geoid

3. Navigate to the location of the geoid and select the format of the geoid.
4. Select the desired geoid and click **Open**.

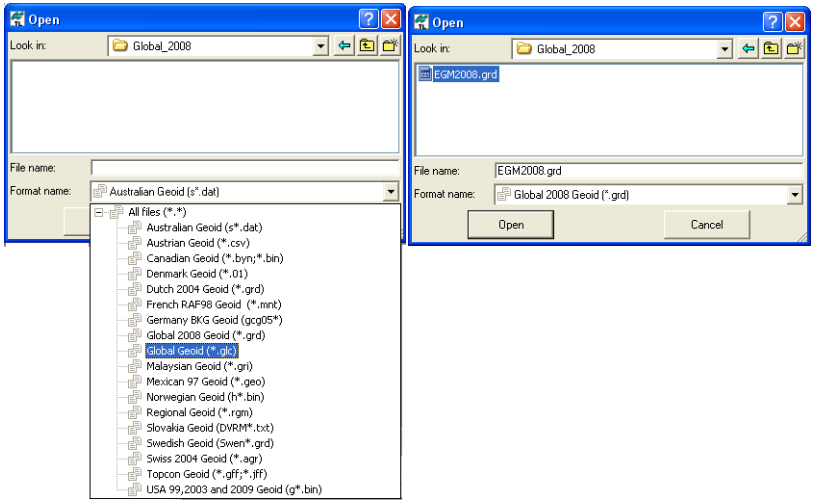


Figure 2-16. Select Geoid Format and Geoid

NOTICE

To add a geoid to Topcon Link, select ONLY corresponding formats in the Format name field

5. Repeat these steps for any other geoids. The geoids will be listed in the right pane (Figure 2-17).

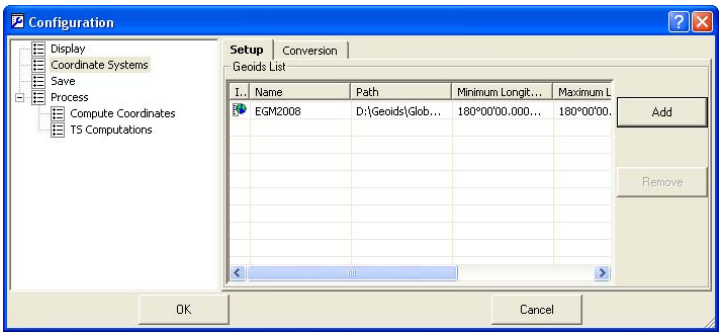


Figure 2-17. Added Geoids

6. Any Geoid from the list will be automatically used when Topcon Link opens files.
7. Click **OK** to save the configuration and exit.

About Geoids

A geoid model is used to transform the ellipsoidal heights measured by GPS (purely geometrical) to heights that are based on a physical reference surface, such as mean sea level. Over small regions there is little difference between the two reference surfaces, but for large projects the differences may be unacceptable. Working with a geoid model when surveying with GPS will ensure proper point measurements.

Geoid models for the United States have been developed by the National Geodetic Survey (NGS). The most recent model is called Geoid 2003. To keep the file size smaller, the continental United States is divided into a grid with eight zones; each zone has a geoid. Use Figure 2-18 to help you determine the geoid file to use for your project. For Geoid 2003, the files are numbered “g2003u01” to “g2003u08” to correspond to grids 1 to 8. For other regions, or if you have questions, contact your local representative or Topcon Support.

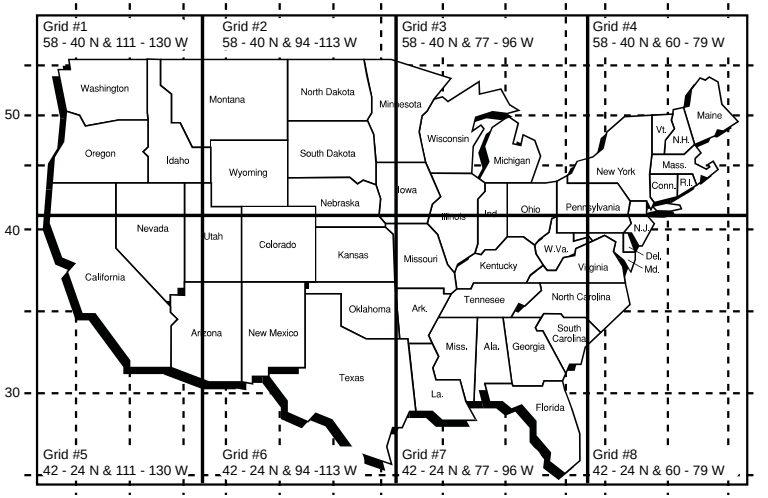


Figure 2-18. Geoid Grid Example – Approximate Grid for US

Using Topcon Link, you can create a Topcon geoid file for a specific area from a supported geoid model, and then export the file into Field Software Jobs. See “Geoid File Conversion Parameters” on page 5-20 for file conversion details.

Creating a Regional Geoid Model

If geoid heights (the differences between ellipsoidal and orthometric heights) for the nodes of a regular grid are known, you can create a Regional Geoid Model File (*.rgm). After creating the file, use Topcon Link to convert the regional geoid model file to a Topcon geoid file (*.gff).

To create a regional geoid model file, do the following steps:

1. Open an ASCII text editor (such as Notepad).
2. Enter geoid heights in the format shown in Table 2-2, where each row in the table corresponds to a line in the file. See below for a description of the fields in this format.

Table 2-2. Regional Geoid Model Format

Format Fields	Example
LAT, LON, n_row, n_column, step_lat, step_lon, geoid_direction, ellipsoid;	40 30 10, -4 30 00, 3, 5, 2 00, 2 00, NE, WGS84;
H1 H2 H3 H4 H5	1.1 6.6 11.11 16.16 2.2
H6 H7 H8 H9 H10	7.7 12.12 17.17 3.3 8.8
H11 H12 H13 H14 H15	13.13 18.18 4.4 9.9 14.14

3. Save the file with an “.rgm” extension.
4. Open Topcon Link and convert the regional geoid model file to a Topcon geoid file. See “Converting A File” on page 5-2 and “Geoid File Conversion Parameters” on page 5-20 for details.

The fields in the regional geoid model format

correspond to the following information:

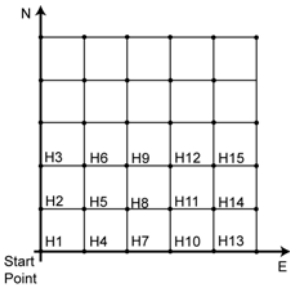
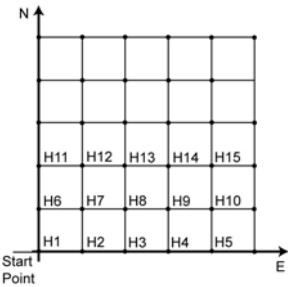
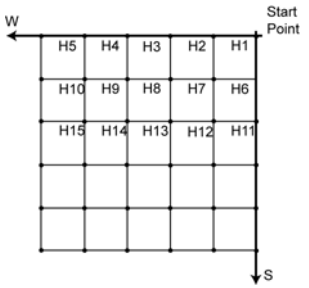
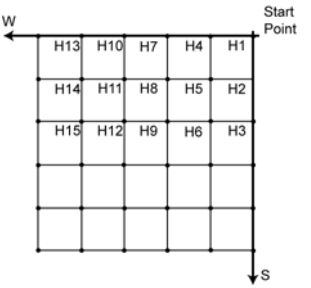
- LAT, LON – latitude (GG MM SS) and longitude (GG MM SS) of the start point for the Regional Geoid Model
  - Latitudes are positive for the Northern Hemisphere.

– Longitudes are positive for the Eastern Hemisphere.

Enter latitudes and longitudes in this format: dd° mm' ss"

- n_row – the number of rows in the file
- n_column – the number of columns in the file
- step_lat – grid step along parallels (MM SS)
- step_lon – grid step along meridians (MM SS)
- geoid_direction – direction for entering geoid heights along the grid (Table 2-3)

Table 2-3. Direction For Entering Geoid Heights

NE from north to east	EN from east to north
	
WS **from west to south**	**SW** **from south to west**
	

- ellipsoid – the ellipsoid type that the given regional geoid is based on
- H1,H2... – geoid height in the node (meter)

Notes:

File Operations and Data Views

Topcon Link works with individual data formats rather than importing data into an application-based, project-style file. This feature allows Topcon Link to provide robust import/export and conversion utilities for multiple data types, as well as the ability to work with a data type in its native format. To this end, Topcon Link uses standard file opening/closing and saving operations. Most files can be opened, saved, and closed. However, a few formats may need to be converted before opening and working with the data, or converted to another format before saving changes.

- See "File Operations" on page 3-2 for details on opening/closing files, and for details on setting file properties and printing.
- See "Saving the File as Another Format" on page 3-12 for details on saving proprietary or device-specific formats.

Topcon Link includes a standard configuration for viewing data, such as distance precisions, applicable coordinate systems, and computation parameters. To change any of these settings, see "Applying Configuration Parameters" on page 3-15.

The Tabular view initially contains default data columns and settings for viewing and working with data. The CAD view can display information for data points. These columns and settings can be shown/hidden or re-arranged.

- See "Setting Tabular View Options" on page 3-19 for details on setting up data columns for the different tabs.
- See "Setting CAD View Options" on page 3-26 for details on viewing data information in the CAD view.

File Operations

Topcon Link uses standard file opening/closing and saving operations for all file types. A properties feature allows job and company specific information to be saved with the file. The selected view can be printed for further study.

Opening a File

Because Topcon Link is a utility program that works with various file types, it does not have a type of file specifically associated with this software. Some types of files can be directly opened in Topcon Link. Table 3-1 lists the file types that Topcon Link can open.

Table 3-1. File Types that can be Opened

File Type	Format Extensions
Code Library	*.las; *.dbf; *.tdd; *.xml
Coordinates	*.sdr; *.pt3; *.mgn; *.txt; *.xml; *.cr5; *.csv; *.xyz; *.fc4; *.pnt; *.fc5; *.rw5; *.*
Digital Level Observations	*.sdr;*.dl;*.lev;*.txt
GPS+ Raw Data	*.sdr; *.pdc; *.tps; *.jps; *.tpd; *.??O; *.??D; *.??G; *.??N; B*.*; *.lb2; *.mdb; *.m00; *.sbf; *dat
Field Software Jobs	*.tsj; *.tlsv
Total Station Observations	*.sdr;*.dat; *.raw; *.fc5; *.gts; *.gt6*, gts6; *.gts7; *.gt7; *.*; *.xml

Other file types must be converted first before Topcon Link can read the data. See Chapter 5 for details.

1. Open Topcon Link and click **File ▸ Open File**.
2. Select the file format.
3. Navigate to and select the file to open.
4. If needed, select desired *Advanced Options*
5. Click **Open**.

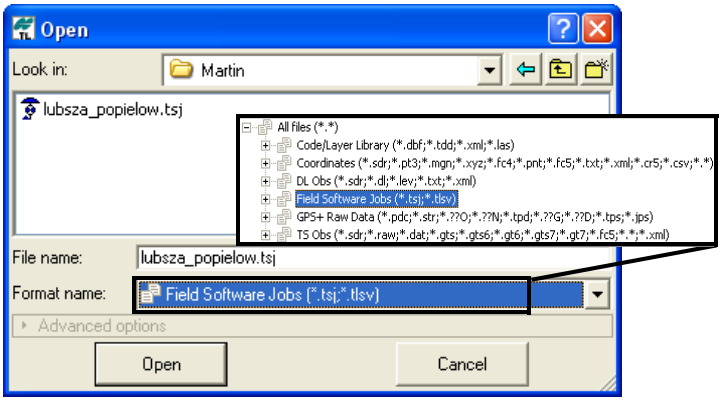


Figure 3-1. Select Format and File to Open

Creating a Custom Text File Format for a Coordinate File

To open or save a file of arbitrary coordinate format, you can create and save a custom format. A custom text format allows you to customize the data included in the coordinate file. Text formats are saved as an ASCII format (*.txt, *.csv, etc.).

To create an arbitrary text coordinate file, take the following steps:

1. Click **File ▸ Open File**.
2. On the ***Open*** dialog box, navigate to and select a desired coordinate file in the File name field.
3. On the ***Open*** dialog box, select the Custom text format from the list of coordinate formats in the *Format name* field. Click **Open**.
4. On the Custom format properties dialog window select the delimiter that separates data in a line and the coordinate system used to create the data.

NOTICE

Do not use the "Space" delimiter if the file contains codes with attributes.

5. Select data types for the custom format:
   - In the left column, select the data type(s) to include and click the **Move Right** button.
   - In the right column, use the **Move Up/Move Down** button to arrange the data types into the same order used in the opened file.

NOTICE

Always include "PointNum" in the right column and always have it as the first data type.If including "FullCodes" in the right column, always have it as the last data type.

6. Select the rule(s) to use for displaying data:
   - Ignore first line – if the first line if informational only.
   - FullCodes include Code, String and ControlCode – if these codes are included as shown in Figure 3-2 on page 3-4.
   - FullCodes include Code and Attribute – if these codes are included as shown in Figure 3-2.

   If the custom format has mixed FullCodes, select both options.

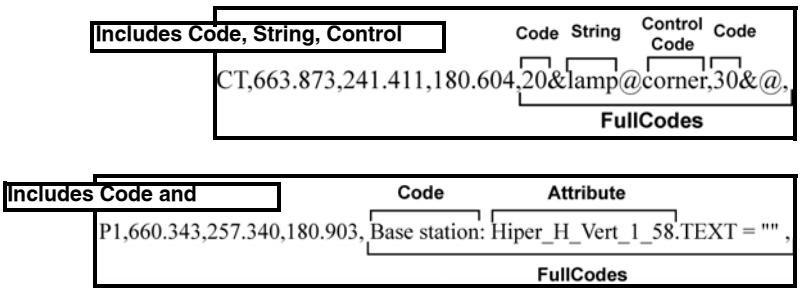


Figure 3-2. Examples of File Formats with FullCodes

7. Enter a name for the format and an extension type.
8. Click **Ok** to store the format in the Formats folder (installed with Topcon Link) and include it in the format name list. This format is added to the list of coordinate formats for ***Open***, ***Save As*** and ***Convert File*** dialog boxes.

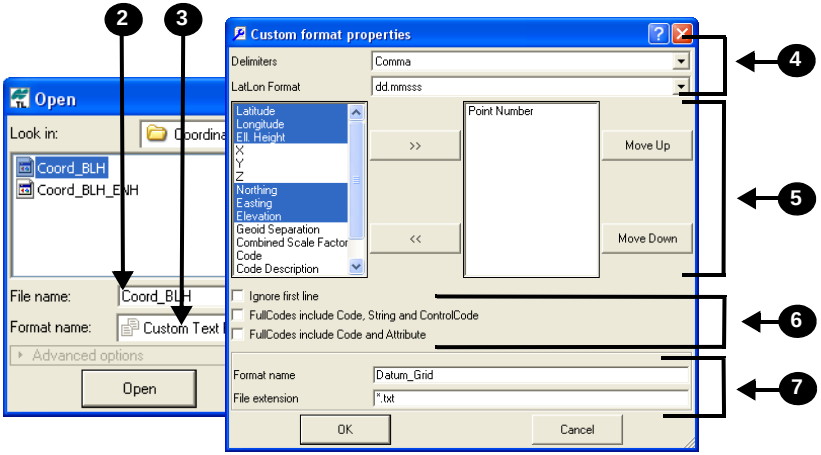


Figure 3-3. Create Custom Text Coordinate Format (new picture with Code Description)

NOTICE

Topcon Link applies the default file name, UnName.*, if no file name accompanies the new coordinate file format. In this case, Topcon Link deletes the created file format when closed.*

As a rule any coordinate file format (and Custom file format too) does not contain information about the coordinate system and linear units. These files contain ONLY the values of coordinates. To open the point coordinates in the corresponding coordinate system, the user has to:

- know the coordinate system / projection, and linear unit,
- select this coordinate system / projection and corresponding linear unit as current before importing using *Advanced Option* in the ***Open*** dialog window:

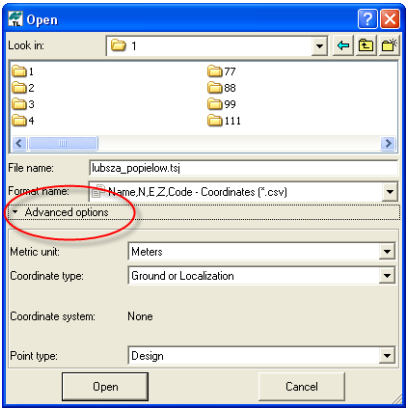


Figure 3-4. Using Advanced Option for Coordinates File

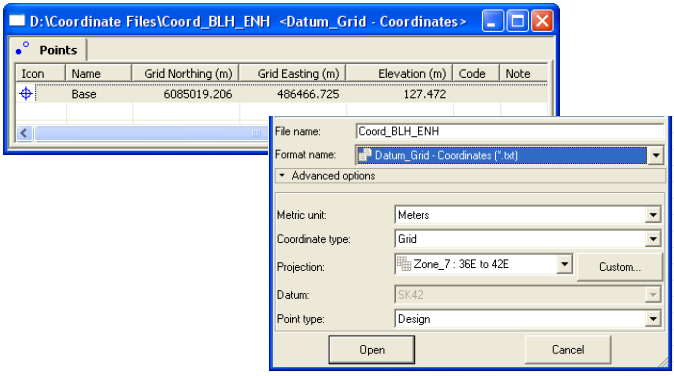
The coordinate custom text format allows one to insert different types of coordinates (Latitude/Longitude/Height or/and Norhing/Easting/ Ortho Height or/and XYZ) into this format (see Figure 3-3 on page 3-5). If the user selects several coordinate types for the created format, the coordinate file will have the following form:

```
Base,54.532100302,38.472078683,127.472,6085019.206,486466.725,127.472,137.286
Name    Latutude    Longitude    Height    Northing    Easting    Ortho Height    Ell Height
```

To correctly open this file in Topcon Link, the user has to select the desired coordinate type and corresponding projection/datum.

If the user (before importing) selects the given Grid coordinate system, the *Points* tab will display the Grid coordinates. But if the user selects the given datum, the *Points* tab will display the Latitude/ Longitude/Height coordinates (Figure 3-5 on page 3-7).

For Grid Coordinate System



For Datum Coordinate System

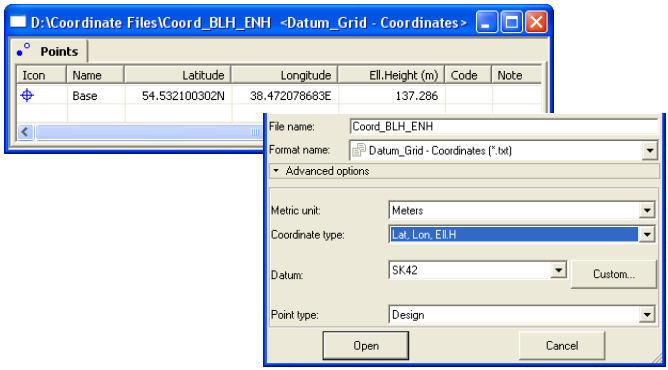
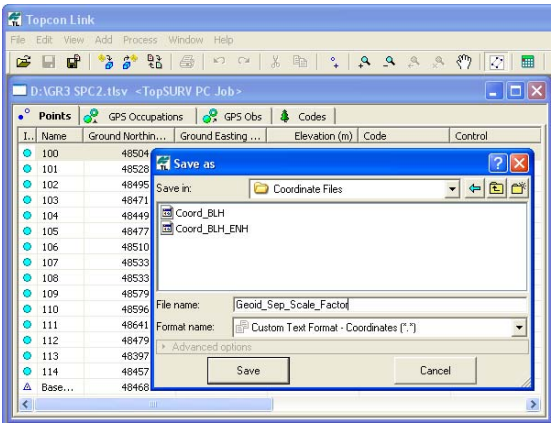


Figure 3-5. Examples of Opening Custom Text file with sets of coordinate system

Using the coordinate custom text format the customer can save the Geoid Separation and Combined Scale Factor for the opened Field Software Job. To do this, take the following steps:

1. Add the Geoid used in the Field Software Job to Topcon Link
2. Open the corresponding Field Software Job

3. Click **File ▸ Save As**, select *Custom Text Format* and click **Save**



4. Select the *Geoid Separation* and *Combined Scale Factor* in the ***Custom Format Properties*** window. After clicking **OK** Topcon Link creates a text file that contains the corresponding values of these parameters (Figure 3-6).

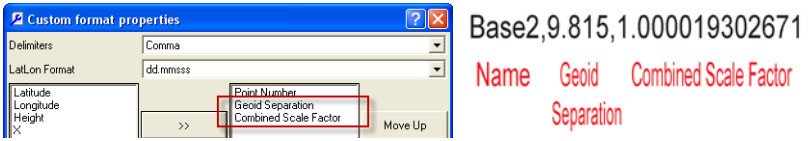


Figure 3-6. Examples of creating a text file with Geoid Separation and Combined Scale Factor

NOTICE

Topcon Link creates a file with Geoid Separation and Combined Scale Factor, but does not display them in the opened file. To view and edit these parameters use any text editor.

About Opening TS Raw Data Files

While a TS raw data file does not record information about the vertical angle mode (Figure 3-7 on page 3-9), you can select the mode under Advanced options when opening the file in Topcon Link.

- Zenith – vertical angles are from zenith
- Horizontal Level – vertical angles are from horizontal level
- Auto – no information available on the vertical angle mode. In this case, angles from 0 to 45° are considered "horizontal" and angles more than 45° are considered "zenith."

CAUTION

If vertical angles measured in a TS raw data file exceed 45°, select the same mode used for these measurements when opening the file. If a different mode or "Auto" is selected, the TS Obs tab will display measurements in the wrong column:
- the Vertical Angle column will display values read from zenith
- the Zenith Angle column will display values read from horizontal level

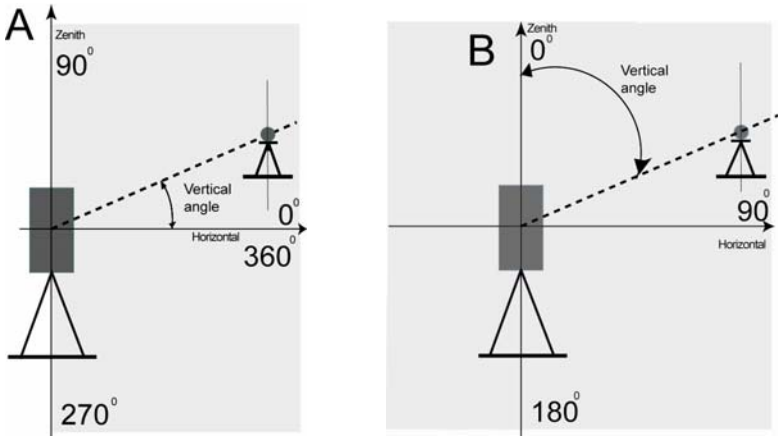


Figure 3-7. Vertical Angle from Horizontal Level (A) and Zenith (B)

Creating a Custom Text File Format for TS Observation file

To open or save a file of arbitrary TS observation format, you can create and save a custom format. A custom text format allows you to customize the data included in the TS observation file. Text formats are saved as an ASCII format (*.txt, *.csv, etc.).

To create an arbitrary text TS observation file, take the following steps:

1. Click **File ▸ Open File**.
2. On the ***Open*** dialog box, navigate to and select a desired TS observation file in the *File name* field.
3. On the ***Open*** dialog box, select the Custom text format from the list of TS observation formats in the Format name field. Click **Open**.
4. On the Custom format properties dialog window select the delimiter that separates data in a line
5. On the Custom format properties dialog window select data types for the custom format:
6. In the left column, select the data type(s) to include and click the **Move Right** button.
7. In the right column, use the **Move Up/Move Down** button to arrange the data types into the same order used in the opened file.
8. Enter a name for the format and an extension type.
9. Click **Ok** to store the format in the Formats folder (installed with Topcon Link) and include it in the format name list. This format

are added (will be added) to the list of TS observation formats for ***Open***, ***Save As*** and ***Convert File*** dialog boxes.

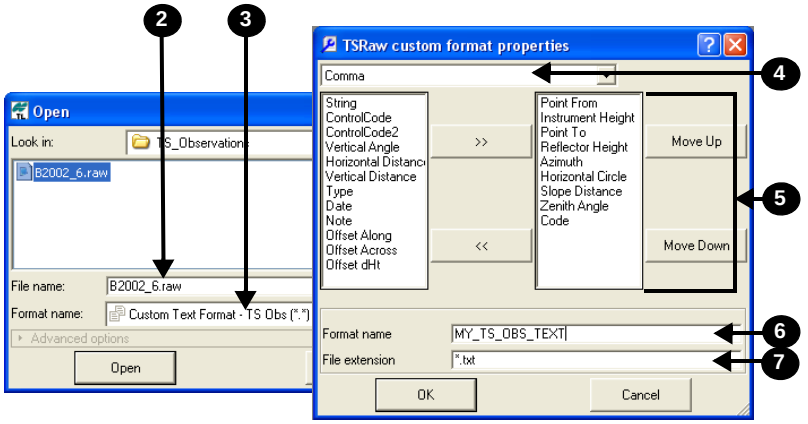


Figure 3-8. Create Custom Text TS Obs Format

Saving a File

Topcon Link opens and imports many files types, but only saves certain file types in a native Topcon format.

When saving a file that has been edited, Topcon Link automatically saves the original version of the file as "*.*.initial" in the current folder. Then the edited file is saved.

Use one of the following methods to save a file:

- Click the **Save** button on the Toolbar.
- Click **File ▸ Save File**.
- Press **Ctrl+S** on the keyboard.

An error message displays if the format is not supported for a save operation.

Saving the File as Another Format

Topcon Link allows one to save the current file with a new name and/or in a new directory and/or to save in other format. Saving a file in another format uses the same process as a file conversion. Topcon Link allows the user to save files only to compatible formats (the formats with the common data).

For details on converting files, see Chapter 5.

*Use the **Save As** function to keep versions of the same file to show progress. Simply add the date or other indicator to the file name.*

1. With the desired file open and active, click **File ▸ Save As**.
2. Navigate to the location in which to save the file.
3. Type in a name for the file.
4. Select the format to save to.

*Topcon Link will display only compatible formats in the File format field of the **Save As** dialog box.*

5. If selecting a different format from the current format, select applicable *Advanced Options*.

   For details on the advanced options, see the applicable section in “Converting A File” on page 5-2.

6. Click **Save**.

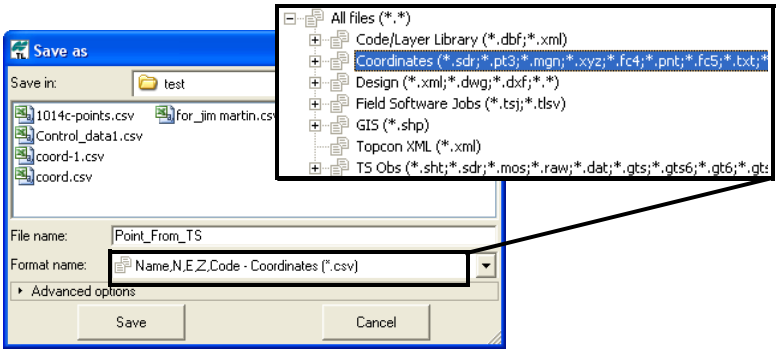


Figure 3-9. Save File As...

Closing a File

To close a file without closing Topcon Link, click the system close button on the Tabular View.

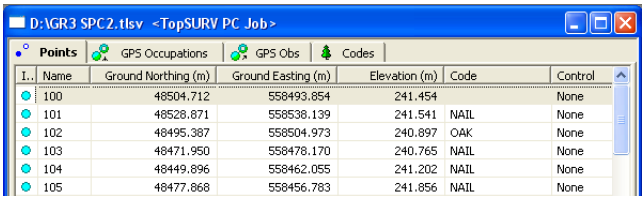


Figure 3-10. Close File

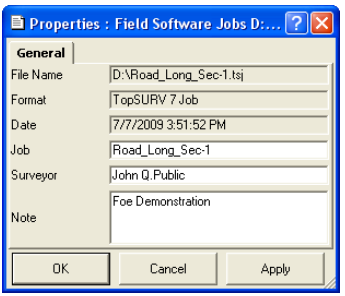
While several files can be open at the same time, it may take longer for Topcon Link to read or compute data if the files have a lot of data. Closing a file before opening another may speed up computations.

Viewing and Entering File Properties

The ***Properties*** dialog box is used for viewing and entering file-specific information. This dialog box also includes the location of the file, file type, and date the file was last saved.

1. Click **File ▸ File Properties**.
2. View the path and format of the file.
3. For some file types, you can type in a name for the job, the name of the surveyor or company, and any associated notes.
4. Click **OK** to save and exit.

Field Software Job File



Digital Level File

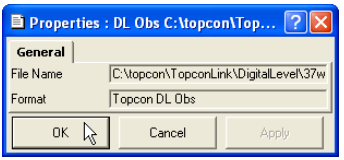


Figure 3-11. File Properties – Examples

Printing the Selected View

The Tabular and CAD views in Topcon Link can be printed for viewing offline.

Some views print best with a landscape orientation.
*Use the **File ▸ Page Setup** option to apply page and margin settings.*
*Use the **File ▸ Print Preview** option to view the potential result of the selected view.*

To print the Tabular view, select the tab and click **File ▸ Print**.

To print the CAD view, select the CAD view and click **File ▸ Print.**

Applying Configuration Parameters

Configuration parameters apply basic settings for such items as how to display angles and the decimal for digits, the coordinate systems available and adding a geoid, and the settings to use for adjustments. These parameters will be saved with Topcon Link and used when opening a file. The default configuration is usually appropriate for most operations.

1. Open Topcon Link and click **File ▸ Configuration**.
2. In the *Display* pane, select the following parameters for displaying information (Figure 3-12 on page 3-16). Click **Ok** to save and exit.
   - In the *Precisions* tab, select the number of digits to display after the decimal for measurements.
   - In the *Time* tab, select the GPS time zone offset and automatic fixing clock for daylight saving changes
   - In the *Roads* tab, select the term to use for displaying information on the centerline; either *Chainage* or *Station*.
   - In the *Angles* tab, select the form for displaying angles and latitudes/ longitudes.

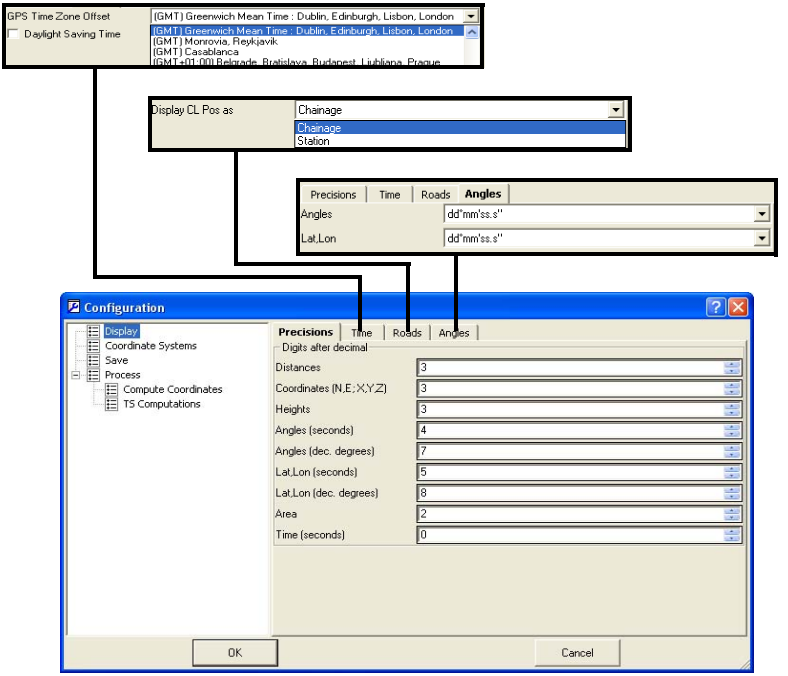


Figure 3-12. Select Display Parameters

3. The *Coordinate System* item displays the *Setup* and *Conversion* tabs in the right pane. In the *Setup* pane the user can view, add, or remove available geoid file (Figure 3-13). Click **Ok** to save and exit.

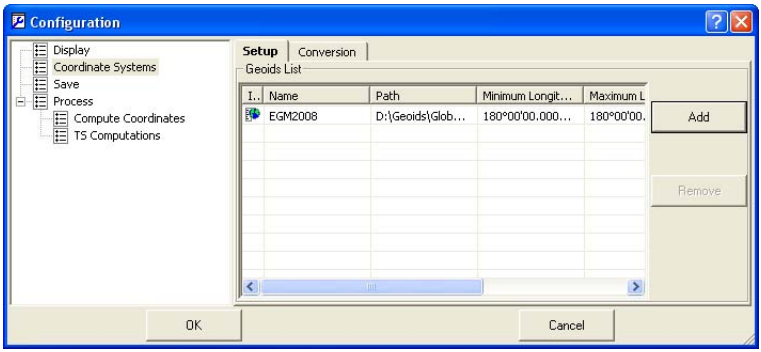


Figure 3-13. Select Geoid

To add a new Geoid to the list, see “Adding a Geoid” on page 2-14.

The *Conversion* tab allows one to select the way of transformation between NAD27 and NAD 83 datums. The user can apply:

parameters of the NAD27 from Topcon Link database

or

the Federal standard for NAD 27 to NAD 83 datum transformations – NADCON program

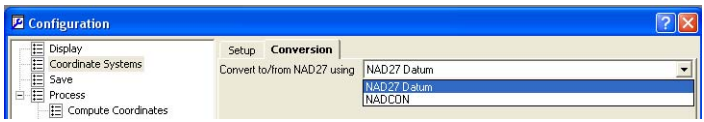


Figure 3-14. Job Configuration, Coordinate systems – Conversion Tab

4. In the *Save* pane, select the interval in minutes for saving a backup copy of the current file (Figure 3-15). Click **Ok** to save and exit. Topcon Link uses the following rules for saving/deleting backup copies:
   - The file will be saved at the selected interval.
   - If the file has been edited, a backup copy is automatically saved.

- After saving the file (either click **Ctrl+S**, click on the **Save** button, or click **File ▸ Save/Save As**), the backup copy is deleted. A new backup copy is saved when at the end of the next time interval.
- Type "0" into the field to turn off the backup save feature.
- If Topcon Link (or the system) shuts down unintentionally, the backup copy of the current files opens and is marked "reserved".

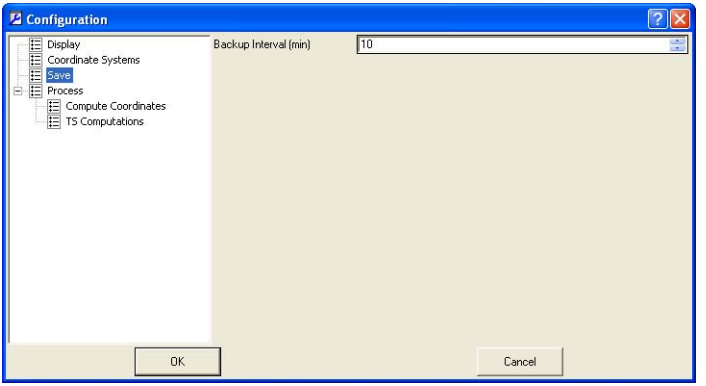


Figure 3-15. Select File Backup Properties

5. In the *Process Compute Coordinates* pane (Figure 3-16), type in distance and angle measurement errors to take them into account when computing the coordinates of station using directions observed from the station to points of known positions (resection method). Click **Ok** to save and exit.
6. In the *Process TS Computations* pane, select the refraction coefficient to be applied to total station observations during

calculation of the coordinate (Figure 3-16). Click **Ok** to save and exit.

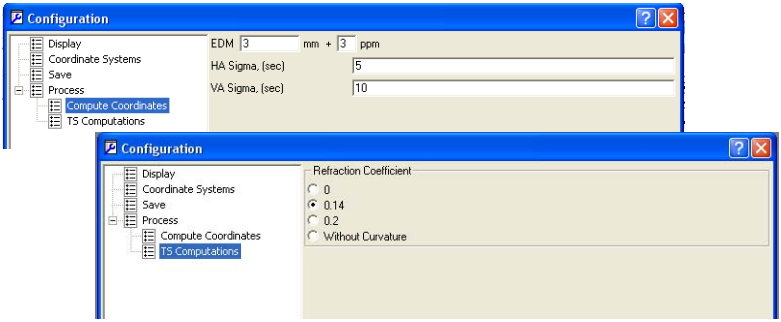
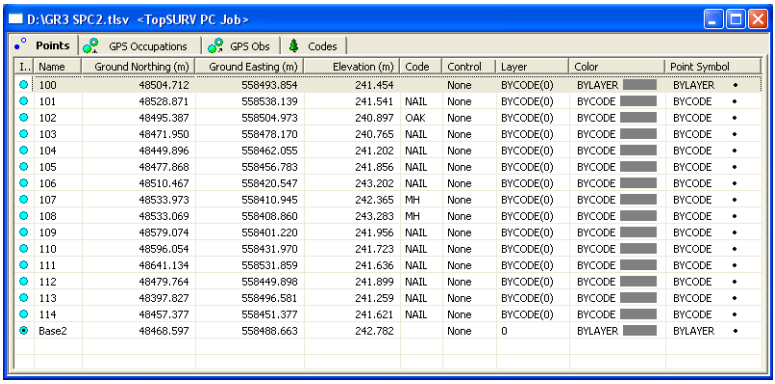


Figure 3-16. Set Processing Properties

Setting Tabular View Options

Topcon Link displays data in two views, a tab view and a CAD view. The Tabular view groups data based on type and displays the information in a series of tables on different tabs (Figure 3-17).



I..	Name	Ground Northing (m)	Ground Easting (m)	Elevation (m)	Code	Control	Layer	Color	Point Symbol
	100	48504.712	558493.854	241.454		None	BYCODE(0)	BYLAYER	BYLAYER
	101	48528.871	558538.139	241.541	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	102	48495.387	558504.973	240.897	OAK	None	BYCODE(0)	BYCODE	BYCODE
	103	48471.950	558478.170	240.765	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	104	48449.896	558462.055	241.202	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	105	48477.868	558456.783	241.856	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	106	48510.467	558420.547	243.202	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	107	48533.973	558410.945	242.365	MH	None	BYCODE(0)	BYCODE	BYCODE
	108	48533.069	558408.860	243.283	MH	None	BYCODE(0)	BYCODE	BYCODE
	109	48579.074	558401.220	241.956	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	110	48596.054	558431.970	241.723	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	111	48641.134	558531.859	241.636	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	112	48479.764	558449.898	241.899	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	113	48397.827	558496.581	241.259	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	114	48457.377	558451.377	241.621	NAIL	None	BYCODE(0)	BYCODE	BYCODE
	Base2	48468.597	558488.663	242.782		None	0	BYLAYER	BYLAYER

Figure 3-17. Tabular View

The tabs that display depend on the type of data in the current file. Data columns for each tab can be shown/hidden and re-arranged based on available data and the user's preference.

Displaying Table Columns

1. To edit the order and visibility of a tab's column, click **View ▸ Options ▸ Tabular View**.
2. For most of the tabs, select the desired field and use the following buttons to set up the data columns. Figure 3-18 on page 3-21 uses the Lines Tab options as an example.
   - Move right (››) to include the field in the table and move left (‹‹) remove the field from the table.
   - Move up (Move Up) and move down (Move Down) to arrange the order of the selected field.

   For the Road Graphic Views and Images tab options, select the desired fields to display on a graphic tab. See page 3-23 and page 3-24 for examples.
3. Click **Ok** to save and apply the settings.

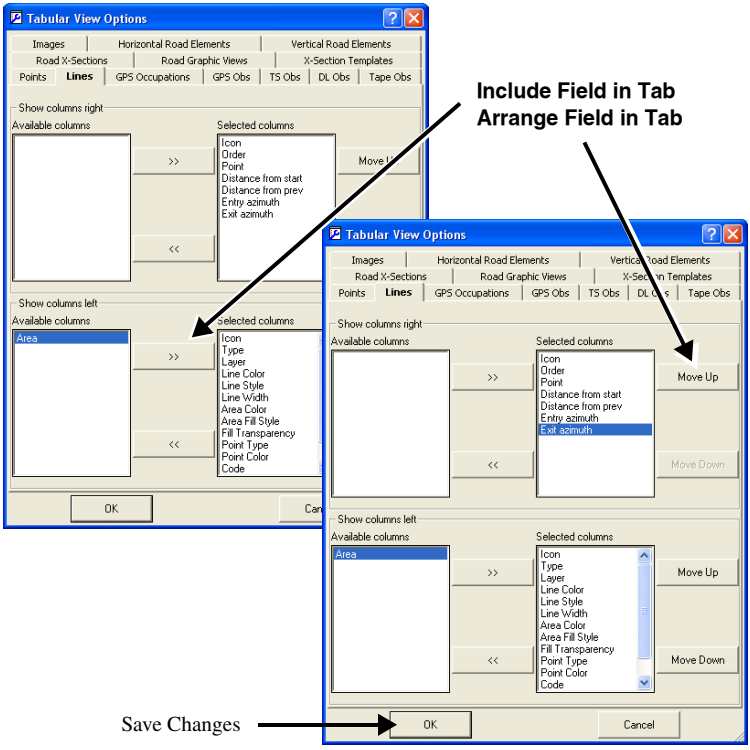
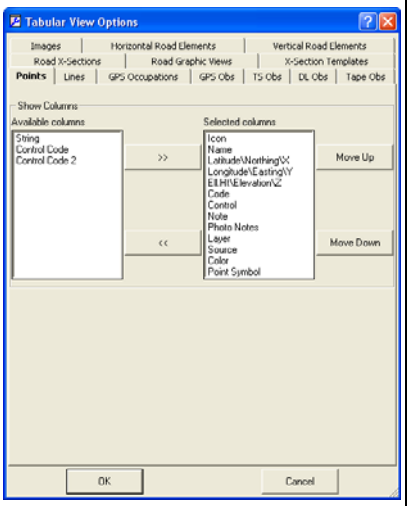


Figure 3-18. Lines Tab Options – Editing Data Columns

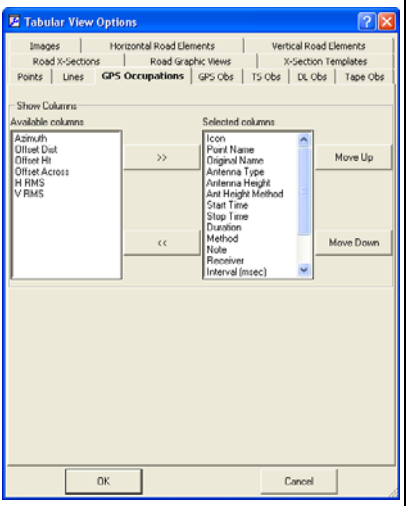
Table 3-2 shows an example of, and the default settings for, each of the Tabular View options tabs. See Figure 3-18 on page 3-21 for an example of the Lines options tab.

Table 3-2. Tabular View Options Tabs

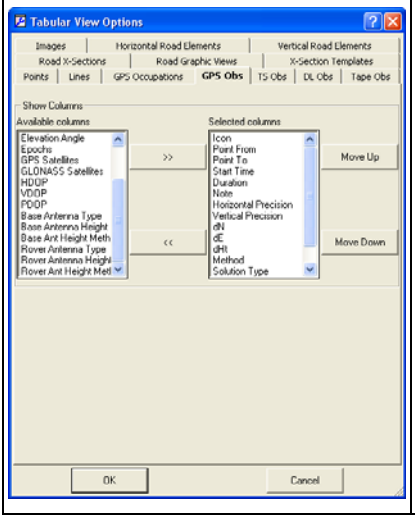
Points tab Options



GPS Occupations tab Options



GPS Observations tab Options



TS Observations tab Options

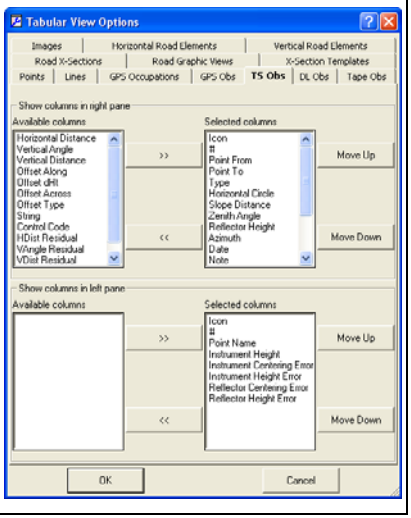


Table 3-2. Tabular View Options Tabs (Continued)

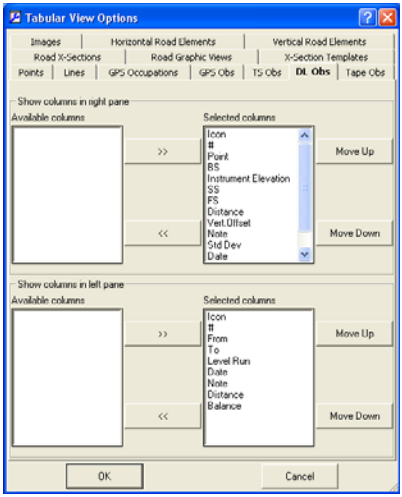
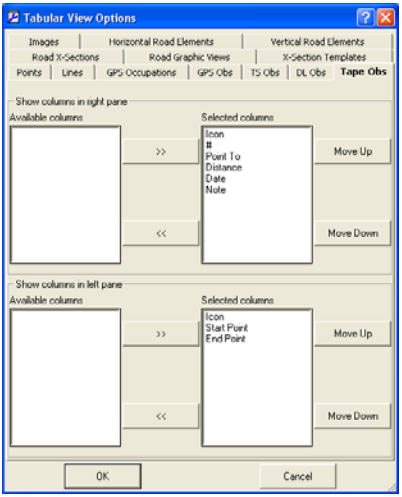
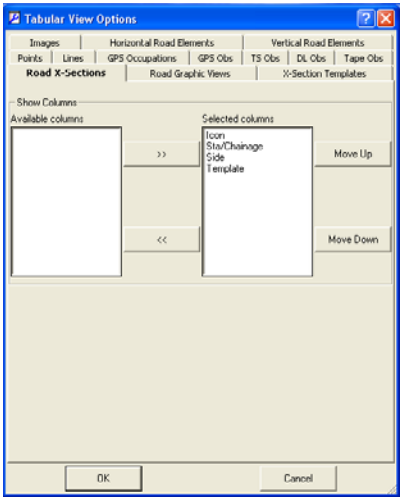
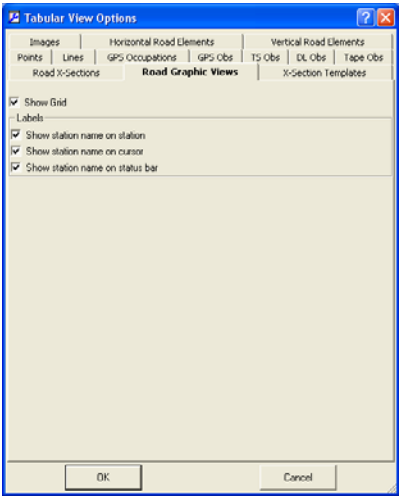
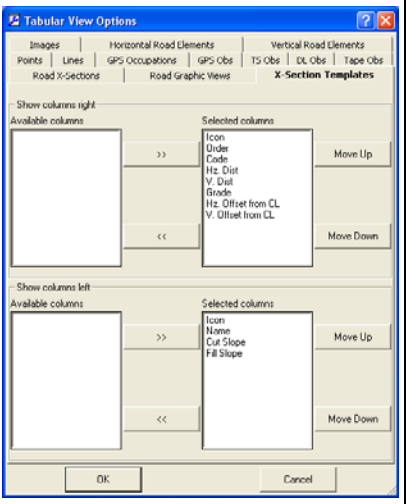
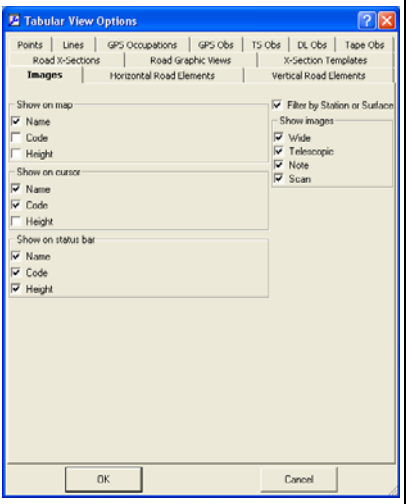
Digital Level Observations tab Options	Tape Observations tab Options
	
Road X-Sections tab Options	**Road Graphic Views tab Options**
	

Table 3-2. Tabular View Options Tabs (Continued)

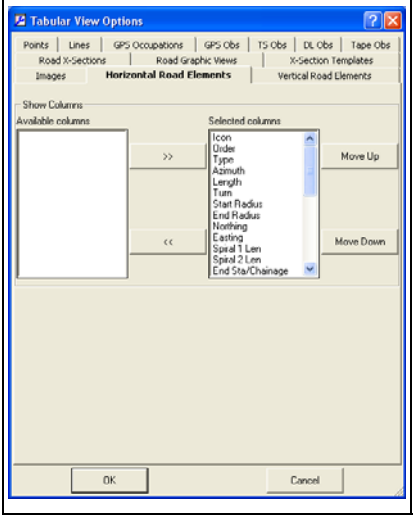
X-Section Templates tab Options



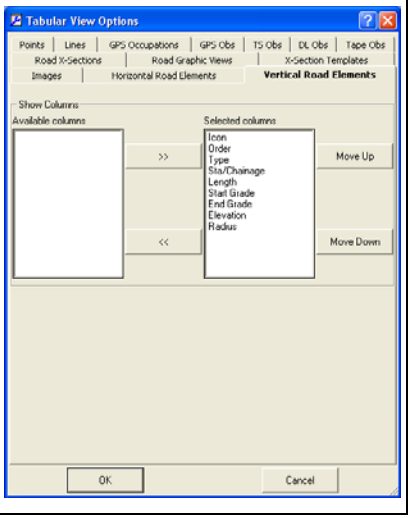
Images tab Options



Horizontal Road Elements tab Options

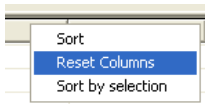


Vertical Road Elements tab Options



Arranging Table Columns

The columns in the Tabular views can be sorted and arranged (Table 3-3) to best display the file's data. The arrangement is used the next time you open a file.

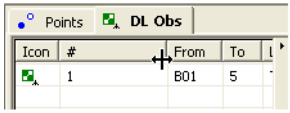
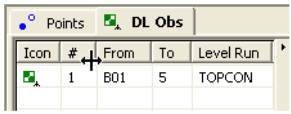
To reset the table's columns to default settings, right-click the column's header and click Reset Columns 

.

Table 3-3. Arranging Table Columns

Column Arranging Options	Examples
Sort columns Data in a column can be sorted in decreasing/increasing order. Click the column's header, or right-click and click Sort.	**Decreasing Order** Ground Northing (USft) 4835.759 4858.723 4858.723 4923.512 4999.986 5000.024 5000.024 **Increasing Order** Ground Easting (USft) 12654.110 10748.594 10694.174 10693.274 10685.742 10597.129 10594.929
Swap columns Columns can be moved from one location to another in the table. Click the column's header and drag it to the desired location.	**Before** Points | Lines | GPS Occupations | GPS Obs | TS Obs I.. Name Ground Northing (USft) Ground Easting (USft) 29412 5697.936 10259.732 29411A 5691.762 10282.462 29411 5691.763 10282.466 26942A 5111.627 10323.941 **During** Points | Lines | GPS Occupations | GPS Obs | TS Obs I.. Name Ground Northing (USft) Ground Easting (USft) 29412 5697.936 10259.732 29411A 5691.762 10282.462 29411 5691.763 10282.466 26942A 5111.627 10323.941 **After** Points | Lines | GPS Occupations | GPS Obs | TS Obs I.. Name Ground Easting (USft) Ground Northing (USft) 29412 10259.732 5697.936 29411A 10282.462 5691.762 29411 10282.466 5691.763 26942A 10323.941 5111.627

Table 3-3. Arranging Table Columns

Column Arranging Options	Examples
Size columns Columns can be sized to display/hide data. Click the column's right edge and drag left to decrease, right to increase the width of the column.	Before  After 

Setting CAD View Options

Topcon Link displays data in two views: a tab view and a computer aided drawing view. The CAD view is a two-dimensional, graphical representation of linework road and surface data, with associated points. To view the CAD graphic, click **View ▸ CAD View**. Depending on the file's data and the filters used, the following information displays:

- Points with associated symbols. If the point does not have a symbol, the dot symbol (•) is used.
- Lines using the associated code/layer color, style, and width.
- Control codes (/AS, /AE, /C) display as an arc or closed polyline, respectively.
- Codes with a polygon entity display as closed and filled (if a fill color has been set).

- Surfaces and road display in the color applied to the corresponding layer(s)

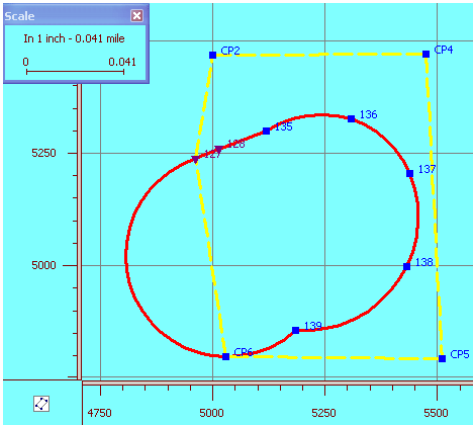


Figure 3-19. CAD View

View options for CAD View include displaying a coordinate grid, applying a background map, and selecting labels to display for points.

1. Right-click on an empty portion of the CAD View and click **Options** on the pop-up menu. The ***Options dialog*** box displays
2. On the *Windows* tab, check mark the desired settings (Figure 3-20 on page 3-28). Click **Apply** to apply the changes, then click **OK** to save the settings and make further changes.
   - Show grid – makes a coordinate grid visible on the CAD View
   - Background color - allows one to set the background color for the CAD View.
   - Show scale bar - displays the bar with the current scale value for the CAD View
3. On the *Labels* tab, enable the desired settings (Figure 3-20 on page 3-28). Click **Apply** to apply the changes, then click **OK** to save the settings and make further changes.
   - Name – enable to display the point's name on selected map, cursor, and status bar positions
   - Code – enable to display the point's code on selected map, cursor, and status bar positions

- Height – enable to display the point's height on selected map, cursor, and status bar positions.

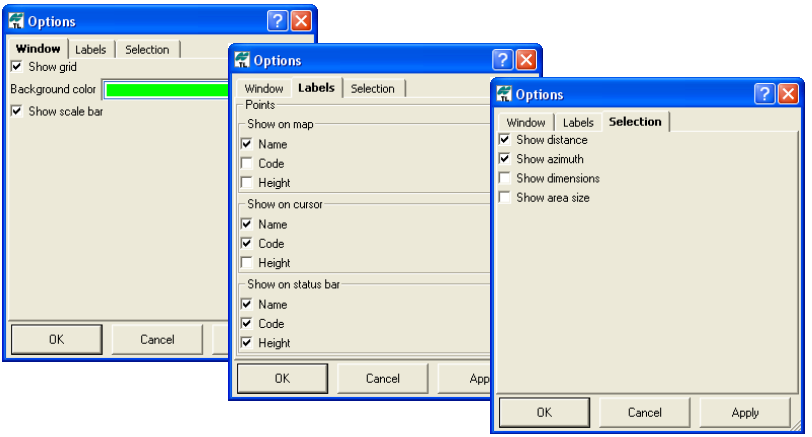


Figure 3-20. CAD View Options

4. On the *Selection* tab enable the desired settings (Figure 3-20). Click **Apply** to apply the changes, then click **OK** to save the settings and make further changes.
   - Show distance – enable to display a distance between corners of the rectangle in the Status Bar, when the user drags the rectangle on the CAD View:
   - Show azimuth – enable to display an azimuth (from the start point to the end point of the rectangle) in the Status Bar, when the user drags the rectangle on the CAD View (Figure 3-21).

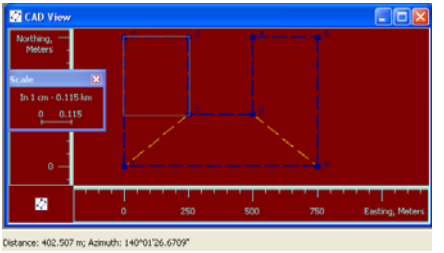


Figure 3-21. Show Distance and Azimuth

- Show dimension – enable to display a dimension (length and height) of the rectangle in the Status Bar, when the user drags the rectangle on the CAD View.

- Show area size – enable to display an area of the rectangle in the Status Bar, when the user drags the rectangle on the CAD View (Figure 3-22)

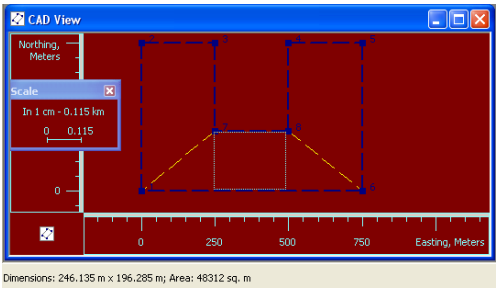


Figure 3-22. Show Area and Dimension

5. Click **OK** to save the settings and close the dialog box.

Notes:

Importing Data Files From a Topcon Device

Topcon Link provides a simple interface for importing data files directly from a Topcon device (instrument). The imported file is saved to the selected directory, and is immediately available for opening and viewing in Topcon Link.

A unique feature of the software includes the ability to import data from a connected device to the computer using Windows® Explorer, without having to open Topcon Link. Then use Topcon Link to open the files for viewing, editing, converting, or uploading.

Before importing data from some devices, the device must first be set up. See "Adding Devices" on page 2-1 for details

This chapter first discusses the steps to view device properties, or file properties on a device's memory card. The remaining sections in this chapter detail the steps required to import data files from a connected device or an inserted memory card.

- See “Importing Files from a Memory Card” on page 4-15.
- See “Using Windows Explorer to Import Files from a Device” on page 4-17.

Importing Files from a Topcon GNSS Receiver

GPS receivers of Topcon family have an internal data storage device to record data in *.tps format. This family of products includes the following receivers.

Odyssey-E, Odyssey-RS, NET-G3, NET-G3A,HiPer, HiPer GD, HiPer L1, HiPer GGD, HiPer XT, HiPer XR	HiPer+, HiPer Pro HiPer Lite, HiPer Lite+ GR-3 Map-HP, Map-RT

Refer to the receiver operator’s manual for details on setup, operation, and connection with other devices.

When importing files from a Topcon GPS receiver, Topcon Link automatically detects the receiver for importing data, and no further setups are required.

Before connecting the receiver’s USB port to the computer’s USB port, the Topcon USB driver must be installed on the computer. The driver is available on the Topcon website: (http://www.topconsupport.com/documents/view/1743)

This section describes data import using the Topcon Link interface. To import data using Windows® Explorer, see “Using Windows Explorer to Import Files from a Device” on page 4-17

1. Connect your receiver and computer according to the receiver operator’s manual.

Bluetooth® connection requires both devices to have Bluetooth wireless technology capabilities.

2. With Topcon Link open, click **File ▸ Import from Device**.
3. In the left panel, double-click *Topcon GNSS Receivers*. Topcon Link will search for connected devices.

   Click **Stop** to quit the search and to display detected devices.

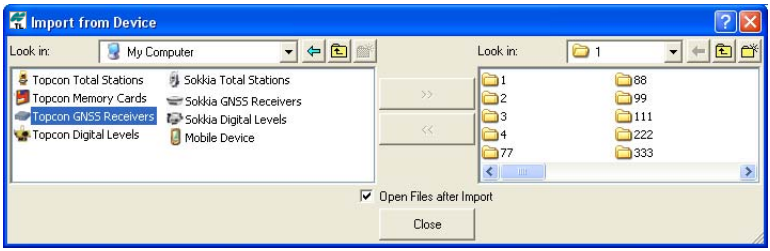


Figure 4-1. Selection Topcon GNSS Receiver

4. Double-click the desired receiver *Topcon Receivers* to access the receiver's data storage module and view the collected raw files.
5. In the right pane, navigate to the folder on the computer in which to save data files.

6. In the left pane, select the desired *.tps file(s) and click the **Move Right** button. The file import progress displays.

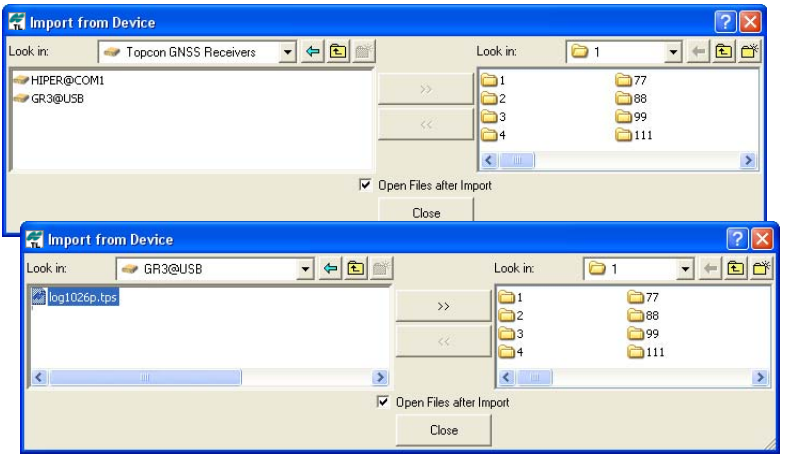
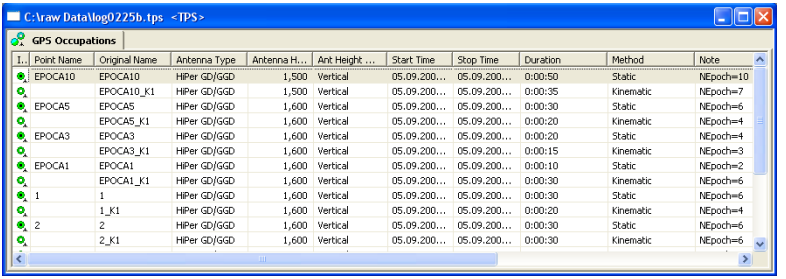


Figure 4-2. Import File from Topcon GNSS Receiver

7. If *Open File After Import* was selected, the import function closes and the *. tps file opens in Topcon Link:

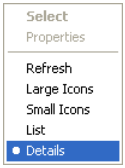


I..	Point Name	Original Name	Antenna Type	Antenna H...	Ant Height ...	Start Time	Stop Time	Duration	Method	Note
	EPOCA10	EPOCA10	HiPer GD/GGD	1,500	Vertical	05.09.200...	05.09.200...	0:00:50	Static	NEpoch=10
		EPOCA10_K1	HiPer GD/GGD	1,500	Vertical	05.09.200...	05.09.200...	0:00:35	Kinematic	NEpoch=7
	EPOCA5	EPOCA5	HiPer GD/GGD	1,600	Vertical	05.09.200...	05.09.200...	0:00:30	Static	NEpoch=6
		EPOCA5_K1	HiPer GD/GGD	1,600	Vertical	05.09.200...	05.09.200...	0:00:20	Kinematic	NEpoch=4
	EPOCA3	EPOCA3	HiPer GD/GGD	1,600	Vertical	05.09.200...	05.09.200...	0:00:20	Static	NEpoch=4
		EPOCA3_K1	HiPer GD/GGD	1,600	Vertical	05.09.200...	05.09.200...	0:00:15	Kinematic	NEpoch=3
	EPOCA1	EPOCA1	HiPer GD/GGD	1,600	Vertical	05.09.200...	05.09.200...	0:00:10	Static	NEpoch=2
		EPOCA1_K1	HiPer GD/GGD	1,600	Vertical	05.09.200...	05.09.200...	0:00:30	Kinematic	NEpoch=6
	1	1	HiPer GD/GGD	1,600	Vertical	05.09.200...	05.09.200...	0:00:30	Static	NEpoch=6
		1_K1	HiPer GD/GGD	1,600	Vertical	05.09.200...	05.09.200...	0:00:20	Kinematic	NEpoch=4
	2	2	HiPer GD/GGD	1,600	Vertical	05.09.200...	05.09.200...	0:00:30	Static	NEpoch=6
		2_K1	HiPer GD/GGD	1,600	Vertical	05.09.200...	05.09.200...	0:00:30	Kinematic	NEpoch=6

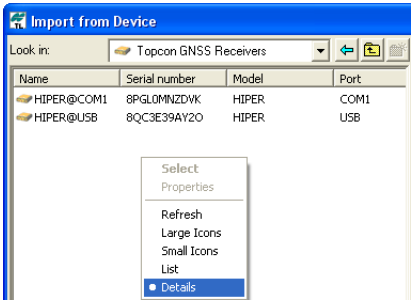
Figure 4-3. Display data of the *.tps file

How to see information about the receiver and files

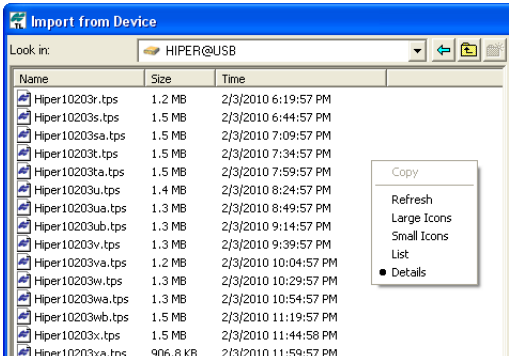
Topcon Link allows one to modify the left panel of the ***Import from Device*** window to obtain extended information about connected receiver(s) and collected raw data file(s). To get this information right-click on the empty place of the left panel and select Details from the pop up menu:



After setting this mode for the receiver page, the left panel will display the serial number, model and port of the computer, which is used for connection with the receiver:



After setting this mode for the file page, the left panel will display the size and the end time of file logging:



Importing Files from a Sokkia GNSS Receiver

GPS receivers of Sokkia family have an internal data storage device to record data in *.pdc and *.sdr format.

When importing files from a Sokkia GNSS receiver, Topcon Link automatically detects the receiver for importing data, and no further setups are required.

Before connecting the receiver's USB port to the computer's USB port, the Sokkia USB driver must be installed on the computer. The driver is available on the Sokkia website: (http://www.sokkiagps.com/support/s_gsr2700isx.php)

This section describes data import using the Topcon Link interface.To import data using Windows® Explorer, see "Using Windows Explorer to Import Files from a Device" on page 4-17.

1. Connect your receiver and computer according to the receiver's documentation.

Bluetooth® connection requires both devices to have Bluetooth wireless technology capabilities.

2. With Topcon Link open, click **File ▸ Import from Device**.
3. In the left panel, double-click *Sokkia GNSS Receivers*. Topcon Link searches for connected devices.

Click **Stop** to quit the search and display detected devices.

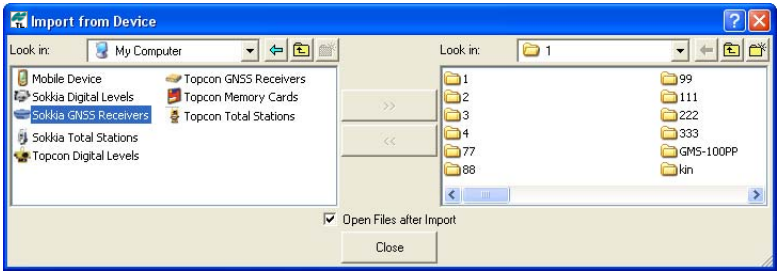


Figure 4-4. Selection Sokkia GNSS Receiver

4. In the right pane, navigate to the folder on the computer in which to save data files.
5. In the left pane, double-click the desired Sokkia GSNSS receiver to access the device's data storage module and view the collected raw files.
6. The Sokkia GNSS receiver node contains three independent COM ports. Clicking on a port will display all logged GNSS raw data files. The user can simultaneously import different raw files from each COM port to the computer (Figure 4-5 on page 4-7).
7. In the left pane, select the desired *.pdc / *.sdr file(s) and click the **Move Right** button. The file import progress displays.

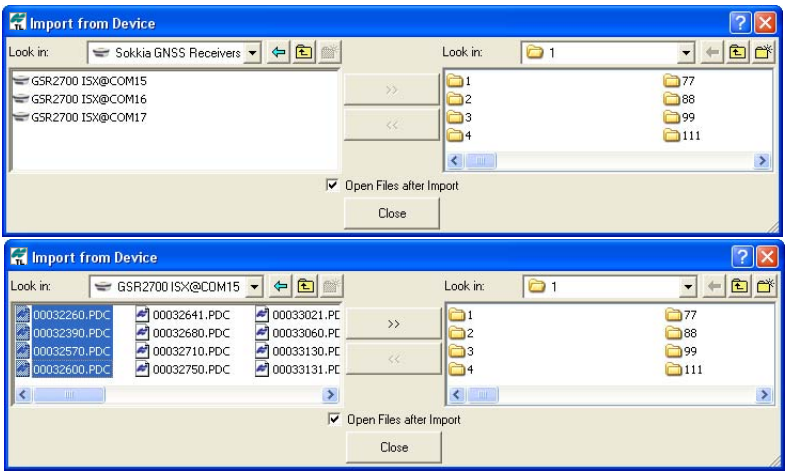


Figure 4-5. Import File from Sokkia GNSS Receiver

8. If *Open File After Import* was selected, the import function closes and the *.pdc / *.sdr file opens in Topcon Link

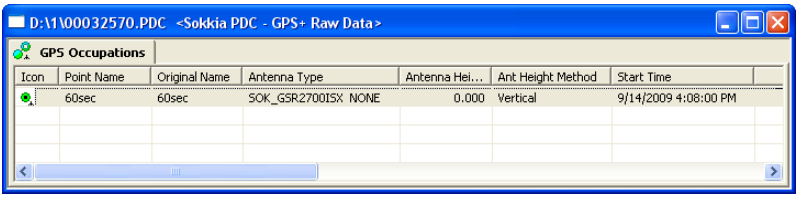


Figure 4-6. Display data of the *.pdc file

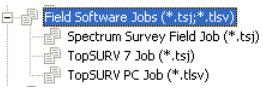
Importing Files from a Mobile Device

The Topcon and Sokkia family of controller software (such as TopSURV and SSF survey application) run on several Topcon and third-party mobile devices.

Microsoft® ActiveSync needs to be installed on the computer with Windows XP. For details on the installation, see “Installing Microsoft ActiveSync for Use With CE-based Devices” on page 1-11.

If the user’s computer operates under Windows Vista, ActiveSync is not needed. A connection between the computer and an external device with Windows CE will be automatically established after connecting your device to your PC.

Topcon Link supports three formats of the Field Software Job files:



- Spectrum Survey Field Job (*. tsj). This job is created in SSF version 7.3 and later.
- TopSURV Job (*. tsj). This job is created in TopSURV version 7.0 and later.

- TopSURV PC Job (*.tlsv). This job is created in TopSURV version 6.11.03 and earlier

There is a difference in formats of these files and a difference in using these files in the computer's software.

In TopSURV version 7.0 and later, and in SSF the *.tsj file is saved on the controller, this file format can be opened by Topcon Link/Topcon Link/Topcon Tools/Sokkia Spectrum Office/TopSURV PC. Topcon Link is used only for transferring the *.tsj file from the controller to the computer without format changes. Moreover, the user can use a movable memory card to transfer the *.tsj file from the controller to the computer.

In TopSURV version 6.11.03 and earlier, the *.tsv file is saved on the controller. But Topcon Link/Spectrum Link/Topcon Tools/Sokkia Spectrum Office/TopSURV PC version can not open this file format. Topcon Link has to convert mobile device-based formats to computer-based formats. Topcon Link performs the conversion of the *.tsv file to the *.tlsv file during the import process. This format (*.tlsv) is opened by Topcon Link/Spectrum Link/Topcon Tools/Sokkia Spectrum Office/TopSURV PC.

This section describes data import using the Topcon Link interface.To use Windows® Explorer for data importing, see "Using Windows Explorer to Import Files from a Device" on page 4-17.

1. Connect your controller and computer according to the controller's documentation.

Bluetooth® connection requires both devices to have Bluetooth wireless technology capabilities.

2. With Topcon Link open, click **File ▸ Import from Device**.
3. In the left panel, double-click **Mobile Device**. Topcon Link connects to the internal memory of the controller.

4. Navigate to the location in TopSURV / SSF folder and select the desired job.
5. In the right pane, navigate to the folder on the computer in which to save data files.
6. In the left pane, select the desired file(s) and click the **Move Right** button. The file import progress displays.
7. If *Open File After Import* was selected, the import function closes and the file opens in Topcon Link.

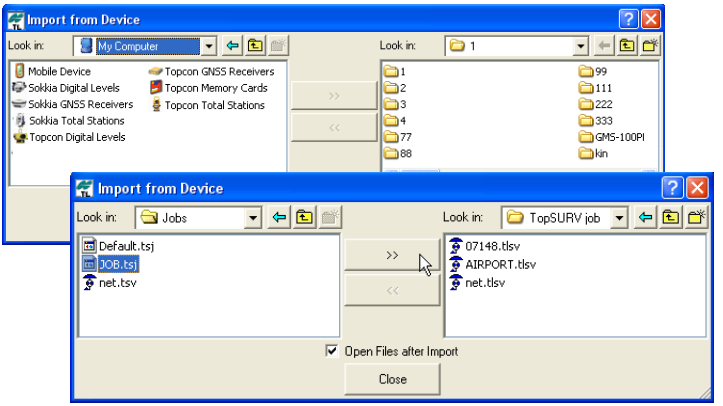


Figure 4-7. Import File from Mobile Device

Importing Files from Total Station

Conventional and robotic Total Stations of Topcon and Sokkia family have an internal data storage device to record data in various formats. Refer to your Total Station operator's manual for details on setup, operation, and connection with other devices.

When importing files from a Topcon and Sokkia Total Station, Topcon Link connects to the device and provides a path for the data transfer. The actual file transfer is performed at the Total Station.

The connection procedure for Topcon and Sokkia Total Stations is different, so refer to the device's documentation for details.

When connecting to a CE-based device, Microsoft® ActiveSync automatically starts up and connects with the device. This connection is required to import files, if your computer operate under Windows XP. If the computer operates under Windows Vista, ActiveSync is not needed.

If you need to install ActiveSync, see “Installing Microsoft ActiveSync for Use With CE-based Devices” on page 1-11 for details.

This section describes data import using the Topcon Link interface. To use Windows® Explorer for data importing, see “Using Windows Explorer to Import Files from a Device” on page 4-17

1. Connect your computer and Total Station according to the operator’s manual.
2. With Topcon Link open, click **File ▸ Import from Device**.
3. In the right pane, navigate to the folder on the computer in which to save data files.
4. In the left pane, double-click *Topcon Total Stations* or *Sokkia Total Stations*.

5. Double-click the desired instrument to connect with the Topcon Link.

For Topcon Total Station *For Sokkia Total Station*

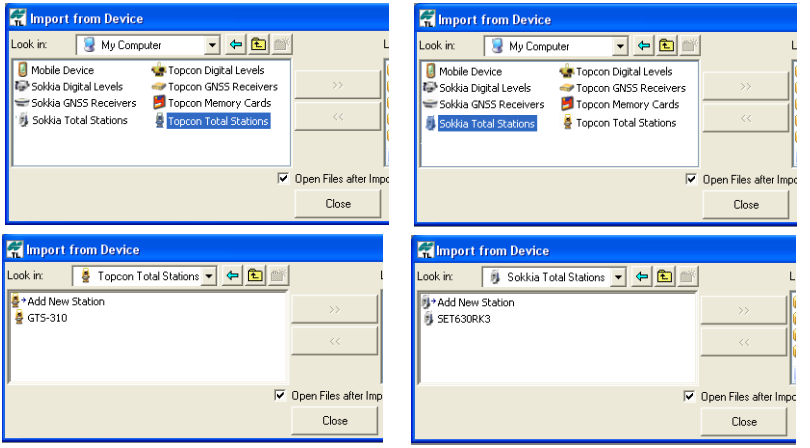


Figure 4-8. Select Total Station to Import Data From

6. Select the “file1.txt” or “file.sdr” file and click the **Move Right** button.
7. Follow all steps listed in the ***Download file from Total Station*** dialog box. These steps may vary depending on the connected device. Click **Start**.
8. If *Open File After Import* was selected, the import function closes and the file opens in Topcon Link.

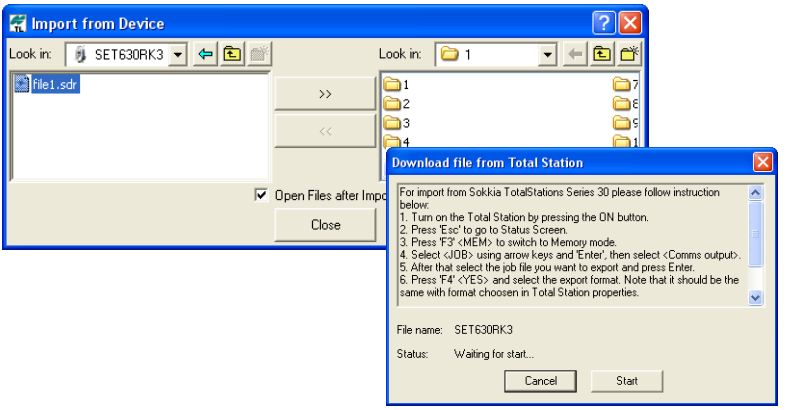


Figure 4-9. Import File from Sokkia Total Station

Importing Files from a Digital Level

Digital Levels of the Topcon and Sokkia family have an internal data storage device to record data. Refer to your Digital Level operator's manual for details on setup, operation, and connection with other devices.

When importing files from a Topcon and Sokkia Digital Level, Topcon Link simply connects to the device and provides a path for the data import. The actual file transfer is performed at the Digital Level.

The connection procedure for Topcon and Sokkia Digital Levels varies, so refer the device operator's manual for details.

This section describes data import using the Topcon Link interface. To use Windows® Explorer for data importing, see "Using Windows Explorer to Import Files from a Device" on page 4-17.

1. Connect your computer and Digital Level according to the operator's manual.
2. With Topcon Link open, click **File ▸ Import from Device**.
3. In the right pane, navigate to the folder on the computer in which to save data files.
4. In the left pane, double-click *Topcon Digital Levels* or *Sokkia Digital Levels*.

5. Double-click the desired instrument to connect with the Topcon Link.

For Topcon Digital Level *For Sokkia Digital Level*

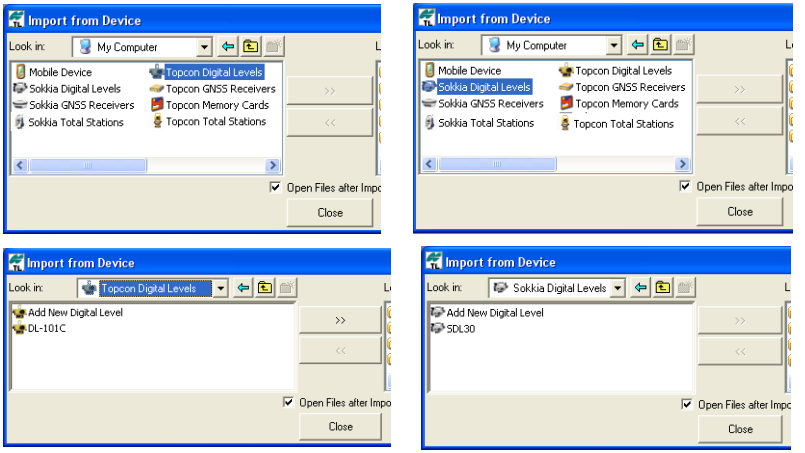


Figure 4-10. Select Digital Level to Import Data From

6. Select the “file.dl”or file1.sdr“” file and click the **Move Right** button.
7. Follow all steps listed in the Download file from the ***Digital Level*** dialog box (Figure 4-11 on page 4-15) to select a file and begin the import. These steps may vary depending on the connected device.
8. If *Open File After Import* was selected, the import function closes and the file opens in Topcon Link.

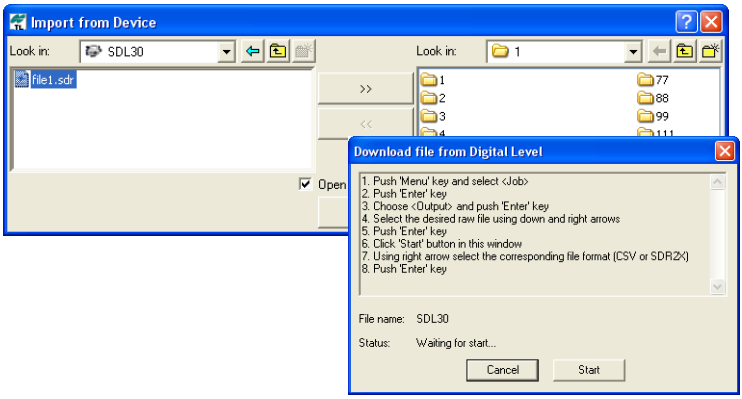


Figure 4-11. Import File from Sokkia Digital Level

Importing Files from a Memory Card

Most Topcon devices contain internal memory cards. These movable memory cards are used to collect raw data and to transfer the collected data from the device to the computer. The memory cards can be divided into two different types:

- Memory cards formatted in Topcon receiver's file system. These cards are used in a Topcon receiver, such as the GR-3 or NET-G3
- Memory cards formatted using the FAT32 file system. These cards used in controllers, such as the FC-200 or GMS-2.

To download data from the first type of the memory card, use Topcon Link/Topcon Tools. Only these software support such cards.

If a memory (SD) card was used in a Topcon receiver, such as the GR-3 or NET-G3, and contains *.tps files, it has already been formatted. Topcon Link can read files on a memory card formatted in the Topcon receiver file system. The device icon for a formatted card is red.

Topcon Link can format a memory card for use in a Topcon receiver, such as the GR-3 or NET-G3. The device icon for an unformatted

card is gray. See “Adding Devices” on page 2-1 for details on formatting cards with a gray device icon.

This section describes data import using the Topcon Link interface. To use Windows® Explorer for data importing, see “Using Windows Explorer to Import Files from a Device” on page 4-17

1. Insert the memory card into the card reader.
2. With Topcon Link open, click *File* ▸ *Import from Device*.
3. In the left panel, double-click *Topcon Memory Card*.
4. Click the desired, formatted memory card device icon.
5. Wait while Topcon Link checks the card’s file system and displays the card’s data.

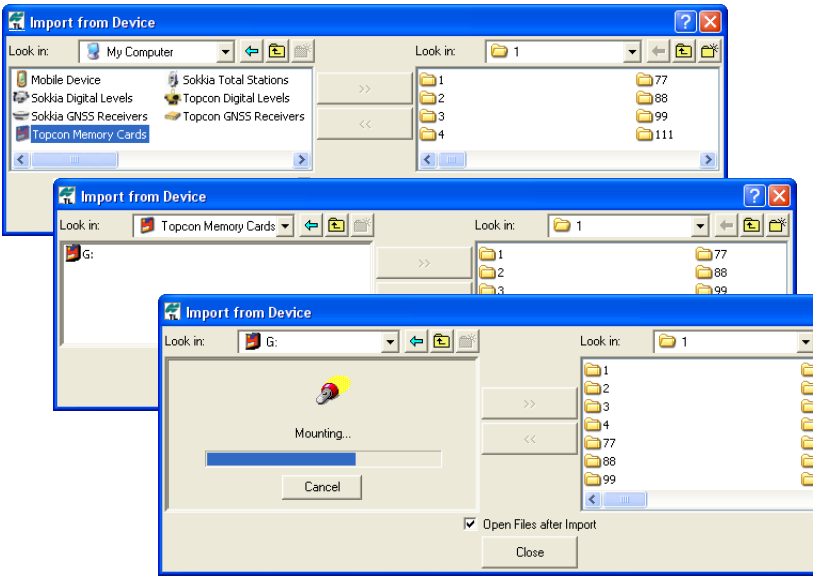


Figure 4-12. Mount Memory Card

6. In the right pane, navigate to the folder on the computer in which to save data files.
7. In the left pane, select the desired file(s) and click the **Move Right** button. The file import progress displays.
8. If *Open File After Import* was selected, the import function closes and the file opens in Topcon Link.

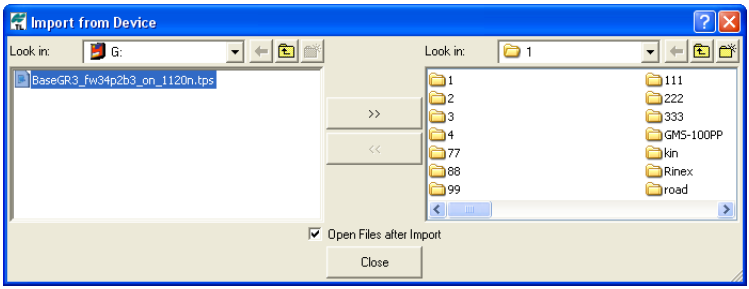


Figure 4-13. Import File from Memory Card

To download data from the second type of the memory card, one can use the standard Windows procedure.

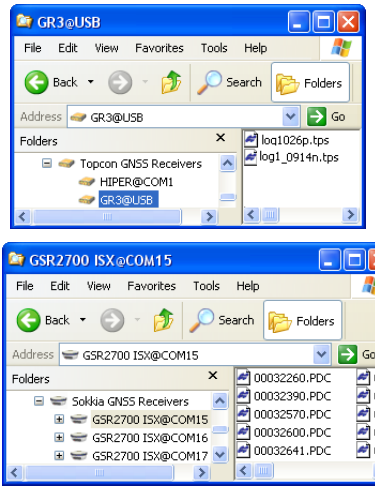
Using Windows Explorer to Import Files from a Device

After installing Topcon Link, the computer's hard disk contains up to eight virtual drives for accessing Topcon and Sokkia devices to import/export data. These virtual drives provide a quick way to transfer data without opening Topcon Link. Many of the steps are the same as for importing/exporting data via the Topcon Link interface. See the corresponding section above for further details on the steps listed in sections below.

Import from Topcon/Sokkia GPS Receivers using Windows Explorer

1. Connect the receiver to the computer. Turn on the receiver.
2. Navigate to the *Topcon Receivers* or *Sokkia Receiver* directory and click the device icon.

3. After discovering devices, click the receiver's icon.
4. Copy or drag-and-drop this file to a directory on the computer.



From Topcon GNSS Receiver

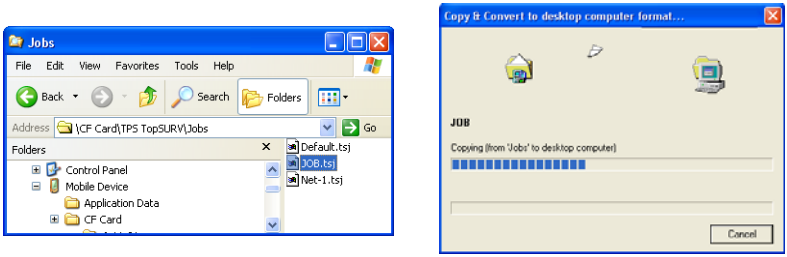
From Sokkia GNSS Receiver

Figure 4-14. Import Using Explorer – Receiver

Import from Topcon and Sokkia Mobile Device using Windows Explorer

1. Connect the controller to the computer. Microsoft® ActiveSync needs to be installed on the computer with Windows XP.
2. Navigate to the *Topcon Mobile Devices* device directory and click the device icon.
3. Navigate to the job location in TopSURV / SSF folder and select a desired file.
4. Copy or drag-and-drop the desired files to a directory on the computer.

for the job created by TopSURV version 7.0 and later,
and the job created by SSF version 7.3 and later



for the job created by TopSURV version 6.11.03 and earlier

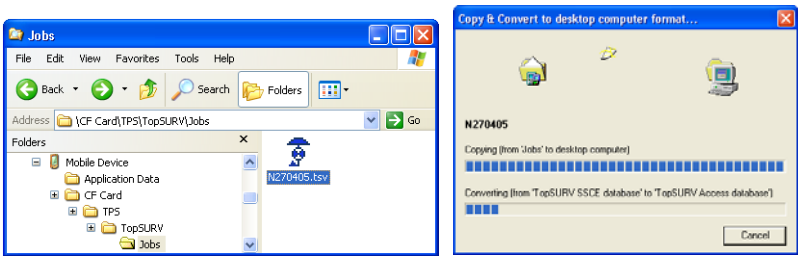


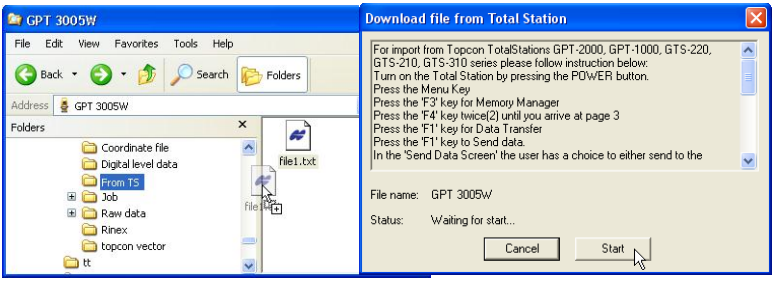
Figure 4-15. Import Using Explorer – Mobile Device

Import from Topcon and Sokkia Total Station using Windows Explorer

1. Connect the total station to the computer. If needed, connect to the total station via ActiveSync.
2. Navigate to the *Topcon Total Stations* or *Sokkia Total Station* directory and click the device icon.
3. Click the icon for the connected total station and select the "file1.txt" or "file1.sdr" file.
4. Copy or drag-and-drop this file to a directory on the computer.

5. Follow instructions on the ***Download from Total Station*** dialog box.

For Topcon Total Station



For Sokkia Total Station

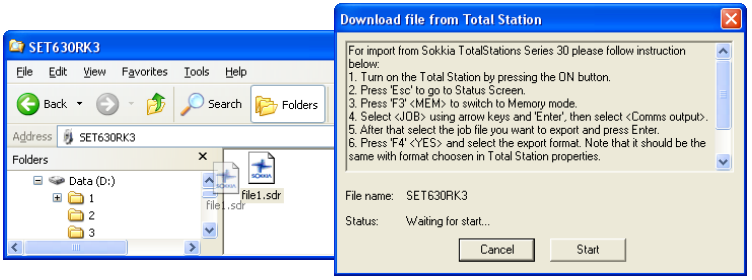
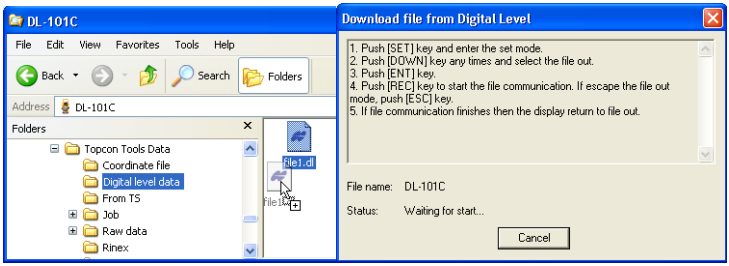


Figure 4-16. Import Using Explorer – Total Station

Import from Topcon and Sokkia Digital Level using Windows Explorer

1. Connect the digital level to the computer.
2. Navigate to the *Topcon Digital Levels* or *Sokkia Digital Levels* directory and click the device icon.
3. Click the icon for the connected digital level and select the “file1.dl” or “file1.sdr” file.
4. Copy or drag-and-drop this file to a directory on the computer.
5. Follow instructions on the ***Download from Digital Level*** dialog box.

For Topcon Digital Level



For Sokkia Digital Level

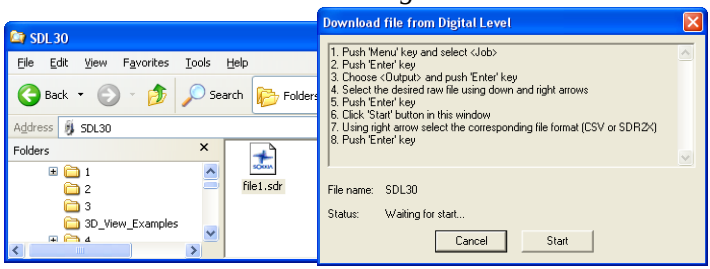


Figure 4-17. Import Using Explorer – Digital Level

Import from Memory Card using Windows Explorer

1. Insert the formatted memory card into the card reader.
2. Navigate to the *Topcon Memory Cards* directory and click the device icon.
3. Click the icon for the desired memory card.
4. Select and copy or drag-and-drop the desired files to a directory on the computer.

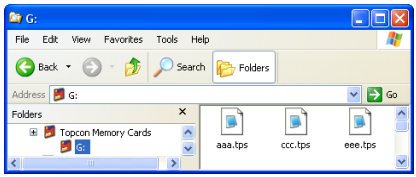


Figure 4-18. Import Using Explorer – Memory Card

Viewing File and Device Properties

The properties of a data file on a device can be viewed after connecting to the device. Once set up in Topcon Link, device properties can be viewed at any time.

To view the properties of a file in a connected Topcon and Sokkia controller or Topcon memory card, right-click the file and click **Properties**. Figure 4-19 gives an example of the ***Properties*** dialog box for a data file in a connected controller and memory card.

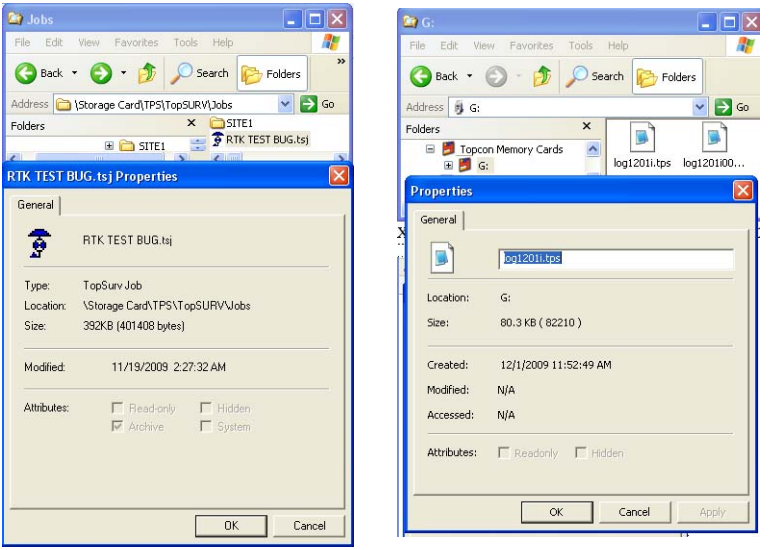


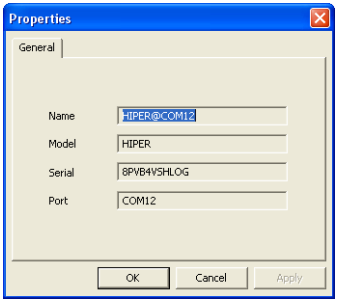
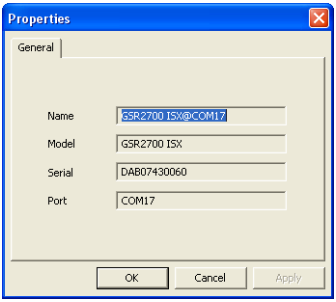
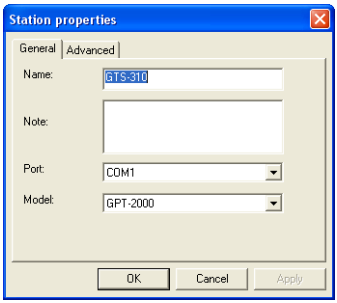
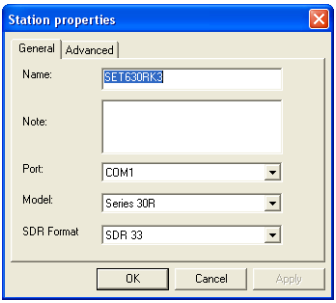
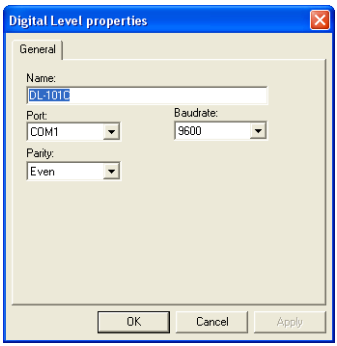
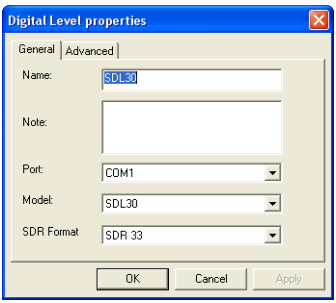
Figure 4-19. Data File Properties

To view the properties of a GNSS Receiver, Total Station or Digital Level device, right-click the device and click **Properties**. Table 4-1 gives examples of the ***Properties*** dialog box for different devices.

Table 4-1. Device Properties Dialog Boxes

Topcon GNSS Receiver	Sokkia GNSS Receiver

Table 4-1. Device Properties Dialog Boxes

	
Topcon Total Station	Sokkia Total Station
	
Topcon Digital Level	Sokkia Digital Level
	

For details on editing Digital Level and Total Station device properties, see “Adding Devices” on page 2-1

Converting Files Between Formats

One of the primary functions of Topcon Link is to convert files from one format to another. A file format conversion may be required to access or work with data from multiple, proprietary, or third-party software or systems. The Topcon Link conversion function allows data to be cross-functional and multi-disciplinary. For example, a survey crew may take point measurements in a field adjacent to a city park in preparation for a new shopping center. Using Topcon Link, this data can be converted to a shape file for uploading into the city's GIS database, or it can be converted to a Topcon GC3 file for sharing with the construction crew for three-dimensional grading.

When converting files, a custom projection or custom datum may need to be created. Topcon Link includes a number of pre-defined projections and datums from which to base a custom projection or custom datum.

When applying a projection or datum to a data set, transformation parameters between the jobsite's "grid" and the projection's "ground" can also be specified.

Converting A File

To perform a format conversion, Topcon Link checks the data and its format in the selected file and converts it to the default settings of the selected format. Topcon Link will offer the user to select the desired format of the file to be created from those which are allowed for the data included in the file being converted. If it is desired to change the coordinate system, coordinate order and/or metric units during the process of transformation, use the *Advanced Conversion options*. These options provide further control over the resulting data format.

1. Click **File ▸ Convert Files**.
2. To select the file to convert, click **Add files** in the *Convert Files* window.
3. In the ***Open*** dialog box select the appropriate format name. Navigate to and select the desired file, then click **Open**. Also, the user can activate the option for automatic recognition of the file format in the process of opening the file. To do this, check the "Recognize the file automatically" check box in the ***Open*** window and do not select the desired file format.
4. If the selected file format is correct, the *File status* field displays "File format is verified" and you can continue converting.
5. To create the file, select the appropriate format name and desired folder where this file will be saved.
6. Topcon Link will use the name of the converted file to name of the created file (except the RINEX file format). The extension for the created file will be automatically assigned in accordance with the selected file format. The *Destination file name* field displays the name of the created file. To edit the name, click- pause-click on this field.
7. To remove a file from the ***Convert Files*** window, select the desired file and click **Remove files.**
8. To remove all files from the ***Convert Files*** window, click **Clear all**.
9. If needed, click **Advanced Conversion options** and select the parameters to apply to data during the conversion. See the following sections for more details.

Available parameters depend on data in the selected file and the format being converted to.

10. Click **Convert.**

    Topcon Link performs the conversion, saves the file in the selected directory.

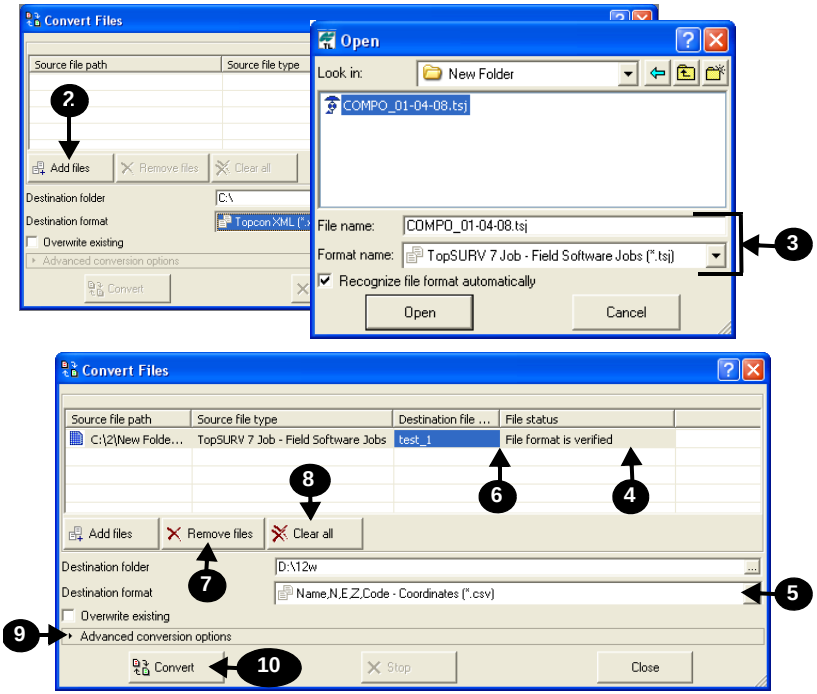
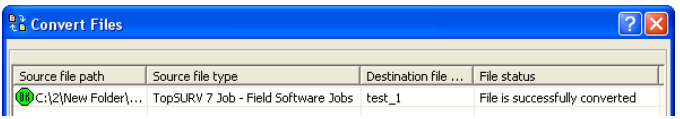


Figure 5-1. Convert File

If the file conversion is successful, the ***Convert Files*** dialog box displays the following:

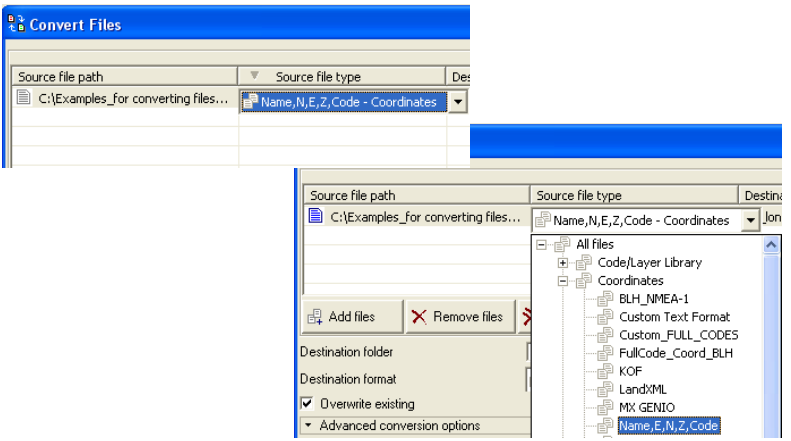


To automatically overwrite the previously created file check the checkbox: 

The user can add unlimited number of files to the ***Convert Files*** dialog box, if these files contain compatible data. If the user added the files which have incompatible data, the conversion of these files is not performed and the following alarm message displays:

To perform a conversion, delete file(s) containing data incompatible with other file(s).

If the user selects other format for the converted file in the ***Open*** widow, he can select the desired file format from the format list of the *Source file type* column. To activate this list, double click on the name of the selected format:



The ***Advanced conversion option*** dialog box contains a group of fields. They are necessary to input the data used for the coordinate transformation/metric unit/coordinate order, etc. during the file conversion. Each converted file should be supplied with information that is absent in the file but needed for the correct transformation. For example, the user can set the coordinate system, metric units for the converted coordinate file, if these data are available. These data are entered to the From fields. For the created file, one should enter the parameters that appear in this file after conversion. For example, the

coordinate system in the file should be NAD 83, metric units - US Feet, orthometric heights - take into account the usage of Geoid 2003. These data are entered to the To fields.

In general, the data entered to the ***Advanced conversion option*** dialog box can be divided into following groups:

1. Convert coordinate type and system, including Grid to Ground conversion
2. Convert ellipsoidal/orthometric height
3. Convert coordinate order
4. Convert metric unit
5. Convert angular unit
6. Convert vertical angle
7. Convert distance format
8. Change geoid bounds
9. Filter raw data

Topcon Link analyses the data type of the converted/created file, automatically selects the needed group parameter(s) used for each format. *Advanced conversion option* will display only those parameters which are needed for given types of input/output data.

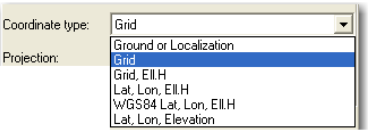
The groups are independent in selecting and can be enabled/disabled independently.

Depending on the data type of the converted/created file some fields of any group can be disabled or not presented.

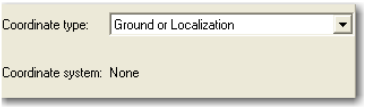
Convert Coordinate Type and System

Using the fields in the *Convert coordinate type and system* tab the user can specify a coordinate system for converting and creating file.

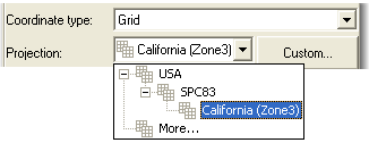
Depending on the data type of the converted/created file, the user can select the following coordinate type in the To/From fields:



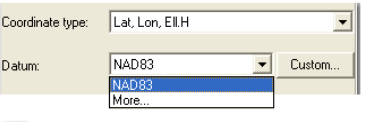
If the user selected the Ground or Localization coordinate type, the coordinate system is set to None for the converted/created file:



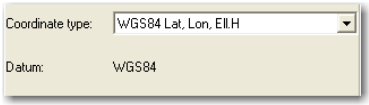
If the user selected the Grid (Grid coordinate system with orthometric heights) or Grid Ell (Grid coordinate system with ellipsoidal height) coordinate type, the user can select a desired projection type from the list of projections available or create a new projection. For details on how to create a projection, see “Adding a Custom Projection” on page 5-37:



If the user selected the Lat,Lon,Ell.H (a datum with ellipsoidal heights) or Lat,Lon,Ellevation (a datum with orthometric heights) coordinate type, the user can select a desired datum from the list of datums available, or create a new datum. For details on how to create a datum, see “Adding a Custom Datum” on page 5-41.

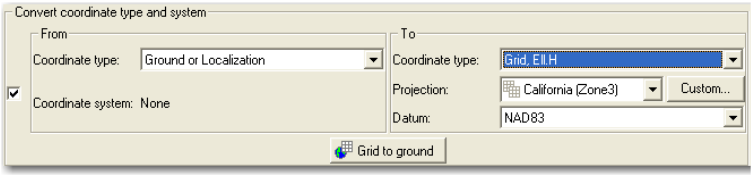


If the user selected the WGS-84 Lat,Lon,Ell.H coordinate type, the datum will be selected automatically:

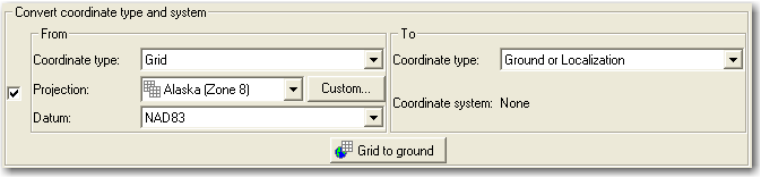


Using this tab the user can perform transformation between Grid and Ground coordinate systems. The transformation will be enabled if:

- the converted file contains points in the Ground coordinate system but a created file has to contain points in a Grid or a Datum coordinate system. In this case Topcon Link performs Ground to Grid transformation:



- the converted file contains points in the Grid coordinate system but a created file has to contain the point in the Ground coordinate system. In this case Topcon Link performs Grid to Ground transformation:



For all other combinations of coordinate systems for input/output files the Grid and Ground is disabled: 

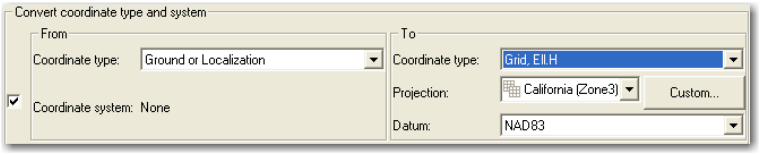
For details on setting these parameters, see “About Grid->Ground Parameters” on page 5-42

Convert Height

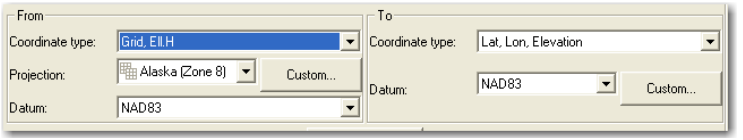
The conversation of heights is enabled if is needed to obtain orthometric heights for the points of the created file from the ellipsoidal heights of the points in the converted file and vise versa.

The transformation will be enabled if:

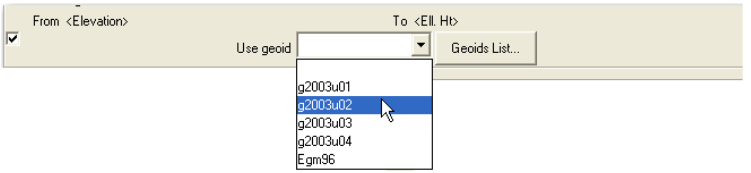
- the converted file contains points in the Ground or Grid/Datum coordinate system with orthometric heights, but a created file must contain points in a Grid/Datum coordinate system with ellipsoidal heights:



- the converted file contains points in the Grid/Datum coordinate system with ellipsoidal heights, but a created file has to contain points in a Grid/Datum coordinate system with orthometric heights:



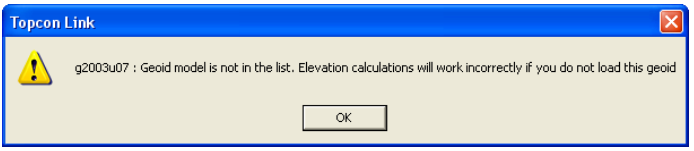
In these cases Topcon Link offers to select the desired Geoid from the list of geoids used. The user can add any Geoid file to this list by clicking the **Geoid List** button (see “Adding a Geoid” on page 2-14):



Field Software Job is the most informative file format. This format can contain both ellipsoidal and orthometric heights and also the name of the geoid used for height calculation. If Field Software Job is converted, Topcon Link automatically uses the height information

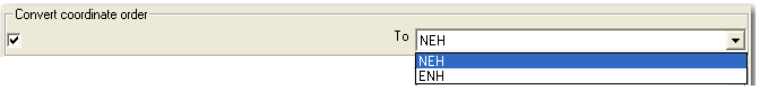
contained in the job. The height conversion will be available if the geoid used in TopSURV/SSF is presented in the Topcon Link geoid list. In an example below, the geoid selection from the geoid list is not available:

If the geoid used in TopSURV/SSF is not presented in the Topcon Link geoid list, the following message will appear:



Convert Coordinate Order

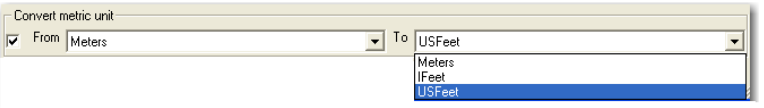
This type of conversion allows one to select the order of the horizontal coordinate (Easting and Northing) for the points of the created file if Ground/Grid/Grid Ell coordinate system is set for this file:



If the user selected Name,N,E,Z,Code or Name,E,N,Z,Code coordinate file format, the fields of coordinate order selecting will display the order which defined by the corresponding file format:

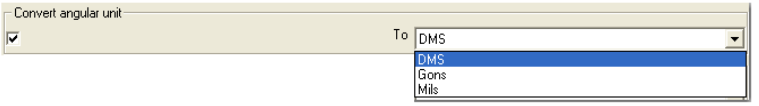
Convert Metric Unit

This type of conversion allows one to select the desired metric unit for converted and created files:



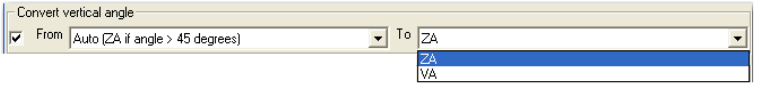
Convert Angular Unit

This type of conversion allows one to select the desired format of angular values for converted/created Total Station raw files:



Convert Vertical Angle

If TS raw data file does not have information about vertical angle mode, the user can select the mode under *Advanced conversion option* when such file is converted/created by Topcon Link:



- ZA – vertical angles are from zenith
- VA– vertical angles are from horizontal
- Auto – no information available on vertical angle mode. In an example below, angles from 0 to 45° are considered “vertical” and angles more than 45° are considered “zenith.”

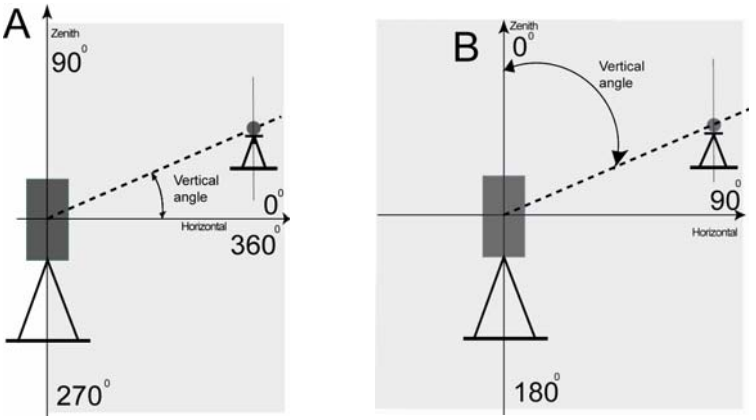
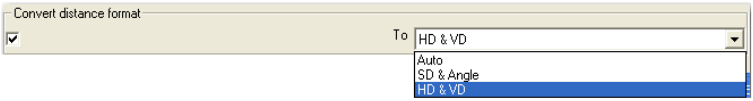


Figure 5-2. Vertical Angle from Horizontal (A) and Zenith (B)

Convert Distance Format

This type of conversion allows one to select the desired format of distance values for a created Total Station raw file: the distance between a station and a measured point can be recorded either as slope distance and vertical angle or as horizontal and vertical distances. Selecting Auto records distances into the created file using the distance format of the converted file:



Change Geoid Bounds

This option allows one to define the area of a created geoid file from any supported geoid model. When converting from a Geoid file, the following parameters are available in the right pane:

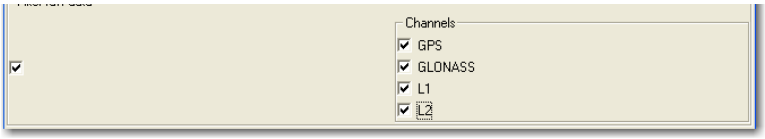
- Minimum / Maximum Latitude – enter the minimum and maximum latitude of the points that limit the use of this model. Latitudes are positive for the Northern hemisphere.

Minimum / Maximum Longitude – enter the minimum and maximum longitude of the points that limit the use of this model. Longitudes are positive for the Eastern hemisphere.

Filter Raw Data

This option allows one to include:

- GPS or GLONASS satellites
- pseudorange and phase measurements on L1 or L2 frequency to created RINEX/Compact RINEX/Topcon TPD file formats:



To remove any item, uncheck a desired checkbox.

The following sections describe the file format conversions, as well as list which files can be converted to which format.

Code Library File Conversion Parameters

A code library file contains a description of codes, such as code name, plotting style, and attribute. Table 5-1 lists the formats that a code library can be converted to.

Table 5-1. Code Library File Conversion Formats

From a...	To a...
Code Library file: DBF Code Library, TDD Code Library, XML Code Library, Autodesk Layer States Code Library	Code Library file Field Software Job file
Field Software Job file	Code Library file

When converting from a Code Library file, no further parameters are required.

Coordinate File Conversion Parameters

A coordinate file contains a list of points in some coordinate system. Table 5-2 lists the formats that a coordinate file can be converted to/ from.

Table 5-2. Coordinate File Conversion Formats

From a...	To a...
Coordinate file: Custom Text Format; Topcon FC-4; Topcon FC-5; Topcon GTS-210/310-10; Topcon GTS 210/310-12; Topcon GTS-7; Sokkia SDR;LandXML; Topcon XML; Field Software Jobs; Name,E,N,Z,Code; Name,N,E,Z,Code; Name,Lat,Lon,Ht,Code; SBG Geo; SBG Pxy; TDS; KOF	Coordinate file Design GIS: ESRI Shape Topcon XML file Field Software Job file
Field Software Job file	Coordinate file
Design	Coordinate file
TS Obs (if the format contains point coordinates)	Coordinate file
GIS: ESRI Shape	Coordinate file

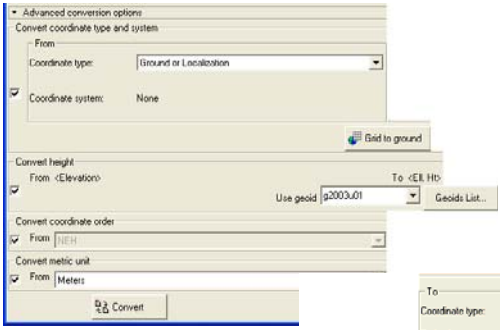
Available parameters depend on the data in the selected file and the format being created.

When converting from/to a coordinate file the user can select the following parameters:

1. Convert coordinate type and system (see “Convert Coordinate Type and System” on page 5-6)
2. Convert height (see “Convert Height” on page 5-8)
3. Convert coordinate order (see “Convert Coordinate Order” on page 5-9)
4. Convert metric unit (see “Convert Metric Unit” on page 5-9)

These parameters are selected independently and can be enabled/ disabled independently:

for converted coordinate file:



for created coordinate file

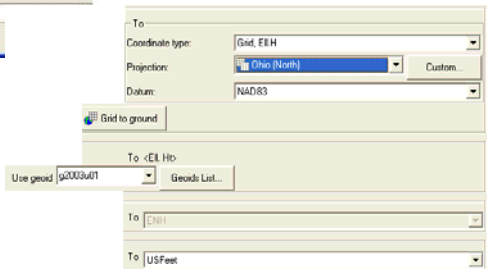
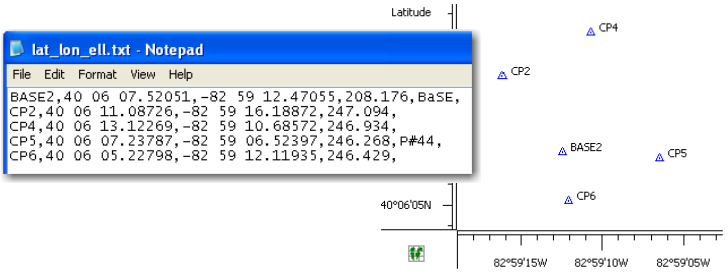


Figure 5-3. Convert Coordinate File – Example

Example of Conversion Coordinates File

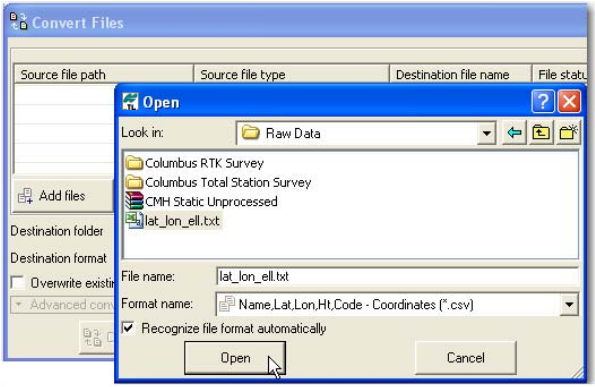
The following pages describe the example of conversion of the coordinate file (‘lat_lon_ell.txt’), which contains the points in the datum coordinates (NAD83). This file has Lat, Lon, Ht, Code file format, and height is ellipsoidal height in meters:



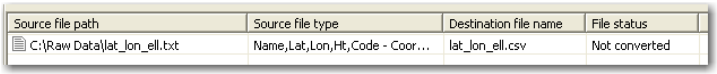
The task is to convert this file to other coordinates file, which will contain the points in Grid coordinates system (SPC83-Ohio (North)), with orthometric height in US Feet.

To create such a file, we do the following steps:

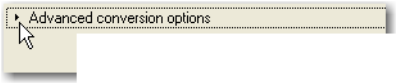
1. Click **File->Convert Files** and click **Add Files** in the window. The ***Import*** window appears.
2. Navigate to the desired file, highlight it and select the corresponding file format in the *Format name* field:



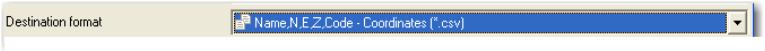
3. The converted file appears in the list of the converted files:



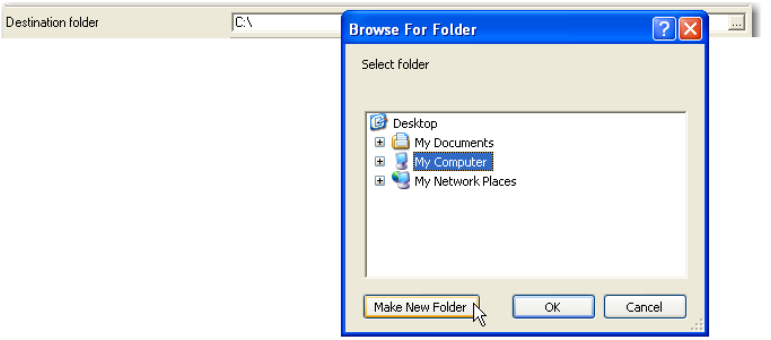
4. Check the *Advanced conversion option* checkbox:



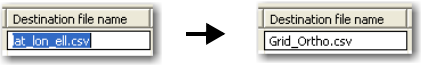
5. Select the format name for the grid coordinate system of the created file in the *Destination format* field:



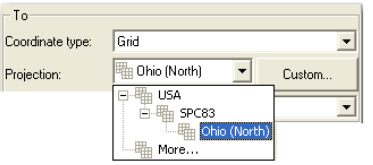
6. Select or create the folder where this file will be saved (by clicking ...):



7. Change the name of the created file in the *Destination field name* field:

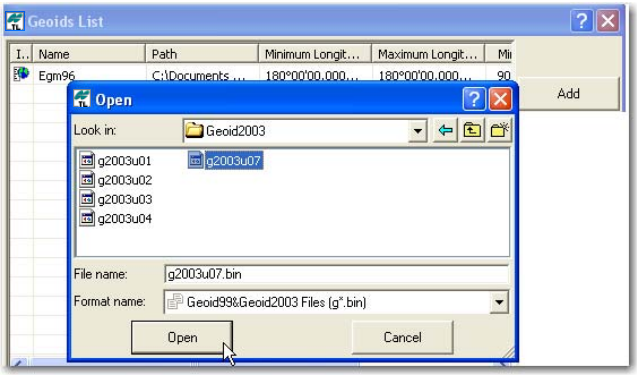


8. Select the Grid coordinate system and Ohio (North) projection in the corresponding fields:

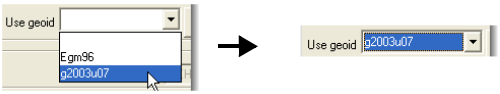


9. Add the 'g2003u07.bin' geoid file to the list of geoids used. To do this, click the **Geoid List** button, click **Add**

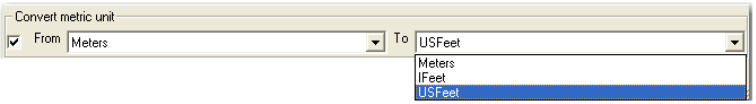
and select the folder where the desired geoid file is located:



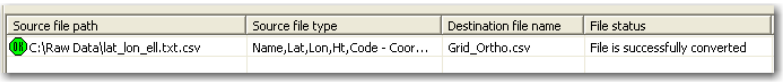
Then activate this geoid for conversion of the coordinate file:



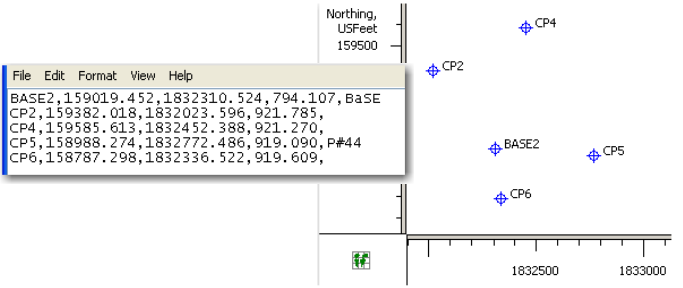
10. Select 'Meters' for the converted and 'Us Feet' for the created file in the *Convert metric unit* fields:



11. Click the **Convert** button.If the file conversion is successful, the ***Convert Files*** dialog box displays the following:



12. The created file has the following coordinates and heights:



Design and Surface File Conversion Parameters

A design file contains CAD information (points, linework, surfaces). Table 5-3 lists the formats that a design file can be converted to/from.

Table 5-3. DWG, DXF, LandXML Design File Conversion Formats

From a...	To a...
Design file: AutoCAD Drawing, AutoCAD DXF; KOF; LandXML, Microstation 95/ISFF, MX GENIO Line, SBG Geo, SBG Pxy, Topcon 3D Linework, Topcon 3D Surface,	Design file Coordinate file Field Software Job file Surface file
Coordinate file	Design file: AutoCAD Drawing, AutoCAD DXF; KOF; LandXML,SBG Geo, SBG Pxy,
TS Obs	Design file: AutoCAD Drawing, AutoCAD DXF; KOF; LandXML,SBG Geo, SBG Pxy,
Field Software Job file	Design file: AutoCAD Drawing, AutoCAD DXF; KOF; LandXML,SBG Geo, SBG Pxy, Microstation 95/ISFF, Microstation V8, Topcon 3D Linework
Topcon XML file	Design file: AutoCAD Drawing, AutoCAD DXF; KOF; LandXML,SBG Geo, SBG Pxy,
GPS Obs	Design file: LandXML

Table 5-3. DWG, DXF, LandXML Design File Conversion Formats (Continued)

From a...	To a...
Design file, Topcon 3D Surface	Design file: AutoCAD Drawing, AutoCAD DXF; LandXML

Available parameters depend on the data in the selected file and the format being created.

When converting from/to a Design file, the user can enable and select the following parameters:

1. Convert coordinate type and system (see “Convert Coordinate Type and System” on page 5-6)
2. Convert height (see “Convert Height” on page 5-8)
3. Convert coordinate order (see “Convert Coordinate Order” on page 5-9)
4. Convert metric unit (see “Convert Metric Unit” on page 5-9)

.

for converted design file:

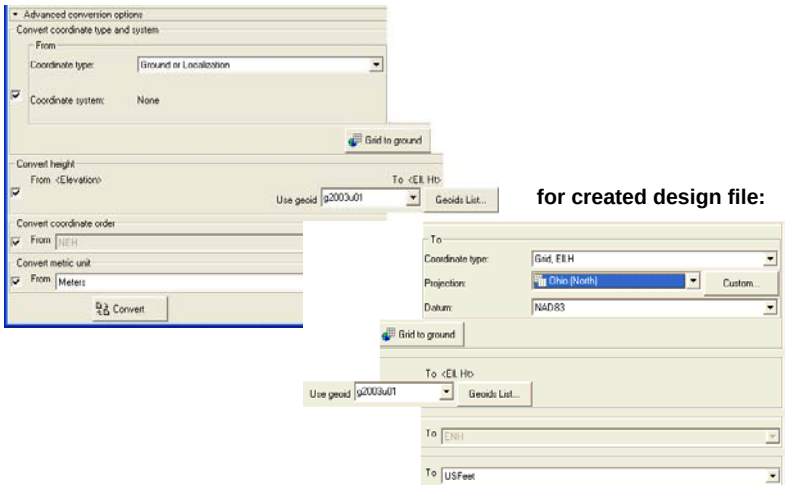


Figure 5-4. Convert Design File – Example

Digital Level File Conversion Parameters

A digital level file contains level measurements from a station to points. Table 5-4 lists the formats that a digital level file can be converted to.

Table 5-4. Topcon Digital Level Conversion Formats

From a...	To a...
Topcon Digital Level: DL, LEV, TXT, Topcon XML Sokkia SDR DL BlueBook	Topcon XML file Field Software Job file

When converting from Digital Level file the user can select only the *Convert metric unit* option (see “Convert Metric Unit” on page 5-9).

Geoid File Conversion Parameters

A geoid file contains data on a physical reference surface. The shape of the geoid reflects the distribution of mass inside the earth. The rise and fall of the surface in a geoid is important for converting GPS-derived ellipsoidal height differences to orthometric height differences.

Using Topcon Link, you can create a Topcon geoid file (*.gff) for a defined area from any supported geoid model—creating a sub-section of the selected geoid file. This file can then be exported into Field Software Jobs. Table 5-4 lists the formats that a geoid file can be converted to.

Table 5-5. Geoid Conversion Formats

From a...	To a...
Geoid file	Topcon Geoid file

When converting from a Geoid file, the user can enable and select only the *Change geoid bounds* option (see “Change Geoid Bounds” on page 5-11)

GPS+ Raw Data File Conversion Parameters

GPS+ Raw Data file contains GPS/GLONASS code and carrier phase measurements collected for point or points where was mounted a GPS antenna. Topcon Link directly converts (that is using its own technique) the following GPS+ raw data files:

- TPS/JPS files are the raw data files logged by Topcon receivers.
- TPD files are a Topcon proprietary format for storing GPS raw data, and can be used to backup raw data or exchange raw data between different jobs.
- Sokkia PDC files are the new raw data files logged by Sokkia receivers (GSR2600, GSR2700 and GSR1700).
- Sokkia Stratus files are the raw data files logged by Sokkia Stratus receiver.
- RINEX 2.11 and RINEX 3.0 is the version of standard format for exchanging GPS Raw Data. For a static/kinematic observation(s) (session(s)) 2 or 3 files are created; the first usually having an extension beginning with the letter 'O' and stores the observations; the second usually has extensions beginning with the letter 'N' or 'G', depending on GPS/GLONASS capability, and stores GPS and GLONASS navigational data (orbits) for those observations.
- Compact RINEX/Compact Rinex3 file (or a Hatanaka compressed file) is the compression of RINEX 2.11 / RINEX 3.0 observation files. This file type contains a "D" extension.

Also Topcon Link allows the user to convert native binary formats of GPS receivers manufactured by Ashtech (B*.*, E*.*, S*.*), Leica Geosystems (*.lb2, *.mdb,*.m00), Trimble (*.dat), Septentrio Satellite Navigation NV (*.sbf) companies. For converting these formats, Topcon Link applies TEQC software (http://facility.unavco.org/software/teqc/teqc.html).

When the user converts one of the above formats in Topcon Link, the following scheme of converting the file starts to work automatically:

1. TEQC converts the native binary format to RINEX 2.11 file format.
2. Topcon Link will convert the created RINEX file to a user-selected file format.

NOTE:

1. The current default setting for the TEQC allows converting only static occupations (provided there is **only one** *Marker Name* in the file for this occupation). In other words, it is impossible to convert kinematic and Stop&Go files of native formats of these companies into Topcon Link.
2. When converting binary files of third-party companies, Topcon Link uses default settings of the TEQC program. If a binary file failed to be converted by Topcon Link, we recommend to repeat the conversion to the RINEX file using settings of TEQC (out of the Topcon Link program) for the given binary file. After obtaining an appropriate RINEX file, this file can be converted by Topcon Link.

Table 5-6 lists the formats that a GPS+ raw data file can be converted to/from.

Table 5-6. GPS+ Raw Data File Conversion Formats

From a...	To a...
Topcon/JPS file	Compact RINEX (ver 2.11) Compact RINEX3 (ver 3.00) RINEX (ver 2.11) RINEX 3 (ver 3.00) TPD file
Sokkia PDC	Compact RINEX (ver 2.11) Compact RINEX3 (ver 3.00) RINEX (ver 2.11) RINEX 3 (ver 3.00) TPD file

Table 5-6. GPS+ Raw Data File Conversion Formats (Continued)

From a...	To a...
Sokkia Stratus	Compact RINEX (ver 2.11) Compact RINEX3 (ver 3.00) RINEX (ver 2.11) RINEX 3 (ver 3.00) TPD file
TPD file	Compact RINEX (ver 2.11) Compact RINEX3 (ver 3.00) RINEX (ver 2.11) RINEX 3 (ver 3.00)
Compact RINEX (ver 2.11) file	Compact RINEX3 (ver 3.00) RINEX (ver 2.11) RINEX 3 (ver 3.00) TPD file
Compact RINEX (ver 3.00) file	Compact RINEX3 (ver 2.11) RINEX (ver 2.11) RINEX 3 (ver 3.00) TPD file
RINEX (ver 2.11) file	Compact RINEX (ver 2.11) Compact RINEX3 (ver 3.00) RINEX 3 (ver 3.00) TPD file
RINEX (ver 3.00) file	Compact RINEX (ver 2.11) Compact RINEX3 (ver 3.00) RINEX (ver 2.11) TPD file
Ashtech file by teqc	Compact RINEX (ver 2.11) Compact RINEX3 (ver 3.00) RINEX (ver 2.11) RINEX 3 (ver 3.00) TPD file

Table 5-6. GPS+ Raw Data File Conversion Formats (Continued)

From a...	To a...
Leica file by teqc	Compact RINEX (ver 2.11) Compact RINEX3 (ver 3.00) RINEX (ver 2.11) RINEX 3 (ver 3.00) TPD file
Septentrio file by teqc	Compact RINEX (ver 2.11) Compact RINEX3 (ver 3.00) RINEX (ver 2.11) RINEX 3 (ver 3.00) TPD file
Trimble file by teqc	Compact RINEX (ver 2.11) Compact RINEX3 (ver 3.00) RINEX (ver 2.11) RINEX 3 (ver 3.00) TPD file

- When converting to a RINEX or Compact RINEX file, the user can enable and select only the Filter raw data option (see “Filter Raw Data” on page 5-11).

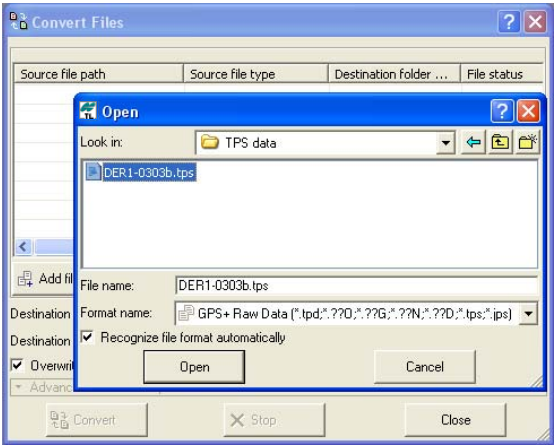
Example of Conversion Topcon File to RINEX File

The following pages describe the example of conversion of the Topcon file (‘DER1-0303b.tps’). This file was collected by dual frequency GPS/GLONASS Topcon receiver. It needs to create the RINEX file with GPS L1 raw data only.

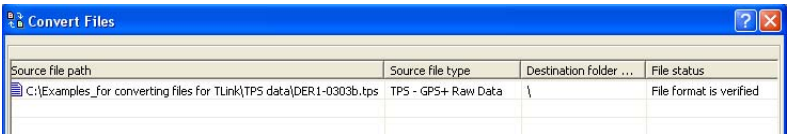
To create this file, do the following steps:

1. Click **File->Convert Files** and click **Add Files** in the window. The ***Import*** window displays

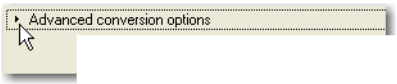
2. Navigate to the desired file, highlight it and select the corresponding file format in the *Format name* field:



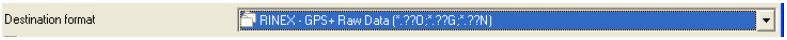
3. The converted file appears in the list of the converted files:



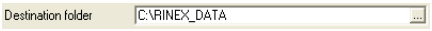
4. Check the Advanced conversion option checkbox:



5. Select the RINEX file format for the created file in the *Destination format* field:



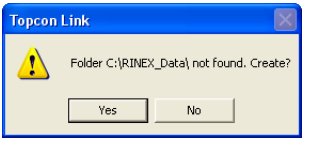
6. Type in a name of a new folder in the *Destination folder name* field:



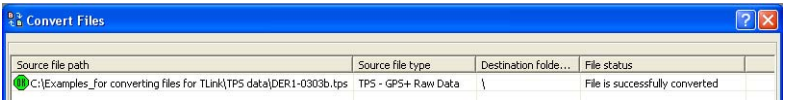
The created files will be stored in the folder.

7. Uncheck the desired channels:

8. Click the **Convert** button. The following message appears:



Press **Yes** to create this folder. If the file conversion is successful, the ***Convert Files*** dialog box displays the following:



9. The created file has the following data:

```
     2.10           OBSERVATION DATA    G (GPS)             RINEX VERSION / TYPE
Topcon Link 7                           21-NOV-07 20:58     PGM / RUN BY / DATE
build July 25, 2002 (c) Topcon Positioning Systems          COMMENT
DER1-0303b_JFGG                                             MARKER NAME
                                                            MARKER NUMBER
-Unknown-           -Unknown-                               OBSERVER / AGENCY
AFFRRRFJFGG         -Unknown-           -Unknown-           REC # / TYPE / VERS
-Unknown-           -Unknown-                               ANT # / TYPE
  2850716.2627  2199374.1797  5247224.3437                  APPROX POSITION XYZ
        0.0000        0.0000        0.0000                  ANTENNA: DELTA H/E/N
     1     0                                                WAVELENGTH FACT L1/2
  2005     3     3     1     0    0.0000000     GPS         TIME OF FIRST OBS
  2005     3     3     1    59   59.0000000     GPS         TIME OF LAST OBS
     1.000                                                  INTERVAL
    13                                                      LEAP SECONDS
    13                                                      # OF SATELLITES
     4    C1    P1    L1    D1                             # / TYPES OF OBSERV
 G 5   821   796   821   821                               PRN / # OF OBS
```

Localization GC3 File Conversion Parameters

A localization file contains coordinate points in both the local and global coordinate systems. These systems are used in the calculation of localization points. Table 5-7 lists the formats that a localization file can be converted to.

Table 5-7. Localization File Conversion Formats

From a...	To a...
Localization file: Topcon 3D	Field Software Job file
Field Software Job file If the Field Software file contains pairs of point coordinates in WGS84 and local system for each Control point.	Localization file

When converting from a Localization file, no further parameters are required.

When converting to a Localization file, the user can enable and select only the *Convert metric unit* option (see “Convert Metric Unit” on page 5-9)

Road File Conversion Parameters

A road file contains information about the stations/chainages, alignments, cross-sections, and grades required for creating a road. Table 5-8 lists the formats that a road file can be converted to/from.

Table 5-8. Road File Conversion Formats

From a...	To a...
Road file: CLIP, ISPOL, LandXML, MX GENIO, SBG, SSS, TDS, Tekla, Topcon 3D, Topcon XML, Field Software Job	Road file Field Software Job file Topcon XML X-Section Templates Design file: LandXML
Field Software Job file If the Field Software file contains road data.	Road file

When converting from a Road file, the user can select:

1. Convert coordinate type and system (see “Convert Coordinate Type and System” on page 5-6)
2. Convert metric unit (see “Convert Metric Unit” on page 5-9.
3. Convert coordinate order (see “Convert Coordinate Order” on page 5-9)
4. Convert metric unit (see “Convert Metric Unit” on page 5-9 no further parameters are required.

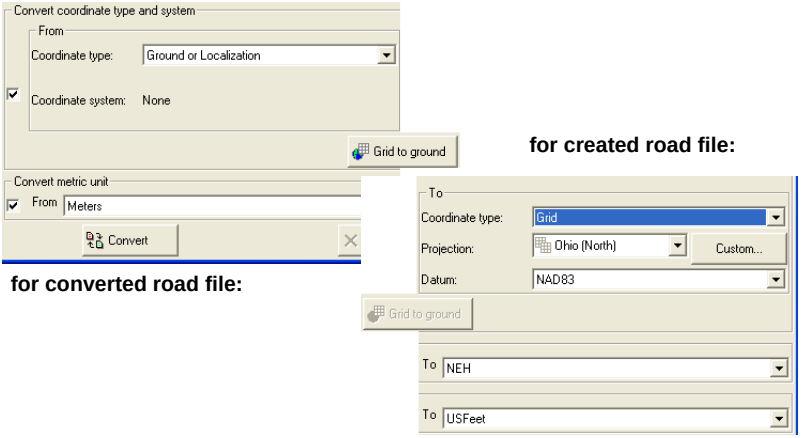


Figure 5-5. Convert Roads File – Example

Topcon XML File Conversion Parameters

A Topcon XML file can contains points, roads, TS measurements, DL measurements, and/or any GPS observations. Table 5-9 lists the formats that a Topcon XML file can be converted to/from.

Table 5-9. Topcon XML File Conversion Formats

From a...	To a...
Topcon XML file	Coordinate file Design (except TN3) file GIS: ESRI Shape file Field Software Job file GPS Obs DL Obs TS Obs Road X-Section Topcon XML
Coordinate file	Topcon XML file
Design (except TN3and LN3)	Topcon XML file
Field Software Job file	Topcon XML file
DL obs	Topcon XML file
TS Obs	Topcon XML file
GPS Obs	Topcon XML file
Land XML	Topcon XML file
Road	Topcon XML file
X-Section	Topcon XML file

Available parameters depend on the data in the selected file and the format being created.

When converting from/to a Design file the user can select the following options:

1. Convert coordinate type and system (see “Convert Coordinate Type and System” on page 5-6)
2. Convert height (see “Convert Height” on page 5-8)
3. Convert coordinate order (see “Convert Coordinate Order” on page 5-9)
4. Convert metric unit (see “Convert Metric Unit” on page 5-9)
5. Convert angular unit (see “Convert Angular Unit” on page 5-10)
6. Convert vertical angle (see“Convert Vertical Angle” on page 5-10)

Field Software Job File Conversion Parameters

A Field Software Job file can contain the following measurements:

- Total Station measurements (the distance, vertical angle, and horizontal angle measurements from a station to a point).
- Digital Level measurements (the level measurements from a station to a point).
- GPS Observation (the coordinate increment in the current projection and solution type for the measurement).

Table 5-10 lists the formats that a Field Software Job file can be converted to/from.

Table 5-10. Field Software Job File Conversion Formats

From a...	To a...
Spectrum Survey Job: TopSURV 7 Job, TopSURV PC Job	Code/Layer Library Coordinate file GPS Obs TS Obs DL Obs GIS: ESRI Shape file Design file Topcon XML file Localization file (if the Field Software file contains pairs of point coordinates in WGS84 and local system) Cut Sheet file (if the Field Software file includes Stakeout points) Road file (if the Field Software file includes road data) X-Section Template file (if the Field Software file includes an X-section template) Field Software Job
Coordinate file	Field Software Job file
DL Obs	Field Software Job file
TS Obs	Field Software Job file
GPS Obs	Field Software Job file
Topcon XMLr	Field Software Job file
Localization file	Field Software Job file
Design file	Field Software Job file
Road file	Field Software Job file
X-Section Template file	Field Software Job file
Code/Layer Library	Field Software Job file
Spectrum Survey Job/TopSURV 7 Job/ TopSURV PC Job	Spectrum Survey Job/TopSURV PC Job/ TopSURV 7 Job

Available parameters depend on the data in the selected file and the format being created.

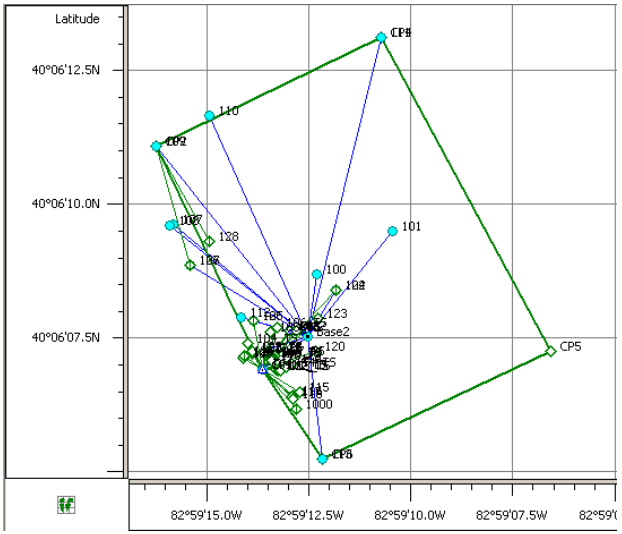
When converting from a Field Software Job file, no further parameters are required.

When converting to a Field Software Job file the following parameters are available:

1. Convert coordinate type and system (see “Convert Coordinate Type and System” on page 5-6)
2. Convert height (see “Convert Height” on page 5-8)
3. Convert coordinate order (see “Convert Coordinate Order” on page 5-9)
4. Convert metric unit (see “Convert Metric Unit” on page 5-9)
5. Convert angular unit (see “Convert Angular Unit” on page 5-10)
6. Convert vertical angle (see“Convert Vertical Angle” on page 5-10)

Example of Conversion Field Software File to Topcon Vector File

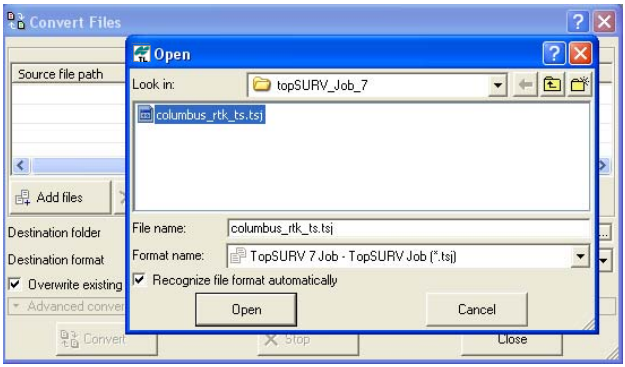
The following pages describe the example of conversion of the TopSURV 7 Job file (‘columbus_rtk_ts.tsj’). This file was collected by Topcon Controller FC -200 with TopSURV version 7.0 and was saved on the controller’s removable flash memory card. This job contains the TS measurements and GPS RTK observations:



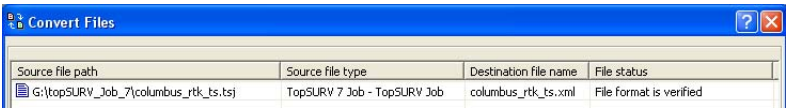
The task is to create the Topcon Vector file and save this file on the computer.

To create this file, we do the following steps:

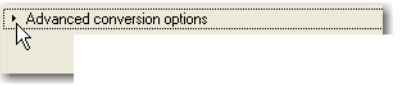
1. Insert the controller's removable flash memory card into the computer's card reader.
2. Click **File->Convert Files** and click **Add Files** in the window. The ***Import*** window displays.
3. Navigate to the desired file, highlight it and select the corresponding file format in the *Format name* field:



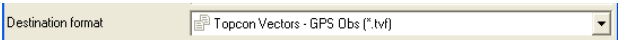
4. The converted file appears in the list of the converted files:



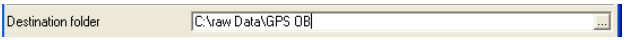
5. Check the Advanced conversion option checkbox:



6. Select the Topcon vector file format for the created file in the *Destination format* field:

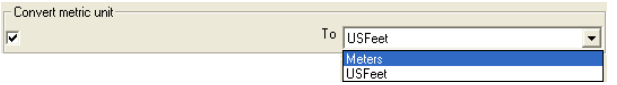


7. Type in a name of a new folder in the *Destination folder name* field:

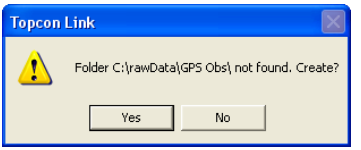


The created files will be stored in this folder.

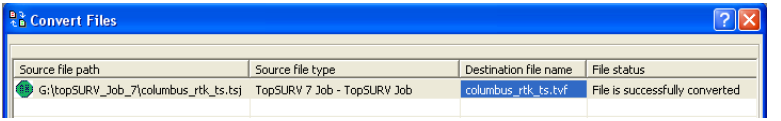
8. Select the desired metric unit for the created file:



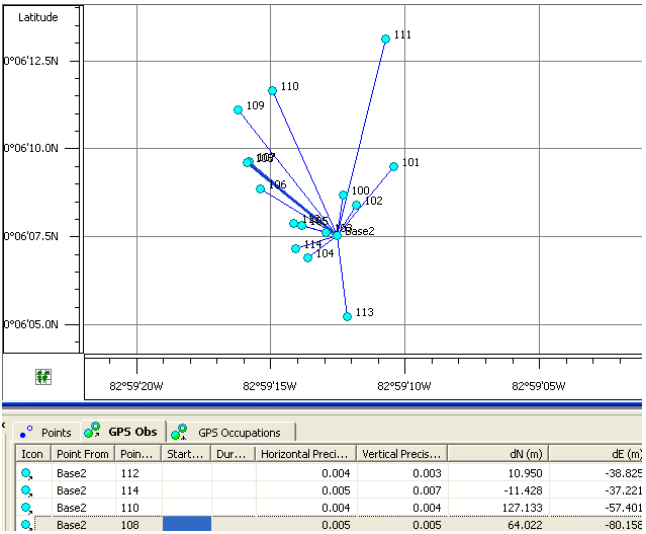
9. Click the **Convert** button. The following message appears:



10. Press **Yes** to create this folder. If the file conversion is successful, the ***Convert Files*** dialog box displays the following:



11. The created file has the following data:



TS Obs File Conversion Parameters

A total station observation file contains the distance and vertical/horizontal angles measurements from a station to a point. Table 5-11 lists the formats that a total station observation file can be converted to.

Table 5-11. TS Obs File Conversion Formats

From a...	To a...
TS Obs file: Custom Text Format, FC-5 Raw, GTS-210_310 Raw, GTS-6 Raw, GTS-7 Raw, GTS-7+ Raw, Topcon XML TS Obs; Sokkia SDR	Measurement file Coordinate file Design file GIS: ESRI Shape file Topcon XML file Field Software Job file TS Obs file
Field Software Job file	TS Obs file
Topcon XML file	TS Obs file
TS Obs file	TS Obs file

Available parameters depend on the data in the selected file and the format being created.

When converting from/to a Field Software Job file, the following parameters are available:

1. Convert coordinate system (see “Convert Coordinate Type and System” on page 5-6)
2. Convert height (see “Convert Height” on page 5-8)
3. Convert coordinate order (see “Convert Coordinate Order” on page 5-9)
4. Convert metric unit (see “Convert Metric Unit” on page 5-9)
5. Convert angular unit (see “Convert Angular Unit” on page 5-10)
6. Convert vertical angle (see“Convert Vertical Angle” on page 5-10)
7. Convert distance format (see“Convert Distance Format” on page 5-11)

X-Section Template File Conversion Parameters

A cross-section template file contains information used for creating a road. Table 5-12 lists the formats that a cross-section template file can be converted to/from.

Table 5-12. X-Section Template File Conversion Formats

From a...	To a...
X-Section Template file	X-Section Template file Field Software Job file
Field Software Job file If the Field Software file contains cross-section data.	X-Section Template file

When converting from/to X-section Template file, the user can select only the *Convert metric unit* option (see “Convert Metric Unit” on page 5-9).

Adding a Custom Projection

A projection contains pre-defined transformation data that is used for conversions between local and global positions. While Topcon Link includes a number of pre-defined projections, a custom projection may be needed for your job site or geographical area. Custom projections are included in the projection list.

1. On the ***Convert Files*** dialog box, click **Custom** next to the ***Projection*** selection box.
2. Click **Add**.

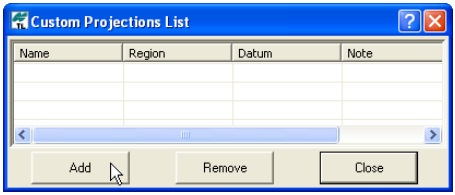


Figure 5-6. Custom Projections List

3. Enter a name for the new projection.
4. Select the type of projection and edit the parameters to create a custom projection. See Table 5-13 on page 5-39 for details and a description of editable parameters for each projection type.
5. Set remaining information for the custom projection.
6. Enter a region for the projection (for example: USA)
7. Enter any applicable notes, such as the projection used (for example: CA, Zone 5)

8. Select the datum for the projection

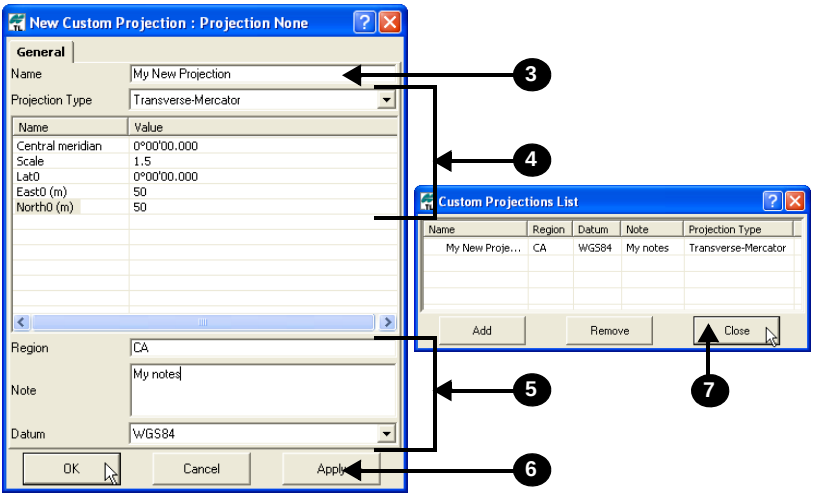


Figure 5-7. Enter Custom Projection Parameters – Example

9. Click **Apply** to set the information, then **Ok** to add the projection to the list of custom projections.
10. Click **Close** to exit the custom datum function.

The following table (Table 5-13 on page 5-39) describes projection types and lists the parameters available for creating a custom projection. A map projection is a systematic representation of all or part of the surface of a round body (the Earth) on a plane. Each projection is specified using a particular set of parameters and can be used for different territories or customized uses.

Table 5-13. Projection Types

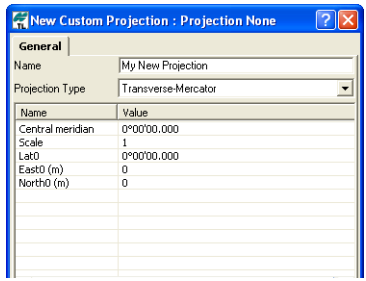
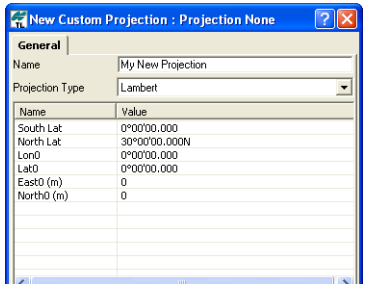
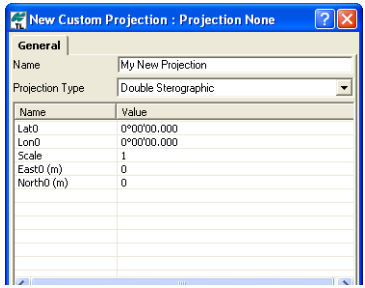
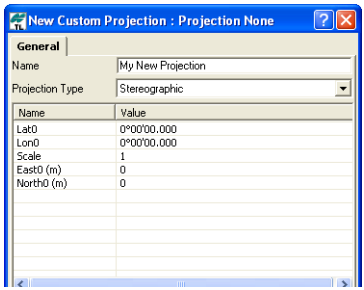
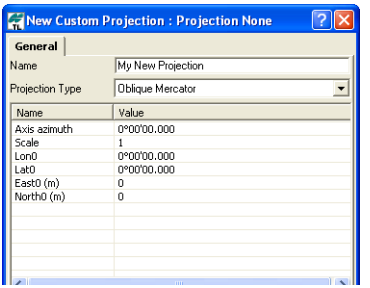
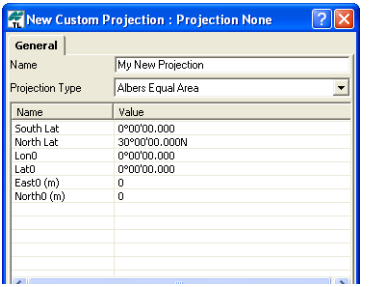
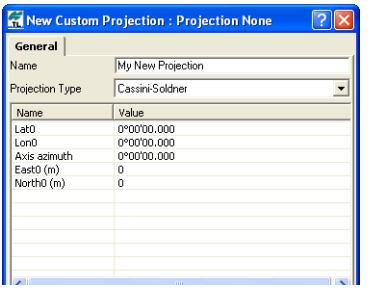
Projection Type and Editable Settings	Examples (With Defaults)
Transverse-Mercator A cylindrical projection of the Earth rotated at 90° relative to the equator. This projection creates little distortion of scale where the projected surface is tangent to the sphere representing the Earth. This projection is useful in areas of narrow longitudinal range.	
Lambert A conic conformal projection of the Earth. This projection is useful in areas with a predominant east-west expanse.	
Double Stereographic A spherical projection of the Earth first on conformal sphere, then on a plane, from a single point. This projection provides a perspective view while conformally mapping a sphere onto a plane. This projection is useful in single hemispheres.	
Stereographic A spherical projection of the Earth on a plane from a single point. This projection conformally maps shapes and angles, but creates areal distortion farther from the projection point. This projection is useful in single hemispheres.	

Table 5-13. Projection Types (Continued)

Projection Type and Editable Settings	Examples (With Defaults)
Oblique Mercator A cylindrical projection of the Earth rotated at some angle relative to a central line. This projection creates little distortion of scale where the projected surface is tangent to the sphere representing the Earth. This projection is useful in areas that are oblique from a other Mercator projections, that is an area predominantly neither east-west nor north-south.	
Albers Equal Area A conical, equal area projection of an area that uses two standard parallels to minimize distortion. This projection creates little distortion of angle and scale between two parallel lines. This projection is useful in equal-area, predominantly east-west regions.	
Cassini-Soldner A cylindrical, equidistant projection of the Earth rotated at 90° along the central meridian with lines plotted along an X,Y graph. This projection creates little distortion of scale along the meridian and lines perpendicular to the meridian. This projection is useful in simple mappings.	

Adding a Custom Datum

While Topcon Link includes a number of pre-defined datums from around the world, a custom datum may be needed for your particular jobsite or geographical area. Custom datums are included in the datum list.

1. On the ***Convert Files*** dialog box, click **Custom** next to the Datum selection box.
2. Click **Add**.

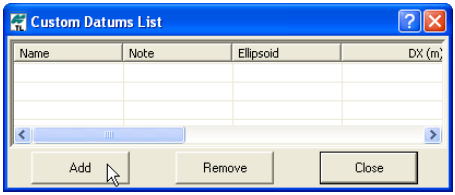


Figure 5-8. Custom Datums List

3. Set the following information for the new datum:
   - enter the new datum name
   - select the ellipsoid used for the datum
   - enter the DX, DY, DZ values for the ellipsoid's shift parameters (the default values are zero)
   - enter the RX, RY, RZ values for the ellipsoid's angle rotation parameters (the default values are zero)
   - enter the Scale by which to adjust the ellipsoid (the default value is zero)
   - enter any identifying notes for the datum

NOTICE

The shifts, rotations and scale parameters specify a coordinate transformation from the newly created reference datum to WGS84 according to the following equation:

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{WGS-84} = \begin{bmatrix} DX \\ DY \\ DZ \end{bmatrix} + (1 + Scale \cdot 10^{-6}) \cdot \begin{bmatrix} 1 & RZ & -RY \\ -RZ & 1 & RX \\ RY & -RX & 1 \end{bmatrix} \cdot \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{new-datum}$$

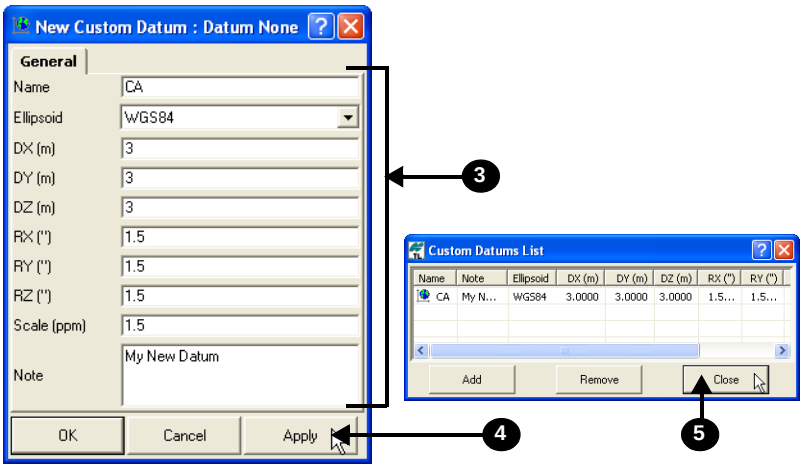


Figure 5-9. Enter Custom Datum Parameters

4. Click **Apply** to set the information, then **Ok** to add the datum to the list of custom datums.
5. Click **Close** to exit the custom datum function.

About Grid->Ground Parameters

A ground projection is a grid mapping projection re-scaled, rotated and shifted to convert point coordinates to another reference surface (up to average project elevation) to produce near ground values. To set a grid-to-ground transformation, Topcon Link rotates the ground system relative to the origin of the grid coordinate system.

1. To enter grid->ground parameters, enable the corresponding check box and click the browse button.
2. Set the scale factor using one of the following methods:
   - Select Avg. Job Height. Then enter an average height from all points in the job and enter the value of the Map Scale Factor.
   - Select Scale Factor. Then enter the value of the Map Scale Factor.

3. Enter the northing and easting offsets in meters from the origin of the grid coordinate system.
4. Enter the azimuth rotation angle in degrees/minutes/seconds between the grid and ground coordinate systems. This angle defines the reference direction for ground azimuths.
5. Click **Ok**.

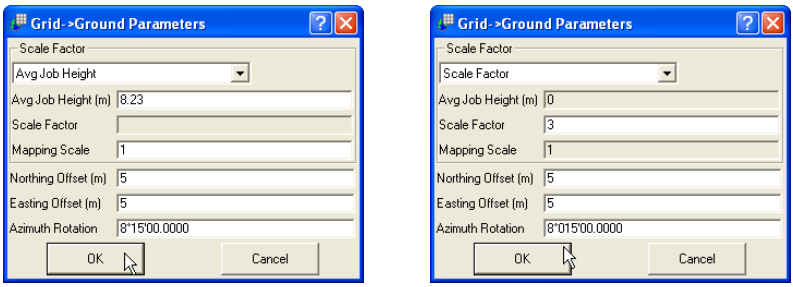


Figure 5-10. Enter Grid->Ground Parameters

Notes:

Editing Data in Topcon Link

After opening a file in Topcon Link, you may want to edit some data before saving it for post-processing or exporting it to a device. The following list describes just some of the edits you can perform to prepare data for other activities.

- Add a point
- Edit/add a GPS antenna
- Assign photo notes
- Edit codes/attributes and layers
- Edit lineworks parameters
- Edit total station observation offsets
- Edit horizontal/vertical alignments and X-sections of the opened road

Because many editing activities are similar, the sections in this chapter are set up to provide editing details based on data tables.

Editing Points

Among other editing activities, Topcon Link can be used to edit coordinates or point names, delete a measurement taken for another point, edit or enter the antenna height.

Add a Point

1. Open a file (excepting a GPS+ Raw Data file)
2. Click **Edit** ▸ **Add** ▸ **Point** (or click **Add Point** on the toolbar).
3. Enter a new name for the point.
4. Edit other parameters as needed. See “Edit in the Point Properties Dialog Box” on page 6-3 for more details.
5. Click **Apply** to save the new point. Click **Ok** to exit.

   The new point is added to the end of point listing.

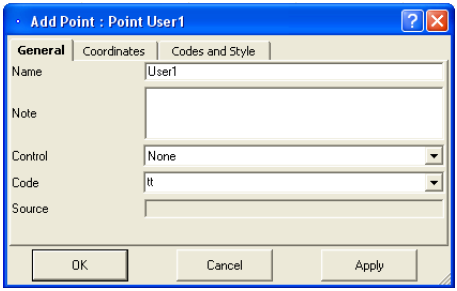


Figure 6-1. Edit New Point Parameters

If the user added a point with a code into a Field Software Jobs file, the CAD View displays this point:

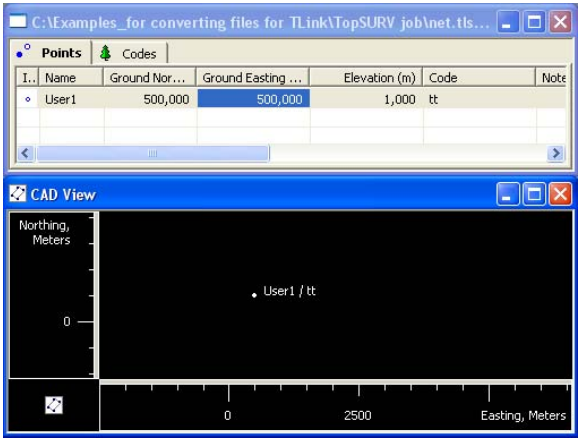


Figure 6-2. Points tab and Cad View

Edit on the Points Tab

You can edit all fields directly on the *Points* tab except the *Icon* and *Photo Notes*. Click-pause-click to access editable fields. Figure 6-3 shows an example of editing fields on the *Points* tab.

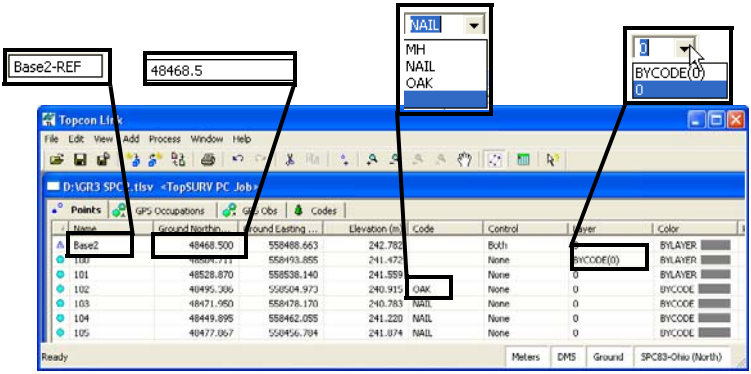


Figure 6-3. Editable Fields on the Points Tab – Example

Edit in the Point Properties Dialog Box

The available property tabs depend on the information in the file. For example, the *Offset* tab is only available if a point-to-line offset was measured.

If the file currently lacks the data being edited in the Properties dialog box, Topcon Link will ask to save to another format before continuing.

1. To edit a point's properties, double-click the desired point.
2. Edit the point's general properties:
   - Name – the name of the point
   - Note – any notes associated with the point
   - Code – the code of the point

3. Edit the point's coordinates (Latitude\Northing, Longitude\Easting and Elevation).

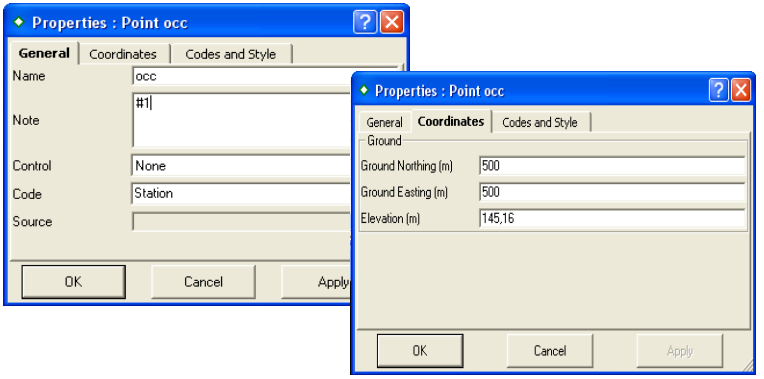


Figure 6-4. Edit General and Coordinate Properties

4. Edit the point's CAD information. The user can edit the data in the following field: *Code*, *String*, *Control Code* and *Control Code2*, *Color* and *Point Symbol*.

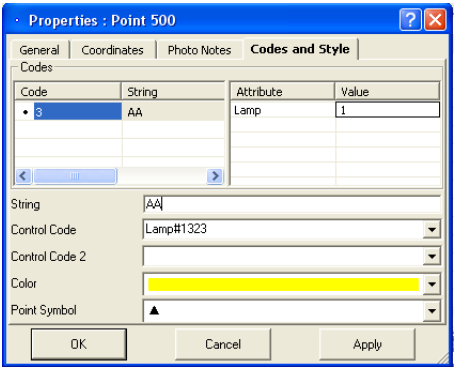


Figure 6-5. Edit CAD and Style Properties

5. The *Photo Notes* tab is available only for points of Field Software Jobs. The user can select a desired photo note from the list, or add/remove a photo note for the point. (The user can add *.jpg or *.bmp files of type).
   - To add a photo note, click **Add Photo Note**. Browse for and select the desired photo, click **Open**. The photo is added to the list, in the order added, and automatically applied to the point.

- To delete a photo note, select the photo from the list and click **Remove Photo Note**.

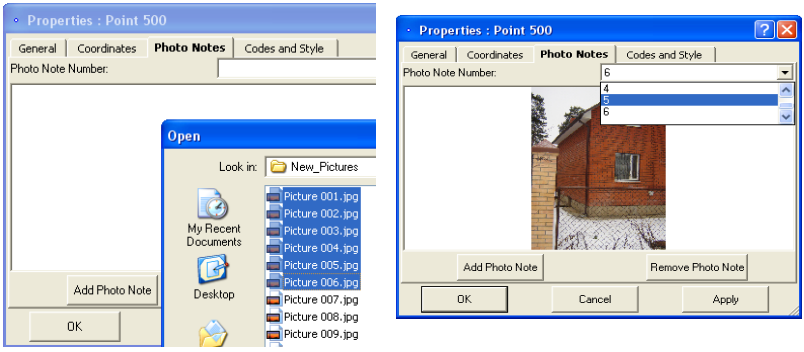


Figure 6-6. Edit Photo Note and Offset Properties

6. For PTL (point to line) points, edit the point's offset. To obtain new coordinates of the point after editing offset parameters, need click **Calculate Coordinates**. See ("About Editing Offsets in Topcon Link" on page 6-53) for more details

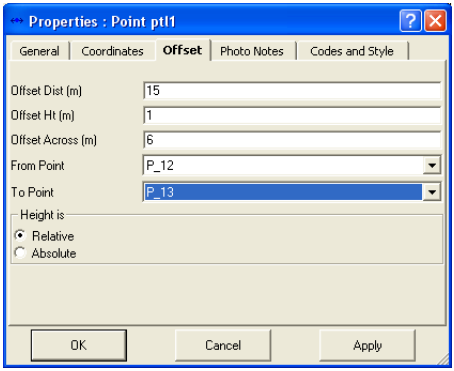


Figure 6-7. Edit Offsets for the PTL point

7. Click **Apply** to save the changes. Click **OK** to exit.

Editing GPS Occupations

Among other editing activities, Topcon Link can be used to edit the height of the antenna and the point name, associated with the occupation. A custom antenna can also be created and applied to an occupation.

Edit on the GPS Occupations Tab

You can edit the *Point Name*, *Antenna Type/Height/Height Method*, and *Note* fields directly on the *GPS Occupations* tab. Click-pause-click to access editable fields. Figure 6-8 shows an example of editing fields on the *GPS Occupations* tab.

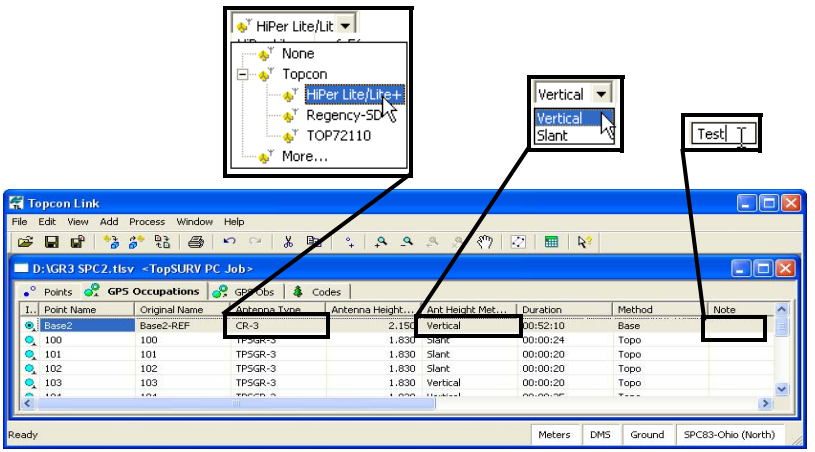
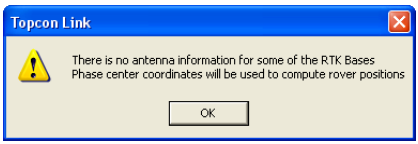


Figure 6-8. Editable Fields on the GPS Occupations Tab – Example

Edit in the GPS Occupations Properties Dialog Box

The available property tabs depend on the information in the file. For example, the *Offset* tab is only available if a line with known azimuth offset was measured.

Note the following restrictions when editing a GPS occupation:
- If making changes to a GPS occupation in a Field Software Jobs, the file must be saved to the same file format.
- If the RTK base station does not have any information about the antenna, Topcon Link will recalculate the coordinates of the rover's points from the phase center of the base antenna. In the given case, after clicking ***Compute Coordinate****, the following message appears:*



1. To edit a GPS occupation's properties, double-click the desired occupation.
2. Edit the GPS occupation's general properties. The Point Name and Note can be edited.

3. Edit the GPS occupation's antenna. To create/edit a custom antenna type, see "Add a Custom GPS Antenna" on page 6-9.

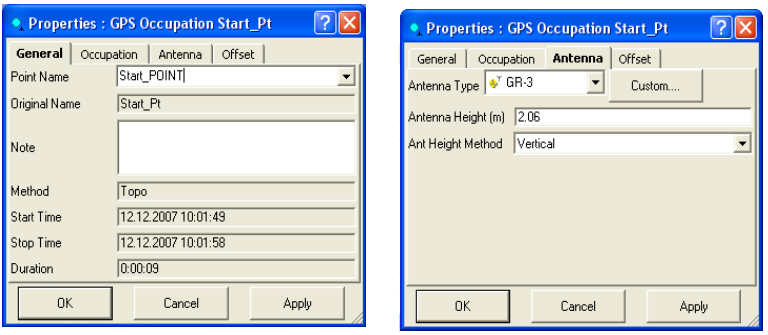


Figure 6-9. Edit General Coordinate Properties

4. Edit the GPS occupation's offsets. See ("About Editing Offsets in Topcon Link" on page 6-53) for more details.

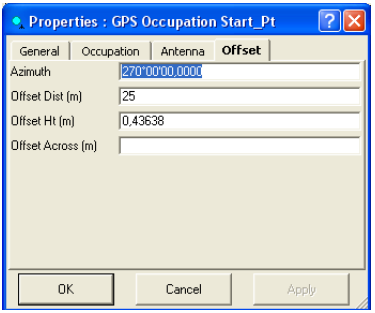


Figure 6-10. Edit Offset Properties

5. View information for the occupation (the number of epochs, the record interval, the GPS week and day of the occupation start time):

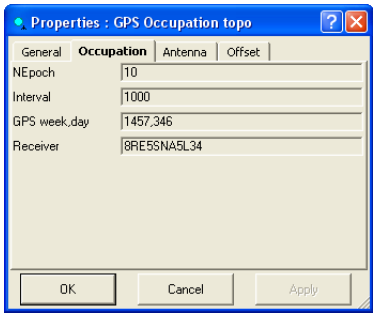


Figure 6-11. View Occupation Properties

6. Click **Apply** to save the changes. Click **OK** to exit

Add a Custom GPS Antenna

Each antenna type has unique phase center parameters obtained through factory calibration. These parameters are not viewable nor editable, but a custom antenna can be added to the Topcon Link list of antennas. You will need the measurements (calibrations) shown in Figure 6-12 to properly add a custom antenna and ensure correct coordinate computations.

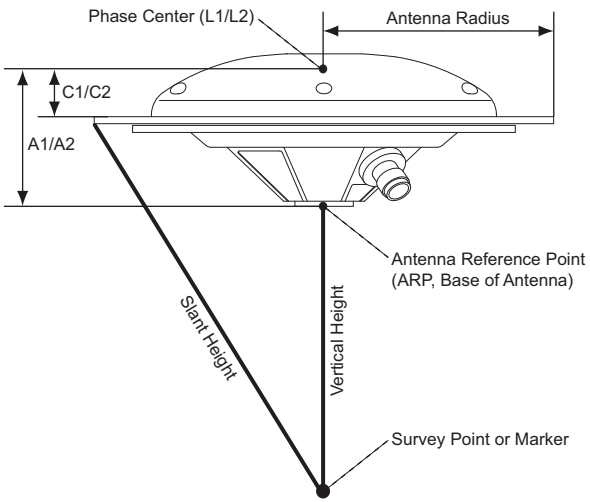


Figure 6-12. Determining Antenna Parameters

1. Measure or record the antenna's offset parameters as shown in Figure 6-12.
2. To add a custom antenna, double-click a GPS occupation.
3. On the *Antenna* tab, click **Custom**. Then click **Add**.

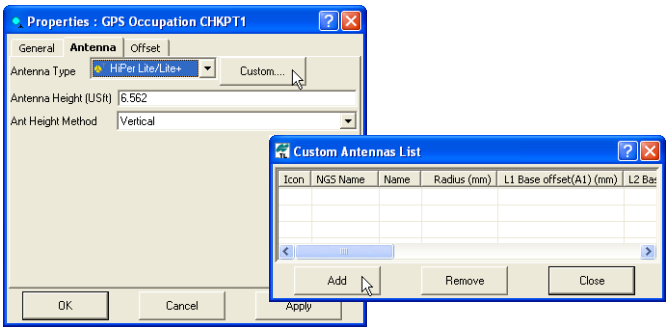


Figure 6-13. Add Custom Antenna

4. Enter the NGS name for the antenna and the display name for Topcon Link. NGS (National Geodetic Services) provides a common database for distributing official antenna designators and offset measurements.

5. Enter the measured offsets for the antenna and select the method used to measure the height.

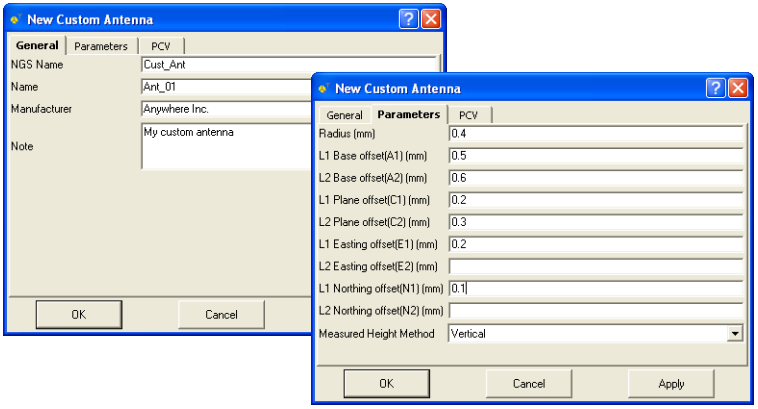


Figure 6-14. Enter General and Offset Parameters

6. Enter the PCV values. These values represent the antenna phase center variations.
7. Click **OK** to save the custom antenna and exit.

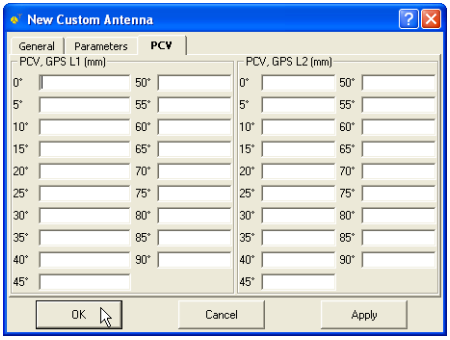


Figure 6-15. Enter PCV Parameters

To edit a custom antenna, double-click the antenna on the antenna in the custom antenna list. The antenna's properties dialog box displays.

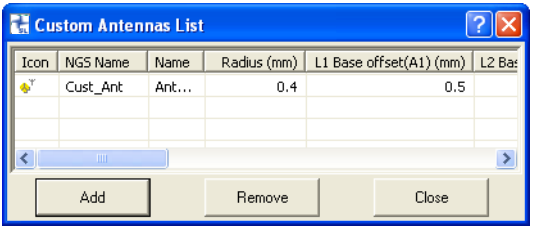


Figure 6-16. Custom Antennas

Editing TS Observations

Among other editing activities, Topcon Link can be used to edit the height of the reflector, the number of the observation, the point the observation was made to. You can also apply sting and control code values to the observation.

Edit on the TS Observations Tab

In the left panel, you can edit all fields except the Icon directly on the *TS Observations* tab. In the right panel, you can only edit the following fields: *Point To*, *Type* of measured point (except BKB points), *Azimuth* (only for BKB points measured from the point with unknown coordinates), *Reflector Height*, *Note*, *String* and *Control Code*, *Offsets*, etc.—directly on the *TS Observations* tab. Click-pause-click to access editable fields. Figure 6-17 shows an example of editing fields on the *TS Observations* tab.

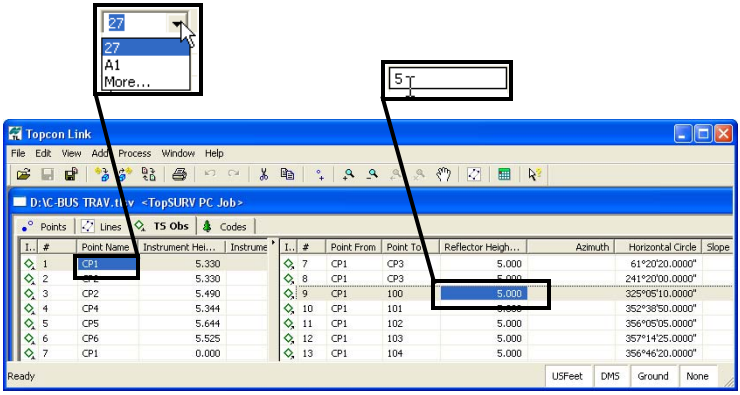


Figure 6-17. Editable Fields on the TS Observations Tab – Example

Edit in the TS Observations Properties Dialog Box

The available property tabs depend on the information in the file and in the selected observation. For example, the *Image* tab is only available if an image is associated with the observation.

Edit Left Panel TS Obs Properties

1. To edit a TS observation's left panel properties, double-click the desired observation in the left panel.
2. Edit the TS observation's general properties (point name, instrument height, order number).

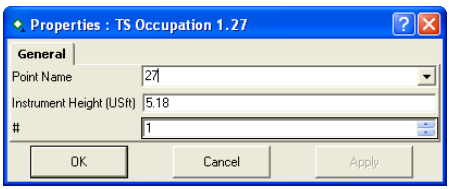


Figure 6-18. Edit General Properties for the Left Panel

Edit Right Panel TS Obs Properties

1. To edit a TS observation's right panel properties, select the observation in the left panel then double-click the desired measurement in the right panel.
2. Edit the TS observation's general properties. The following information can be edited in the *General* tab: Note, Code, String and Control Code.

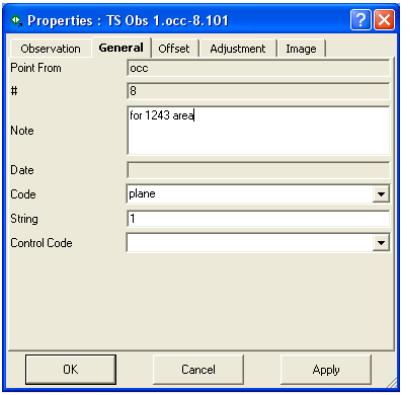


Figure 6-19. Edit General Properties

3. Edit data in the *Observation* tab. The following information can be edited:
   - Point To,
   - Type of measured point for side shot point (SS), backsight point (the previous occupation point) (BS), foresight point (the next occupation point) (FS), Horizontal/Vertical Resection/Resection points,
   - Azimuth only for backsight bearing point (BKB)

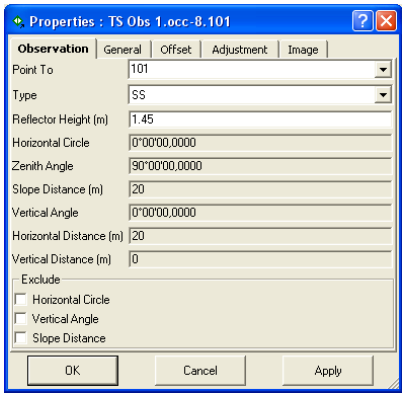


Figure 6-20. Edit Observation Properties

4. Edit the TS observation's offset properties. See ("About Editing Offsets in Topcon Link" on page 6-53) for more details.

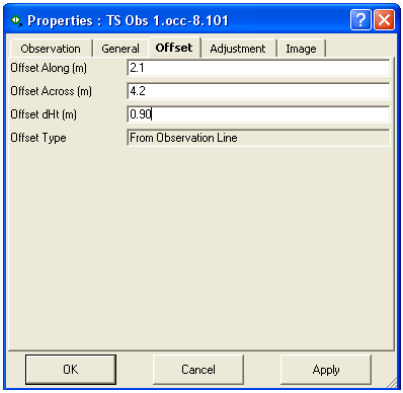


Figure 6-21. Edit Offset Properties

5. View the image(s) associated with the observation measurement in the *Image* tab.
6. View the residuals for observations after calculating coordinates in the *Adjustment* tab. Non-zero values of the residuals will be presented for repeated or redundant measurements.

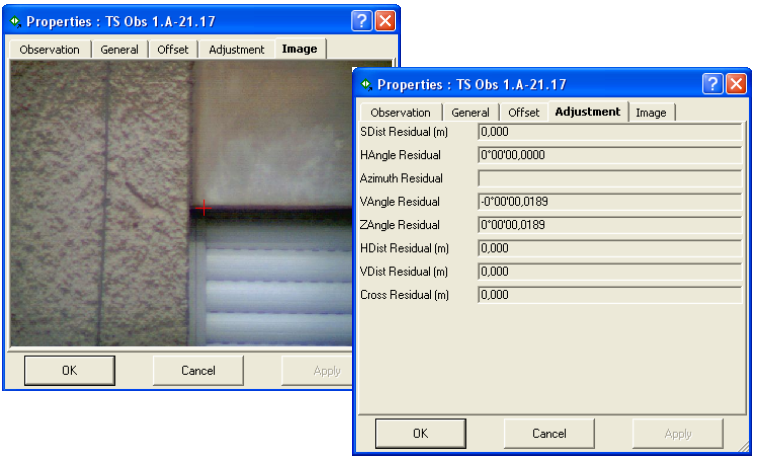


Figure 6-22. View Image and Adjustment Properties

Editing GPS Observations

Since GPS observations are based on GPS occupation measurements, the user can select/add antenna parameters for the base and the rover stations of the observation and can edit notes for the observation. To edit an occupation, see “Editing GPS Occupations” on page 6-6.

Edit on the GPS Observations Tab

You can only edit the *Note* field directly on the *GPS Observations* tab. All other fields are static in this tab. Click-pause-click to access editable fields. Figure 6-17 shows an example of editing this field on the *GPS Observations* tab.

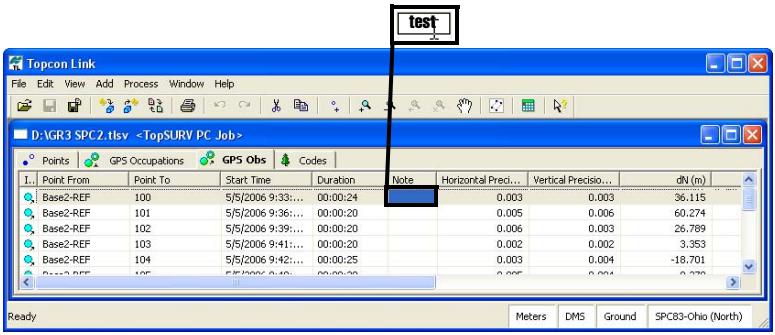


Figure 6-23. Editable Field on the GPS Observations Tab – Example

Edit and View in the GPS Observations Properties Dialog Box

The antenna parameters for the base and the rover stations and the notes associated with a GPS observation can be changed; all other fields are informational.

1. To edit a GPS observation's properties, double-click the desired observation.
2. As needed, edit the GPS observation's note in the *General* tab.

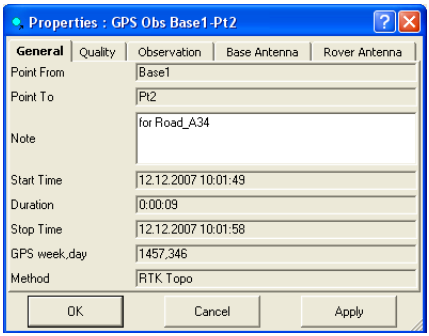


Figure 6-24. Edit General Properties

3. As needed, edit the antenna parameters for the base/rover stations in the corresponding tab:

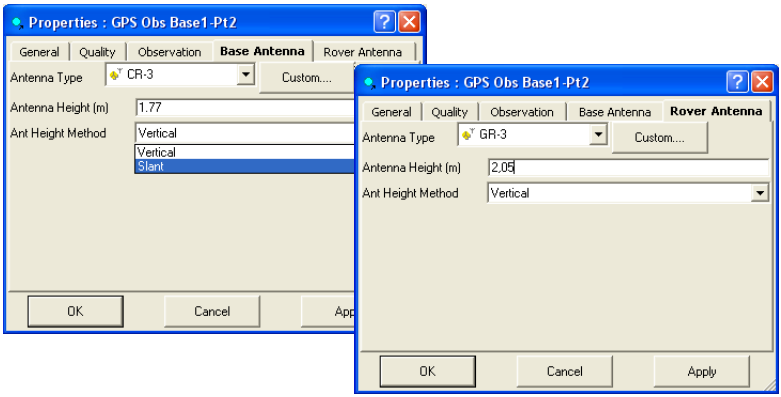


Figure 6-25. Edit Antenna Parameters

4. View the quality information about the observation measurement in the *Quality* tab (Precision, RTK Solution Type, Number of epochs, the common number of SV's observed by the base and rover in the last common epoch, the horizontal/vertical/total position dilution of precision in the last common epoch for RTK observation).
5. View the GPS observations solution components in the *Observation* tab.

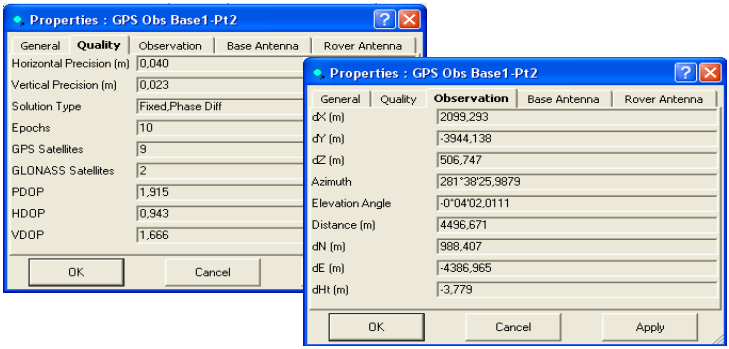


Figure 6-26. View Quality and Observation Properties

Editing Digital Level Observations

Among other editing activities, Topcon Link can be used to edit the level run of an observation, the point, and the vertical offset. Figure 6-27 shows typical observations taken with a digital level.

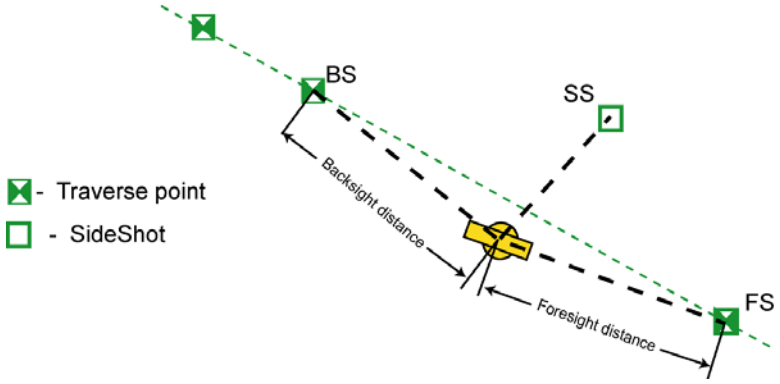


Figure 6-27. Example Digital Level Observation

The *DL Obs* tab displays a table containing two panels. The left panel displays the start and end level points of a job, and the right panel displays all level measurements of the selected job.

Edit on the DL Observations Tab

In the left panel, you can directly edit order, note, and level run fields directly on the *DL Observations* tab. In the right panel, you can only edit fields that correspond to available data — such as *Point*, *Vertical Offset,* and *Note*—directly on the *DL Observations* tab. Click-pause-click to access editable fields. Figure 6-28 shows an example of editing fields on the *DL Observations* tab.

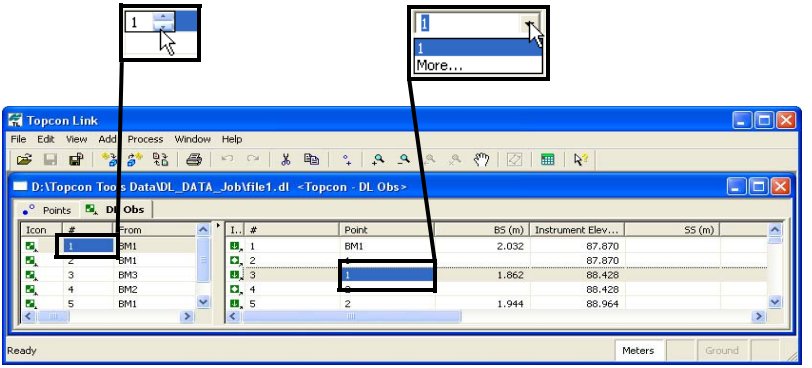


Figure 6-28. Editable Fields on the DL Observations Tab – Example

Edit in the DL Observations Properties Dialog Box

The available property tabs depend on the information in the file and in the selected observation. For example, the *Image* tab is only available if an image is associated with the observation

*If making changes to a digital level observation in a Field Software Jobs, the file may be saved to a *.tlsv / *.tsj and *.dl/ *.lev file format.*

Edit Left Panel DL Obs Properties

1. To edit a DL observation's left panel properties, double-click the desired observation in the left panel.
2. Edit the DL observation's general properties (level run name, note and level run order).

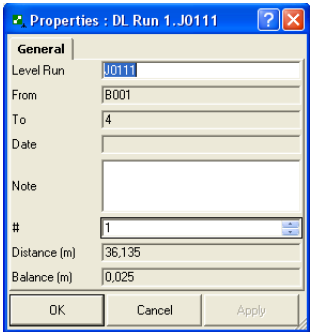


Figure 6-29. Edit General Properties for the Left Panel

Edit Right Panel DL Obs Properties

1. To edit a DL observation's right panel properties, select the observation in the left panel then double-click the desired measurement in the right panel.
2. Edit the DL observation's general properties.

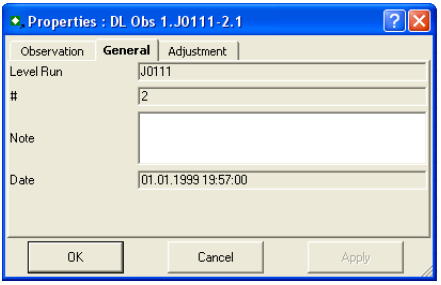


Figure 6-30. Edit General Properties for the Right Panel

3. Edit the Vertical offset and the measured point for the DL observation in the *Observation* tab.

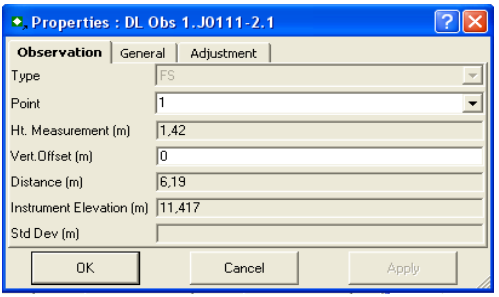


Figure 6-31. Edit Observation Properties

4. View the calculated elevation for the DL observation.

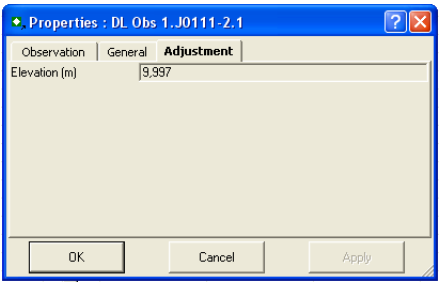


Figure 6-32. View Elevation Adjustment Properties

Editing Codes

Among other editing activities, Topcon Link can be used to edit codes and their attributes. New codes can also be created.

Edit on the Codes Tab

In the left panel, you can edit the code name (if this code is not used for point(s) of the current job) and layer for this code fields directly on the *Codes* tab; you can also add new codes and attributes to codes (if this code is not used for point(s)) using the pop-up menu. In the right panel, you can only edit the attribute name and default value

fields directly on the *Codes* tab. Click-pause-click to access editable fields. Figure 6-28 shows an example of editing fields on the *Codes* tab.

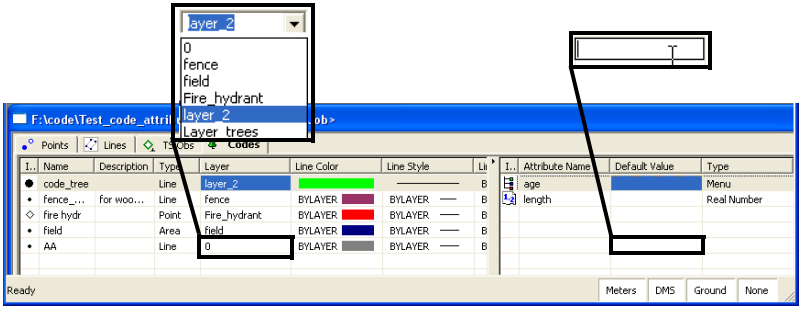


Figure 6-33. Editable Fields on the Codes Tab – Example

Add a Code

1. To add a code, right-click in the left panel and click **New Code**. Enter a name and plotting style for the code. Click **Ok** to save
2. The new code is added to the bottom of the code list. For more information, see “Edit in the Code or Attribute Properties Dialog Box” on page 6-25.

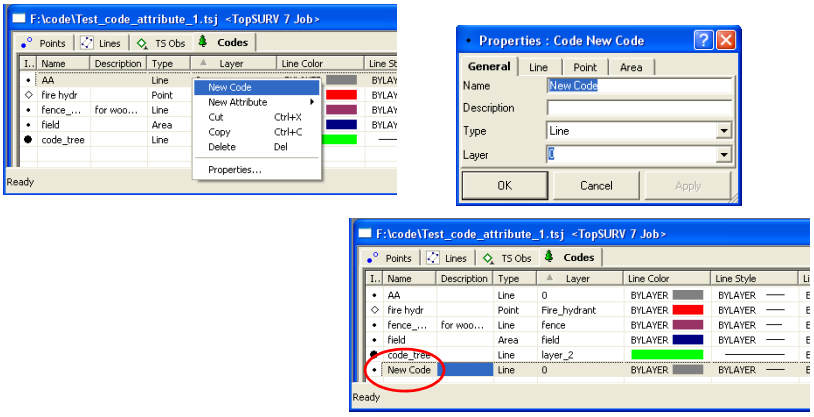


Figure 6-34. Add New Code

Add an Attribute

As many attributes can be assigned to a code as needed. Attributes can be an integer, a real number, a text string, or selected from a menu.

1. To add an attribute, right-click in the left panel, click **New Attribute**, then select the type of attribute.
2. Enter a name and default value for the attribute. Click **Ok** to save.

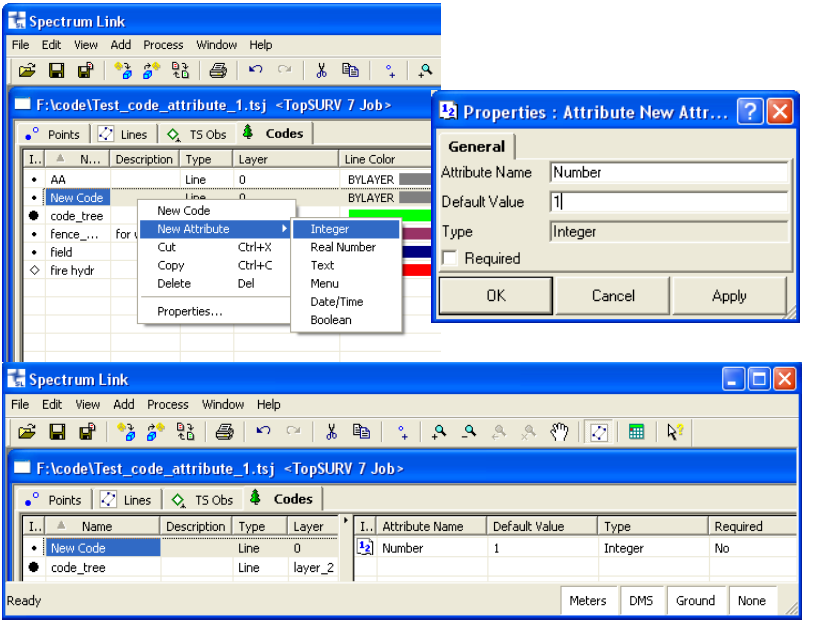


Figure 6-35. Add New Attribute

Edit in the Code or Attribute Properties Dialog Box

The property tabs create or edit a new code and assign plotting styles to lines and points associated with that code.

Edit Left Panel Code Properties

1. To edit the properties for a code, double-click the desired code in the left panel.
2. Edit the Code's general properties (code name and layer).
3. Edit the Code's plotting styles for line and points.
4. Click **Ok** to save.

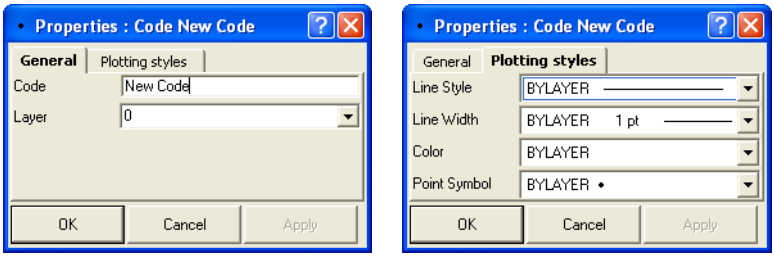


Figure 6-36. Edit Properties for the Code

Edit Right Panel Attribute Properties

1. To edit the attribute properties for a code, select the code in the left panel then double-click the desired attribute in the right panel.

2. For Integer, Real Number, Text, Boolean and Date attributes, edit the name and default value properties.

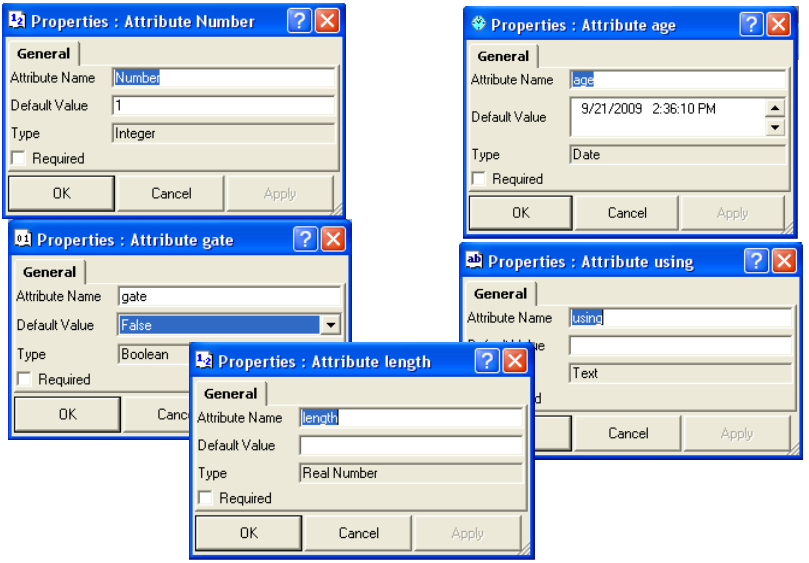


Figure 6-37. Edit General Properties for Integer, Real Number, Text, Boolean and Date Attributes

3. To add a value to a Menu attribute, type the value and click **Add**. The value is saved in the file and with the attribute to be selected for other attributes with the same name
4. All these dialog boxes contain the *Required* check box. This parameter is used in the software for surveying. If it is set to "Yes", the user will be asked to enter the attribute value every time he (or she) uses the corresponding code. If it is set to "No", the default attribute value will be used automatically. In Topcon Link this parameter is used only for displaying attribute status for the corresponding codes during data collection.

5. To delete the value, select it and click delete.

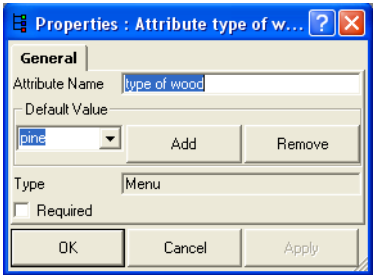


Figure 6-38. Edit General Properties for a Menu Attribute

Editing Line

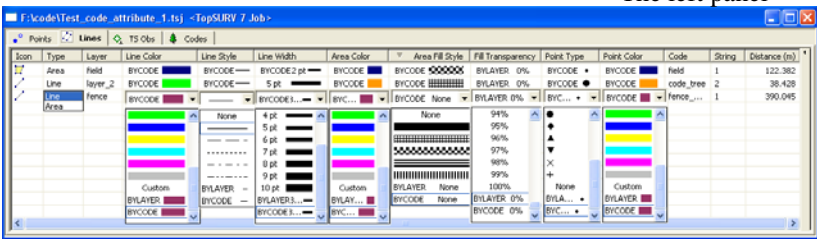
Among other editing activities, Topcon Link can be used to edit layer, line type (line or area), and line segments.

Edit on the Line Tab

In the left panels, you can edit line type (Line/Area), plotting style for line (Line Color/Line Style/Line Width/Area Color/Area Fill Style/ Fill Transparency), plotting style for point (Point Type/Point Color) and select new layer directly on the *Lines* tab (Figure 6-39 on page 6-28).

In the right panels, you can edit only the name of the line's vertex (*Point* field). Click-pause-click to access editable fields. Figure 6-39 shows an example of editing fields on the *Lines* tab.

The left panel



The right panel

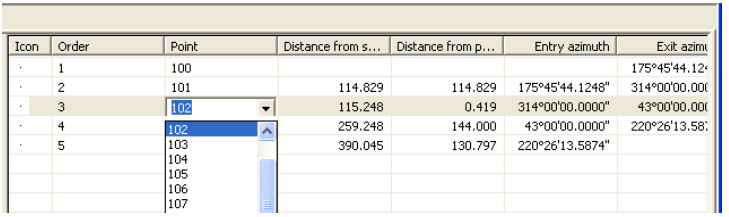


Figure 6-39. Editable Fields on the Line Tab – Example

Line segments (in the right panel) can only be edited in the Tabular view as shown above.

Edit and View in the Line Properties Dialog Box

Only line information and plotting styles can be changed; all other fields are informational.

Edit Left Panel Line Properties

1. To edit the properties for line, double-click the desired line in the left panel.
2. Edit the line's general properties and view its length.
3. Edit the line's plotting styles.
4. View CoGo information.

5. View and edit the photonotes of this line.
6. Click **Ok** to save.

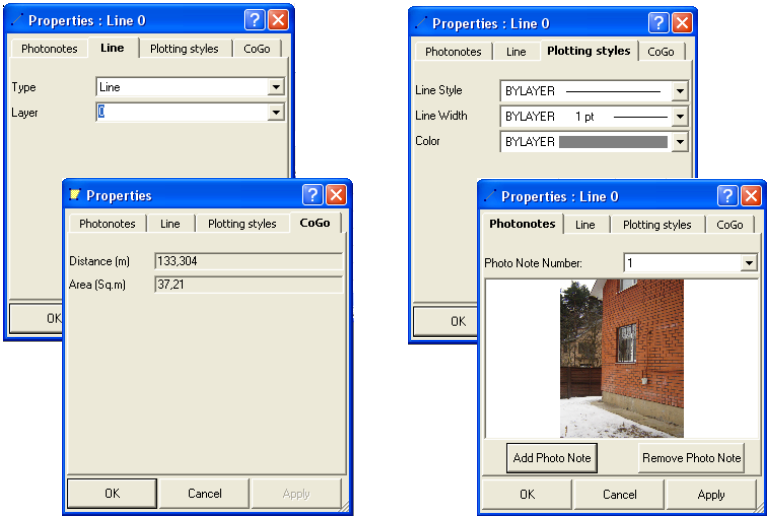


Figure 6-40. Edit Properties for the Line

Editing Tape Dimensions

Among other editing activities, Topcon Link can be used to edit start and end points, tape distance, and point to for a tape dimension.

Tape dimensions are measurements of lines perpendicular to a reference line. The reference line is defined using two points with known coordinates. Figure 6-41 shows tape dimensions measured from a reference line (between points 1 and 2).

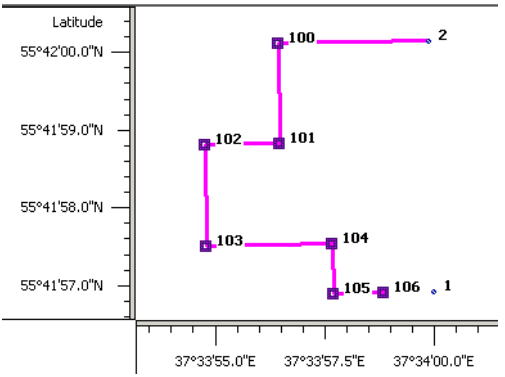


Figure 6-41. Example Tape Dimension Measurements – CAD View

Edit on the Tape Dimensions Tab

In the left panel, you can edit all fields, directly on the *Tape Dimensions* tab. In the right panel, you can edit all fields, except the *Date*, directly on the *Tape Dimensions* tab. Click-pause-click to access editable fields. Figure 6-42 shows an example of editing fields on the *Tape Dimensions* tab.

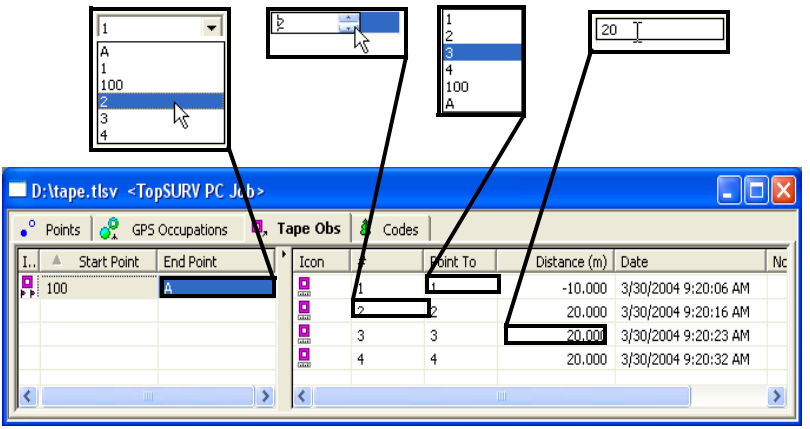


Figure 6-42. Editable Fields on the Line Tab – Example

Edit in the Tape Dimensions Properties Dialog Box

Available tabs depend on the selected object, either a tape or a dimension.

Edit Left Panel Tape Dimension Properties

1. To edit the properties for the tape dimension, double-click the desired tape in the left panel.
2. Edit the tape dimension's start and end point.
3. Click **Ok** to save.

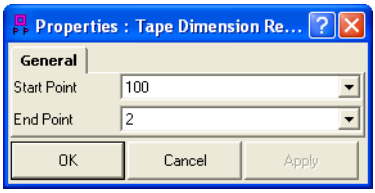


Figure 6-43. Edit Properties for the Tape Dimension

Edit Right Panel Dimension Properties

1. To edit the properties for the dimension, double-click the desired dimension in the right panel.
2. Edit the dimension's general properties and view the date it was measured.
3. Click **Ok** to save.

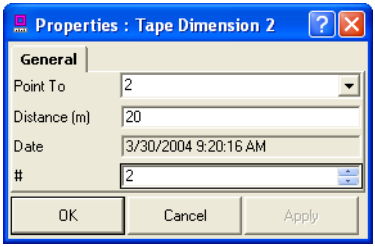


Figure 6-44. Edit Properties for the Dimension

Edit Image Properties

The *Images* tab displays when the file contains data associated with captured images, such as data obtained using the GPT-7000i total station.

Adding a photo note to data will also cause the *Images* tab to display.

Note the following restrictions when editing Images:
- Topcon Link expects images to reside in a folder with the same name as the data file. For example, data from the "050119.tlsv" file will be associated with images in the "050119" folder.
- The data file and image folder must reside in the same directory for the images to display.

The *Images* tab contains thumbnails of images in the file in the left panel and the selected image, with associated points and line, in the right panel. Figure 6-42 shows an example of the fields on the *Images* tab.

- A red cross indicates the point that the image is associated with.
- The currently selected point(s) is indicated with corner edges.
- The currently selected line(s) is highlighted.

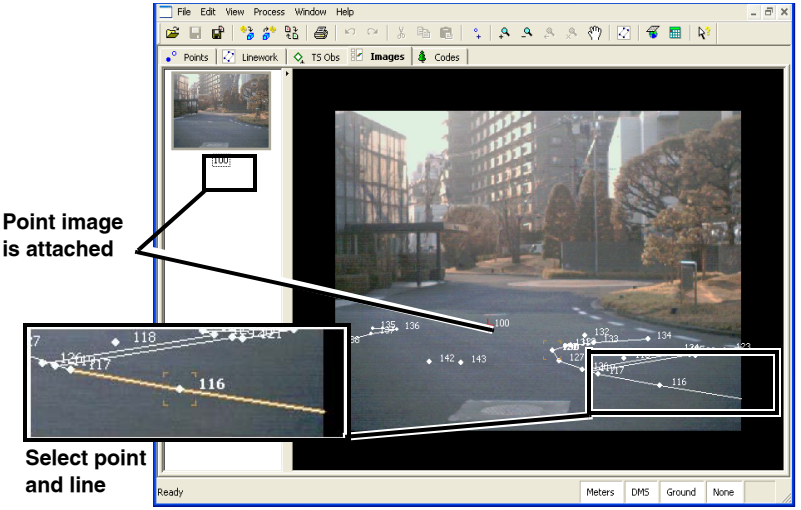


Figure 6-45. Viewing Images

While photo images cannot be edited, any points or lines associated and displayed on the image in the right panel can be edited. Double-clicking the point/line will open the corresponding ***Properties*** dialog box. See the following sections for editing this data:

- “Edit Image Point Properties” on page 6-34
- “Edit Image Line Properties” on page 6-35

View Image Properties

1. To view the properties for the image, double-click the desired image in the left panel.
2. View the image's general properties.
3. View a larger size of the image without associated points/line.
4. Click **Ok** to exit.

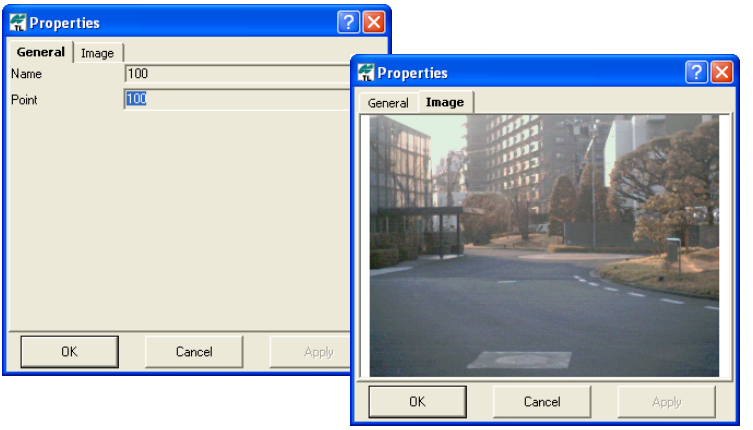


Figure 6-46. View Properties for the Image

Edit Image Point Properties

1. To view the properties for a point on an image, double-click the point on the image in the right panel.
2. Edit desired fields as described in "Edit in the Point Properties Dialog Box" on page 6-3.
3. View the image associated with the point.

4. Click **Apply** to save the changes. Click **OK** to exit.

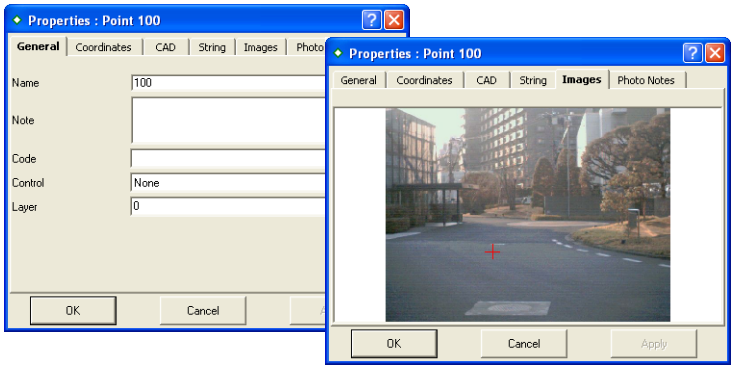


Figure 6-47. Edit Properties for Point on Image

Edit Image Line Properties

1. To view the properties for a line on an image, double-click the line on the image in the right panel.
2. Edit the line's general properties (line or area type, ordered sequence, layer assigned to). View the line's code and its from/to points.
3. Edit the line's plotting styles.
4. Edit the control codes used to for the line View the string assigned to the code.
5. Click **Apply** to save the changes. Click **OK** to exit.

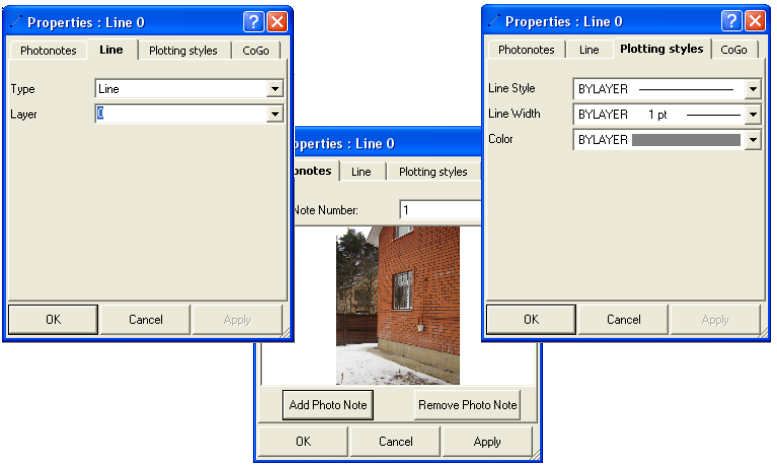


Figure 6-48. Edit Properties for Line on Image

Editing X-Section Templates

Among other editing activities, Topcon Link can be used to edit much of the information associated with cross section template, including the slopes, distances, and grades of the template items.

Edit on the X-Section Templates Tab

In the left panel, you can edit all fields, except the Icon, directly on the *X-Section Templates* tab. In the right panel, you can edit all fields, except the Icon and Hz/V Offset, directly on the *X-Section Templates* tab. Click-pause-click to access editable fields. Figure 6-49 shows an example of editing fields on the *X-Section Templates* tab.

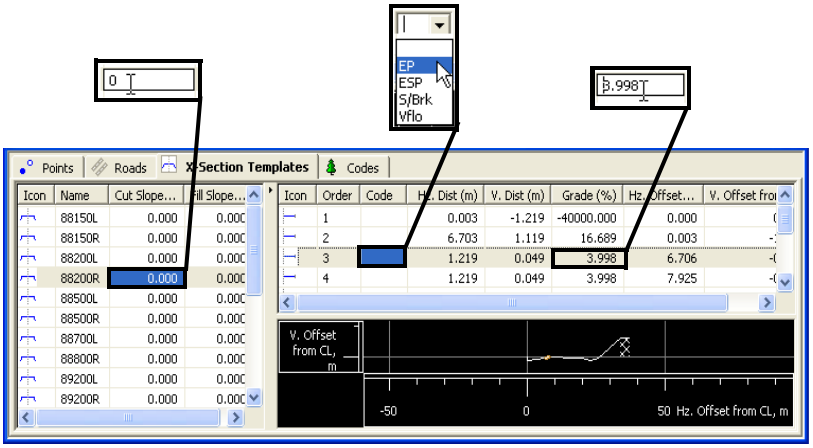


Figure 6-49. Editable Fields on the X-SEction Templates Tab – Example

Edit in the X-Section Templates Properties Dialog Box

Much of the information associated with cross section templates can be edited, except segment offsets.

Edit Left Panel X-Section Template Properties

1. To edit the properties for the x-section template, double-click the desired template in the left panel.
2. Edit the x-section template's name and cut/fill slopes.
3. Click **Apply** to save the changes. Click **OK** to exit.

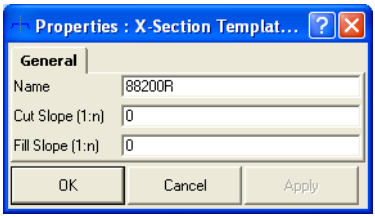


Figure 6-50. Edit Properties for the X-Section Template

Edit Right Panel Segment Properties

1. To edit the properties for a segment of the cross section template, double-click the desired segment in the right panel

*You can also double-click the segment in the graph to open the **Properties** dialog box.*

2. Edit the segment's order, horizontal/vertical distance, percentage of grade, and code. View the horizontal/vertical offsets from the centerline.
3. Click **Apply** to save the changes. Click **OK** to exit.

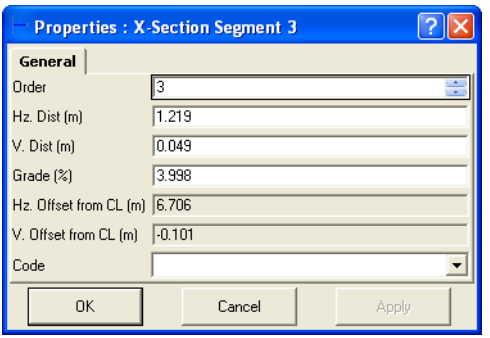


Figure 6-51. Edit Properties for a Segment of the X-Section Template

Editing Roads

Among other editing activities, Topcon Link can be used to edit alignments of center line, cross-section information (for a road with X-section) and string set that describe the parameters of the surface road (for a road with String Set).

TopSURV version 8.0 and later allows one to create a road using one of two following ways:

1. Through horizontal and vertical projections of the center line (alignments) and lines representing the surface of the road and

lying in the planes perpendicular to the center line (X-Section) (see “Road with X-Section” on page A-30).

2. Through a set of several strings (String Set). Every separate string in the set is defined by one or several pairs of the horizontal and vertical alignments (see “Road with String Set” on page A-35).

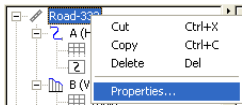
Using Topcon Link the customer can edit road with X-section and road with String Set.

Editing Roads with X-Section

A road with X-section as an object can be described through the horizontal and vertical projections of the center line, called alignments, and the line describing the surface of the road and lying in the plane perpendicular to the center line, called a cross section (x-section). An alignment can be divided into sections, each of which can be described using algebraic functions.

- The horizontal alignment can be described through lines, spirals, curves and intersection points.
- The vertical alignment can be described through grade, parabola and circular arc.
- The cross-section can be described using templates. (To edit the templates for cross-sections, see “Editing X-Section Templates” on page 6-36.)

1. To edit the properties for a road, double-click the desired road in the left panel of the *Roads* tab:



2. Edit the name of the road, the coordinates of the start point, Start Sta/Chainage and Stationing Stakeout Interval.

3. Select a horizontal/vertical alignment and X-section from the list of the used alignments/ X-sections in the given Field Software job.

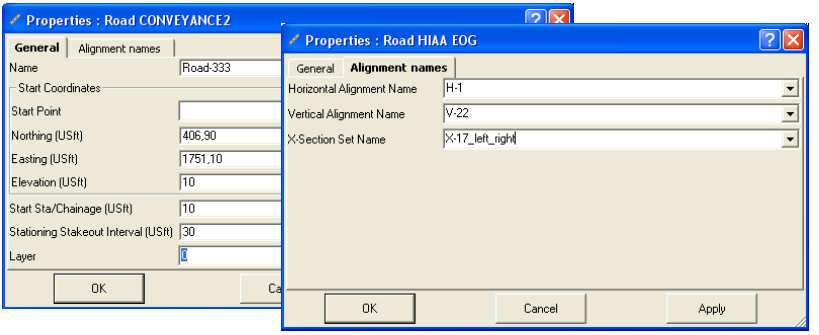


Figure 6-52. Edit Properties for the Road

Edit on the Roads Tab

In the horizontal alignment panel, you can edit the following fields directly on the *Roads* tab. Click-pause-click to access editable fields.

- order
- azimuth
- length
- turn
- start radius
- tangential to previous element
- spiral direction
- delta
- chord
- tangent
- mid ord
- external
- start degree chord
- start degree curve

Figure 6-53 shows an example of editing fields on the *Roads* tab, horizontal alignment panel.

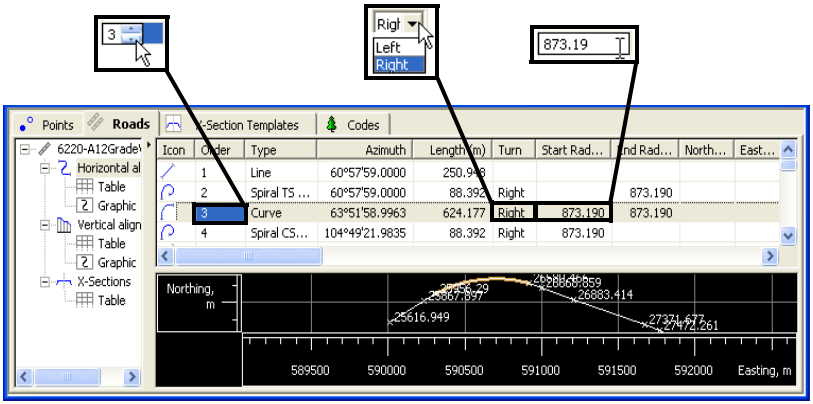


Figure 6-53. Editable Fields on the Roads Tab – Horizontal Alignment Example

- In the vertical alignment panel, you can edit only the Sta/Chainage, Length, and Elevation fields directly on the *Roads* tab. Click-pause-click to access editable fields. Figure 6-54 shows an example of editing fields on the *Roads* tab, vertical alignment panel.

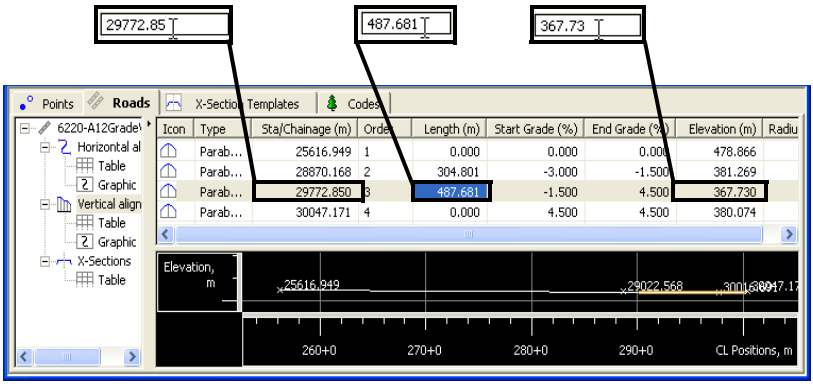


Figure 6-54. Editable Fields on the Roads Tab – Vertical Alignment Example

In the x-sections panel, you can edit all fields, except the Icon, directly on the *Roads* tab. Click-pause-click to access editable fields.

Figure 6-55 shows an example of editing fields on the *Roads* tab, X-Sections panel.

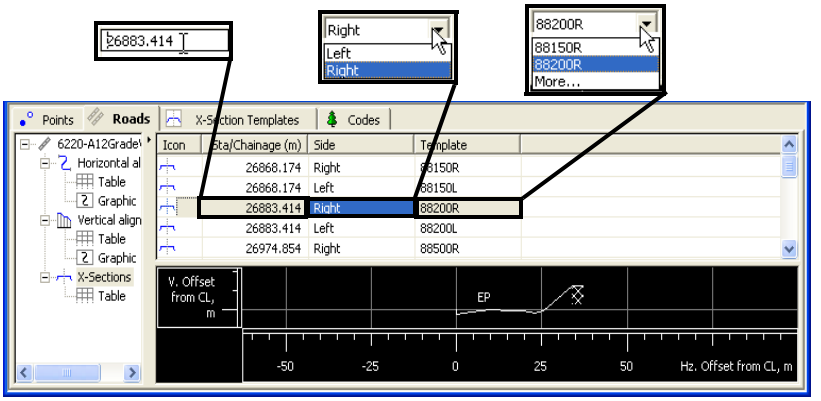
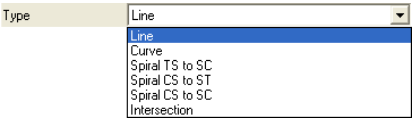


Figure 6-55. Editable Fields on the Roads Tab – X-Sections Example

Edit in the Horizontal Alignment Properties Dialog Box

The user can edit the type of element in the ***Properties*** dialog box. The user can select the following horizontal element:



If the current type of element is changed, the corresponding ***Properties*** dialog box will be appeared for the selected element.

Edit Line Segment Properties

1. To edit the properties for a line segment, double-click the desired segment in the horizontal alignment table

In the graph view, double-click the segment to open the ***Properties*** *dialog box.*

2. View the end position for the line segment.

3. Edit the general properties for the line segment.
   - The tangential to previous element is unavailable if the first segment is a line.
   - Edit the type of element, the azimuth, order, and length as needed.
4. Click **Apply** to save the changes. Click **OK** to exit.

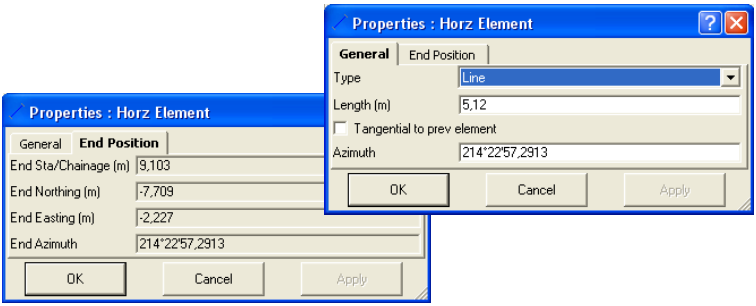


Figure 6-56. Edit Properties for a Line Segment in a Horizontal Alignment

Edit Curve Segment Properties

1. To edit the properties for a curve segment, double-click the desired segment in the horizontal alignment table.

*In the graph view, double-click the segment to open the **Properties** dialog box*

2. View the end position for the curve segment.
3. Edit the general properties for the curve segment.
   - Select whether or not the segment is tangential to the previous element.
   - Edit the type of element.
   - Edit the azimuth and order of the curve segment.
   - Edit the length for the curve segment.
   - Edit the radius of the curve segment.

4. Click Apply to save the changes. Click **OK** to exit.

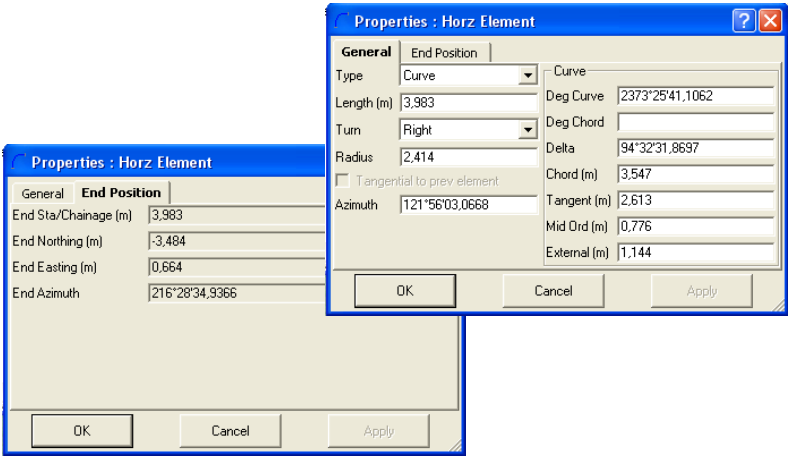


Figure 6-57. Edit Properties for a Curve Segment in a Horizontal Alignment

Edit Spiral Segment Properties

1. To edit the properties for a spiral segment, double-click the desired segment in the horizontal alignment table.

In the graph view, double-click the segment to open the ***Properties*** *dialog box*

2. View the end position for the spiral alignment.
3. Edit the general properties for the spiral alignment.
   - Select whether or not the segment is tangential to the previous element.
   - Edit the type of element
   - Edit the azimuth and order of the spiral segment.
   - Edit the length and spiral constant for the spiral segment.
   - Edit the spiral direction.
   - Edit the radius of the spiral segment.

4. Click **Apply** to save the changes. Click **OK** to exit.

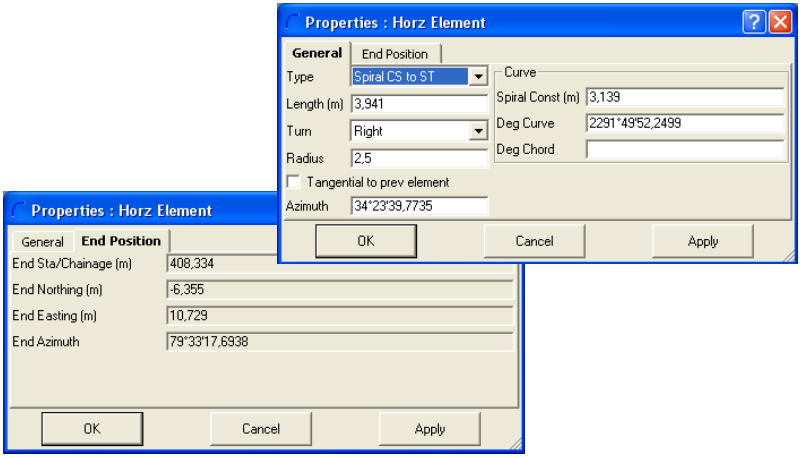


Figure 6-58. Edit Properties for a Spiral Segment in a Horizontal Alignment

Edit in the Vertical Alignment Properties Dialog Box

1. To edit the properties for the vertical alignment, double-click the desired alignment in the vertical alignment table.

In the graph view, double-click the segment to open the ***Properties*** *dialog box*

2. Edit the type of the alignment (Parabola Long Section and Arc Long Section), alignment's station/chainage, length/radius, and elevation.

3. Click **Apply** to save the changes. Click **OK** to exit.

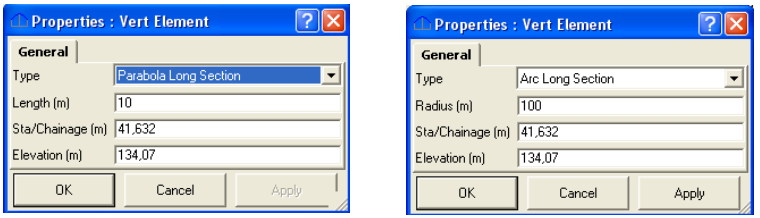


Figure 6-59. Edit Properties for the Vertical Alignment

Edit in the X-Section Properties Dialog Box

Edit Template Properties

1. To edit the properties for the x-section template, double-click the desired template in the *X-Section* table.
2. View the name of used x-section template for the road.
3. Click **Apply** to save the changes. Click **OK** to exit.

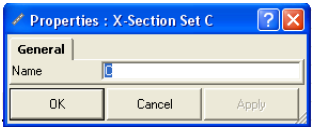


Figure 6-60. Edit Properties for the X-Section

Editing Roads with String Set

For a Field Software Job that contains a road with String Set, the Roads tab displays two panels:

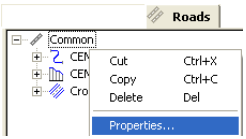
- the left - the name of every road in the job and the names of components of the road,
- the right - in table and graphic view, parameters of horizontal and vertical alignment of the center line, and string sets for the road selected in the left panel.

The left panel contains a data tree with the following entries for each road in the job.

- Horizontal alignment of the center line can be described through lines, spirals, curves and intersection points

- Vertical alignment of the center line can be described through grade, parabola and circular arc
- String set can be described through set of the strings. Every road string is described by the pair or pairs of the horizontal/vertical alignments (HA-VA)

1. To edit the properties for a road, double-click the desired road in the left panel of the *Roads* tab:



2. In the *General* tab edit a name of the road, the starting station or chainage for the road, the stationing stakeout interval in current linear units, the layer in which to store the road, the working corridor is set to use in the Road Stakeout.

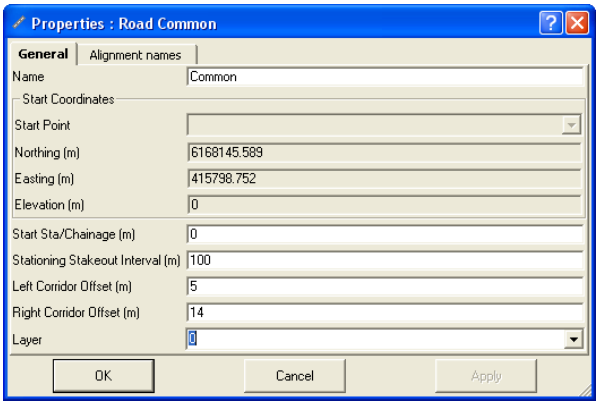


Figure 6-61. Edit Properties for the Road with String Set: General Tab

Note: Entering the working corridor values in Topcon Link does not change the view of the road in this software. These values will be applied only in TopSURV. There is the following rule for creating the working corridor: the value of the left corridor offset has to be less or equal to the value of the right corridor offset.

3. In the *Alignment names* tab select the desired alignment from the list of pre-defined alignments for horizontal and/or vertical

alignments, and select a road string set that describes the parameters of the surface road.

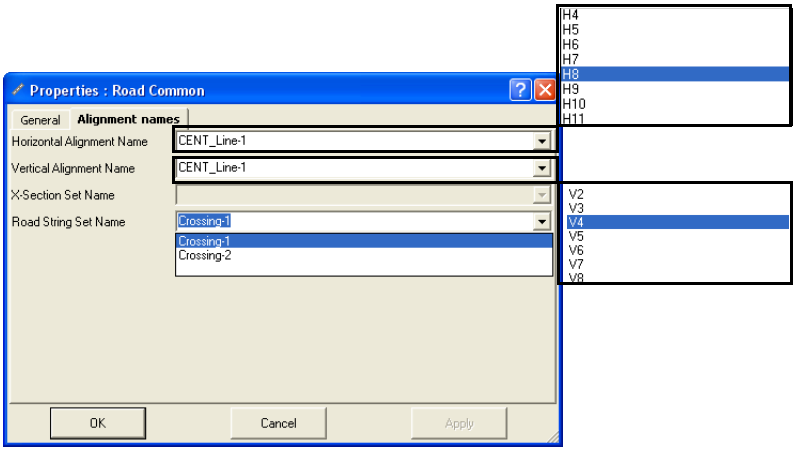


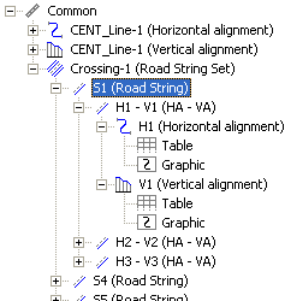
Figure 6-62. Edit Properties for the Road with String Set: Alignment Names Tab

Edit horizontal/vertical alignments of center line

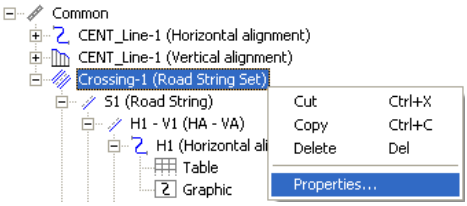
All types of lines, curves, spirals, intersections, grades, parabola and circular arks used for creating horizontal and vertical alignments of a road with String set, are the same as used for alignments editing of a road with X-section. See “Edit on the Roads Tab” on page 6-40 for details.

Edit in the String Set Properties Dialog Box

The left panel of the *Road* tab displays the String Set configuration, as set of the strings. Every road string is described by the pair or pairs of the horizontal/vertical alignments (HA-VA). And every alignment is editable:



To edit any object of the road string set (road string, pair, alignment) of the road, highlight this object and select the *Properties* from the pop-up menu:



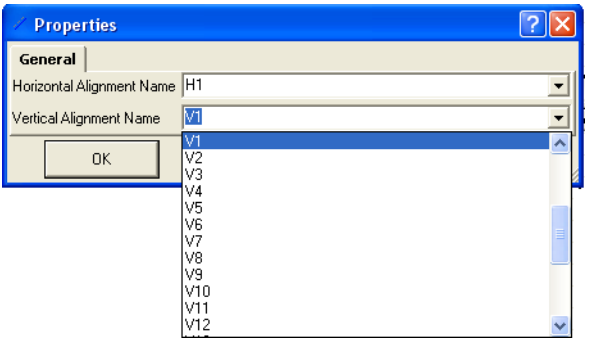
To delete any object of the road, select *Delete* from the pop-up menu.

Each object of the road has different editable parameter(s):

- The name for the String Set:

- The name and order for the string:

- The horizontal and/or vertical alignment from the predifined list:



In the right panel of the ***Road*** tab, the user can delete and/or edit the existing element. To perform any operation, right click the desired elements and select the corresponding command from the pop-up menu:

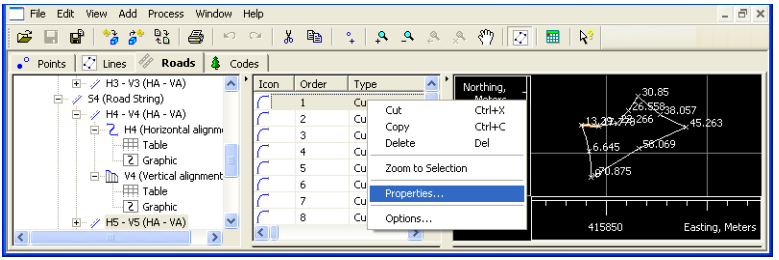


Figure 6-63. Operations with Road Element

When editing the existing element, the user can change any parameters of this element and as well as type of the element:

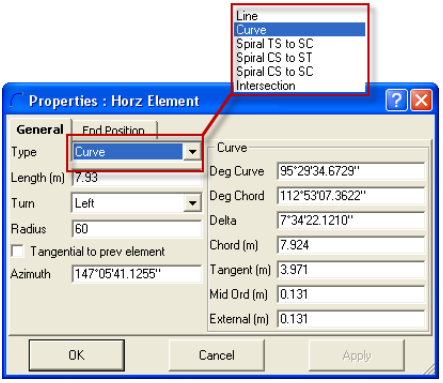


Figure 6-64. Editing the Road Element Parameters

Topcon Link allows to save all changes which were entered in the road with String Set and export this data to TopSURV and LandXML file formats.

Editing Layers

Among other editing activities, Topcon Link can be used to edit the layers in a file, including the layer name, line and point styles, and the color to use for objects on the layer.

Edit on the Layers Tab

In the Layers screen, you can edit all fields directly on the screen. Figure 6-65 shows an example of editing fields on the *Layers* tab.

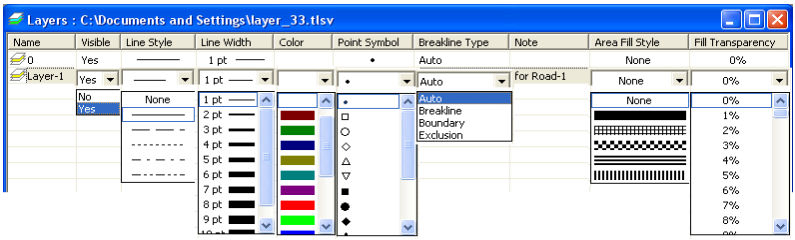


Figure 6-65. Editable Fields on the Layers – Example

Edit in the Layer Properties Dialog Box

1. To edit the properties for the layer, double-click the desired layer in the Layers screen.
2. Edit the general properties for the layer.
   - The notes.
   - Whether the layer is visible or not.
   - The layer's breakline type.
3. Edit the plotting styles for the layer.
   - The line style and width.
   - The color to use for lines and points.
   - The point symbol.
4. Edit the following plotting information for the area:
   - Select the area fill style in the corresponding field.
   - The *Fill Transparency* field displays the value of an area's transparency. Changing of this value does not affect transparency of the area because this option does not work in graphical mode in Topcon Link ver 7.3.
5. Click **Apply** to save the changes. Click **OK** to exit.

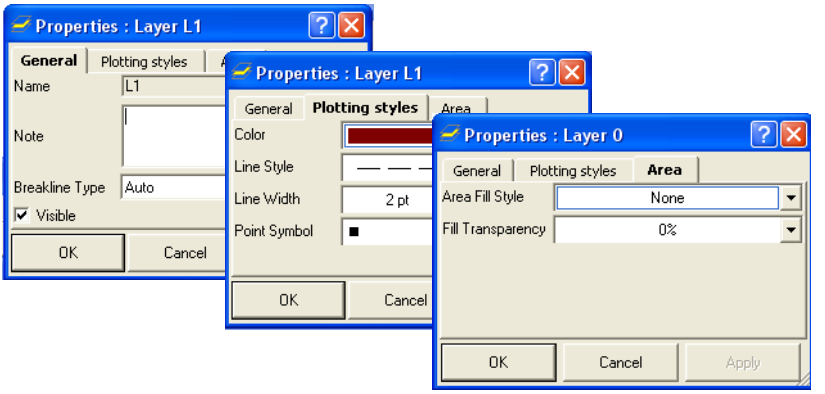


Figure 6-66. Edit Properties for the Layer

About Editing Offsets in Topcon Link

Using the associated Properties dialog box, you can edit the offsets for TS or GPS measurements and for PTL (point to line) points. Topcon Link recognizes offsets from an observation line, point-to-line offsets, and offsets from a line with a known azimuth.

Offsets from an observation line in Total Station measurements

- Offset Along – the distance from the Prism Point to the projection of the Offset Point along the line of sight
- Offset Across – the distance from the offset Point to the line of sight, either to the left or to the right of the line
- Offset Height – the height difference from the prism point to the offset point

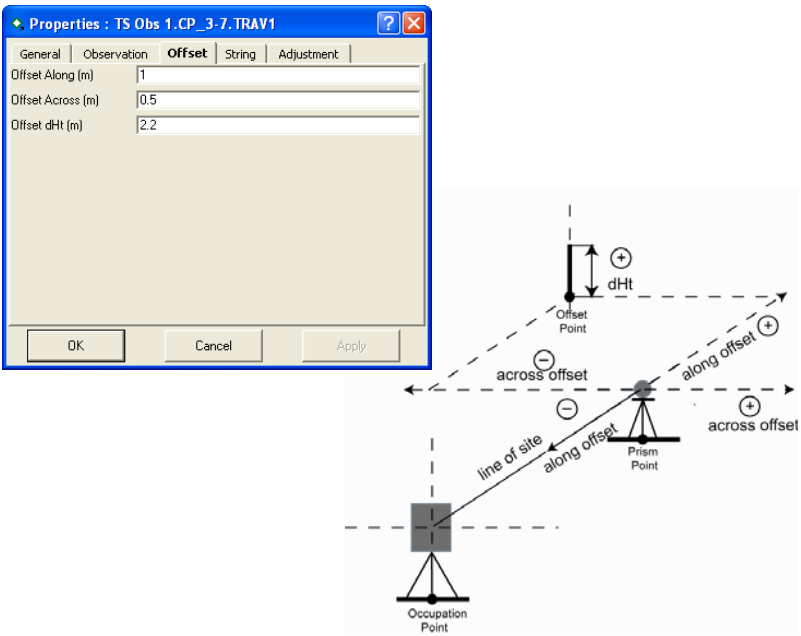


Figure 6-67. Measuring/Editing Offsets From Observation Line

Offsets from the reference line formed by reference points (point-to-line offsets) in TS and GPS measurements

-
- From Point – the start point of the reference line (Point 1)
- To Point – the end point of the reference line (Point 2)
- Offset Dist – the distance along the reference line from the prism or the rover GPS antenna point to the offset point
- Offset Across – the distance perpendicular to the reference line from the prism or the rover GPS antenna point to the offset point
- Height is relative – the height difference from the prism point to the offset point
- Height is absolute – the absolute height of the offset point

NOTE

Field Software Job sets only absolute elevation for a PTL point

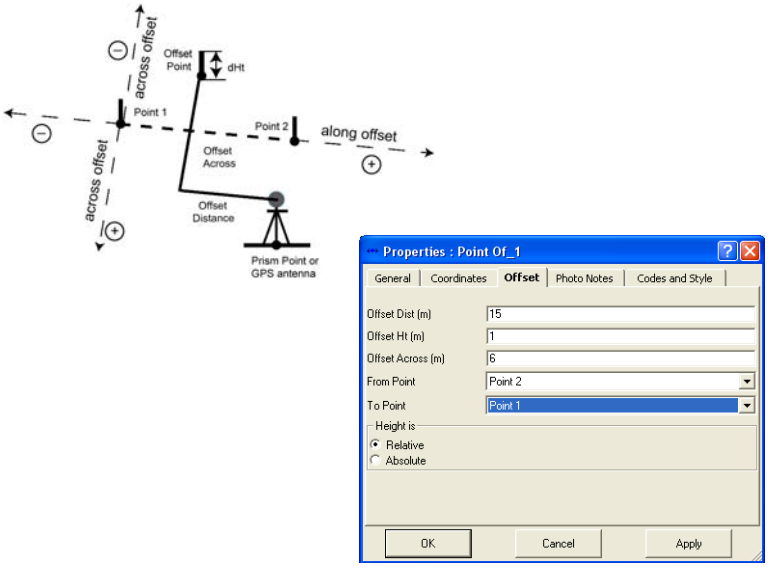


Figure 6-68. Measuring/Editing Offsets From Point-to-Line

Offsets from a line with a known azimuth in TS and GPS measurements

- Azimuth – offset line azimuth
- Offset Dist – the distance along the line with known azimuth from the rover GPS antenna point to the offset point
- Offset Across – the distance perpendicular to the line with known azimuth from the rover GPS antenna point to the offset point
- Offset Ht – the height difference from the rover GPS antenna to the offset point
- Height is relative – the height difference from the prism point to the offset point
- Height is absolute – the absolute height of the offset point

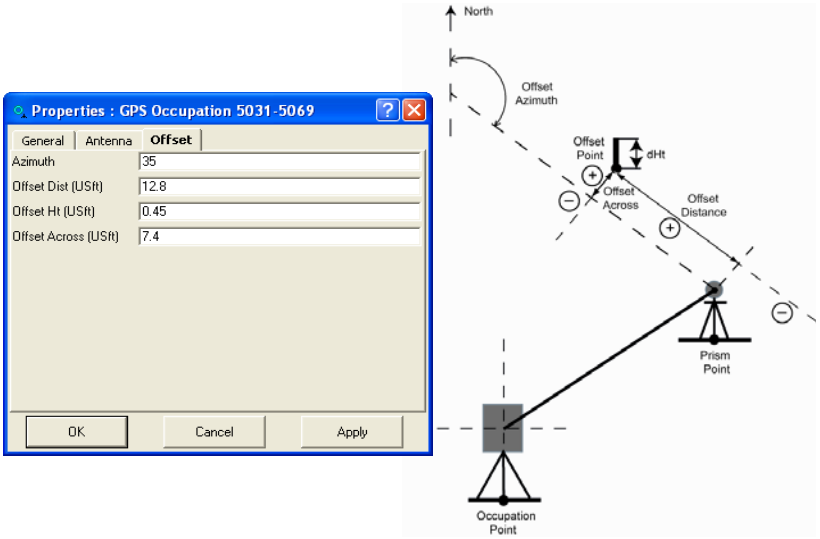


Figure 6-69. Measuring/Editing Offsets From Observation Line

Notes:

Working with Point Data in Topcon Link

Topcon Link includes a function for working with point data: computing coordinates of TS and GPS network.

Computing Point Coordinates for Raw Data and Field Software Files

Topcon Link allows computing point coordinates for raw data and Field Software files.

Compute Coordinates

Note the following restrictions for coordinate computations:

When editing data, coordinate computations (re-calculation) are not automatic. You must manually select the Compute Coordinate function

If there is no antenna information ('Antenna Type' field is empty) for Base RTK station, the phase center of the Base station will be used to compute Rover positions.

For details on setting the parameters for computations, see "Set Process Properties for Computations" on page 7-2.

1. Open a raw data or Field Software file.
2. Click **Process ▸ Compute Coordinates**.

Any new point coordinates are added and written to the file.

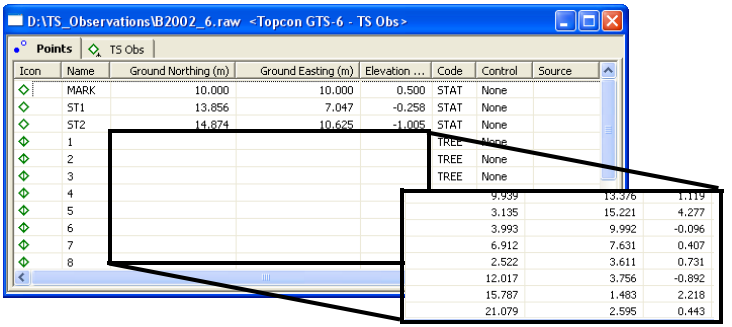


Figure 7-1. Coordinate Calculation – Before and After Example

Set Process Properties for Computations

Typically, the default parameters are sufficient for most coordinate computations of TS network. In the *Process Compute Coordinates* pane, the user can set distance and angle measurement errors to take them into account when computing the coordinates of the station using directions observed from the station to points of known positions (resection method):

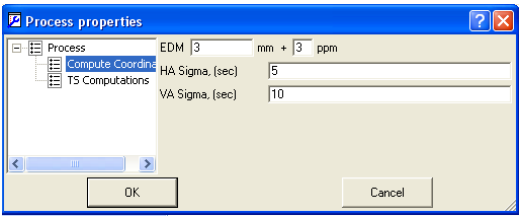


Figure 7-2. Apply Coordinate Computation Parameters

1. Click **TS Computations** in the left pane and select the refraction coefficient for total station observations.

   The refraction coefficient corrects the vertical angle between the earth's curvature and refraction in the atmosphere.

2. Click **OK** to save the settings.

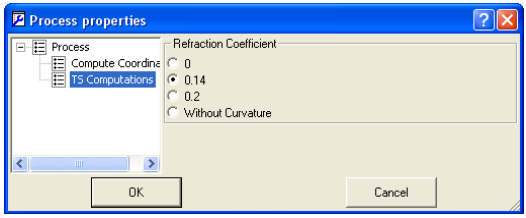


Figure 7-3. Apply Total Station Computation Parameters

Notes:

Exporting Data Files to a Topcon Device

Topcon Link provides a simple interface for exporting data files directly to a Topcon device (instrument). Topcon Link exports any file type to a hand-held controller, coordinate files to a total station.

Before you can export data to a total station, the device must first be set up. See "Adding Devices" on page 2-1 for details.

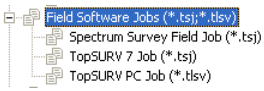
This chapter discusses the steps to export data files to a connected device.

- See "Exporting Files to a Mobile Device" on page 8-1.
- See "Exporting Files to a Total Station" on page 8-3.

Exporting Files to a Mobile Device

The Topcon and Sokkia family of controller software (such as TopSURV and SSF survey application) run on several Topcon and third-party mobile devices.

Topcon Link supports three formats of the Field Software Job files:



- Spectrum Survey Field Job (*. tsj). This job is created in SSF version 7.3 and later.

- TopSURV 7 Job (*. tsj). This job is created in TopSURV version 7.0 and later.
- TopSURV PC Job (*.tlsv). This job is created in TopSURV version 6.11.03 and earlier

There is a difference in format of these files and a difference in using these files in the computer's software.

In TopSURV version 7.0 and later, the *.tsj file is saved on the controller, that this file format can be opened by Topcon Link/ Spectrum Link/Topcon Tools/Sokkia Spectrum Office/TopSURV PC. Topcon Link is used only for transferring the *.tsj file from the controller to the computer without format changes. Moreover, the user can use a movable memory card to transfer the *.tsj file from the controller to the computer.

In TopSURV version 6.11.03 and earlier, the *.tsv file is saved on the controller. But Topcon Link/Spectrum Link/Topcon Tools/Sokkia Spectrum Office/TopSURV PC version can not open this file format. Topcon Link has to convert mobile device-based formats to computer-based formats. Topcon Link performs the conversion during the import process the *.tsv file to the *.tlsv file. This format (*.tlsv) is opened by Topcon Link/Spectrum Link/Topcon Tools/Sokkia Spectrum Office/TopSURV PC.

When connecting to a CE-based device, Microsoft® ActiveSync automatically starts up and connects with the device. This connection is required to properly export files. If you need to install ActiveSync, see "Installing Microsoft ActiveSync for Use With CE-based Devices" on page 1-11 for details.

This section describes data export using the Topcon Link interface. To use Windows® Explorer for data exporting, see "Using Windows Explorer to Export Files to a Device" on page 8-6.

1. Connect your controller and computer according to the controller's documentation.

Note that a Bluetooth® connection requires that both devices have Bluetooth wireless technology capabilities.

2. With Topcon Link open, click **File ▸ Import from Device**.
3. In the right panel, double-click **Mobile Device**. Topcon Link connects to the internal memory of the controller.
4. Navigate to the location in the controller's memory in which data files are saved. For example, Field Software Jobs are saved to the TopSURV/SSF folder.
5. In the left pane, navigate to the folder on the computer in which the file is saved.
6. Select the desired file(s) and click the **Move Right** button. The file export progress displays.

Exporting Files to a Total Station

The Topcon and Sokkia family of conventional and robotic Total Stations have an internal data storage device to record data to in various formats. Refer to your Total Station operator's manual for details on setup, operation, and connection with other devices.

When exporting files to a Topcon and Sokkia Total Station, Topcon Link simply connects to the device and provides a path for the data transfer. The actual file transfer is performed at the Total Station.

The connection procedure for Topcon and Sokkia Total Stations varies, so refer to the device's documentation for details.

When connecting to a CE-based device, Microsoft® ActiveSync automatically starts up and connects with the device. This connection is required to properly export files. If you need to install ActiveSync, see "Installing Microsoft ActiveSync for Use With CE-based Devices" on page 1-11 for details.

This section describes data export using the Topcon Link interface. To use Windows® Explorer for data exporting, see

"Using Windows Explorer to Export Files to a Device" on page 8-6.

1. Connect your computer and Total Station according to the operator's manual.
2. With Topcon Link open, click **File ▸ Export to Device**.
3. In the left pane, navigate to the folder on the computer in which the file is saved.
4. In the right pane, double-click *Topcon Total Stations* or *Sokkia Total Stations*.
5. Double-click the desired device to connect with the Total Station.
6. Select the coordinate file to export and click the **Move Right button**.

For Topcon Total Station

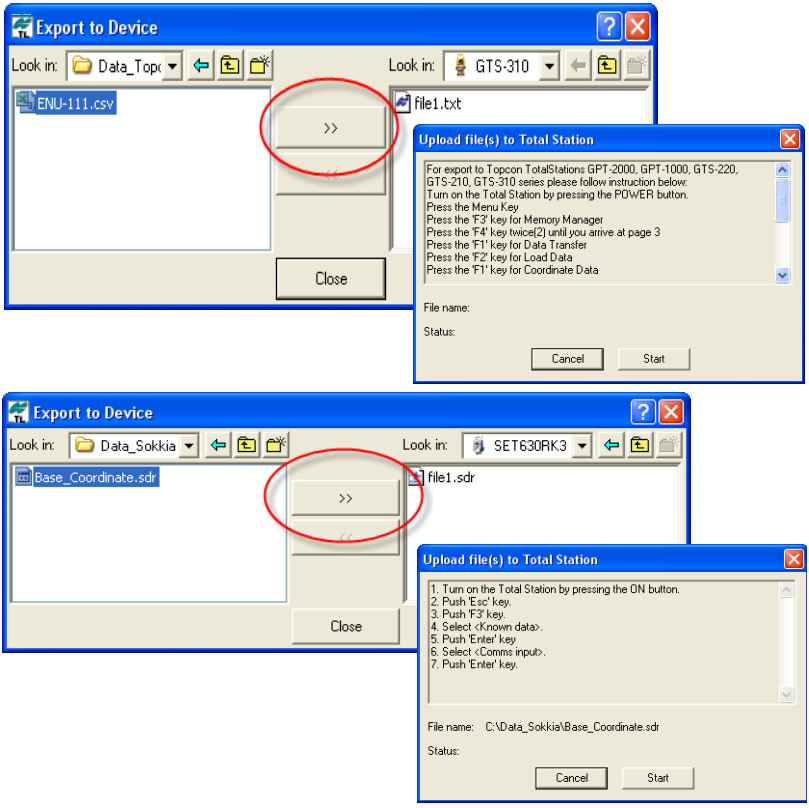


Figure 8-1. Export File to Topcon and Sokkia Total Station

7. Follow all steps listed in the Upload file(s) to Total Station dialog box. These steps may vary depending on the connected device. Click **Start** in Topcon Link to export the data and save it in the Total Station.

Using Windows Explorer to Export Files to a Device

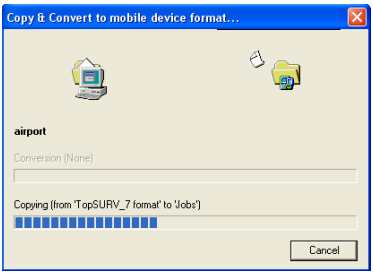
After installing Topcon Link, the computer's hard disk contains up to eight virtual drives for accessing Topcon and Sokkia devices to import/export data. These virtual drives provide a quick way to transfer data without opening Topcon Link. Many of the steps are the same as for importing/exporting data via the Topcon Link interface. See the corresponding section above for further details on the steps listed in sections below.

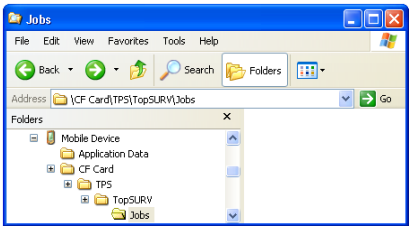
Export to a Topcon and Sokkia Mobile Device using Windows Explorer

1. Connect the controller to the computer. Connect to the controller via ActiveSync.
2. On the computer, navigate to and copy the file(s) to export.
3. Navigate to the ***Mobile Devices*** device directory and click the device icon.
4. Navigate to the ***TopSURV*** or ***SSF*** folder and the desired job file(s).

5. Copy and paste, or drag-and-drop, the desired file(s) to the controller.

for the job created by SSF and TopSURV version 7.0 and later





for the job created by TopSURV version 6.11.03 version and earlier

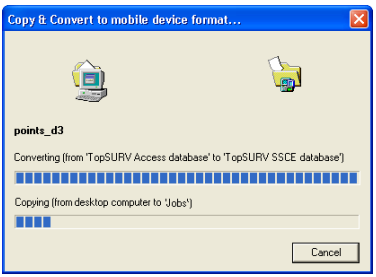


Figure 8-2. Export Using Explorer – Mobile Device

Export to a Topcon and Sokkia Total Station using Windows Explorer

1. Connect the total station to the computer. If needed, connect to the total station via ActiveSync.
2. On the computer, navigate to and copy the coordinate file to export.
3. Navigate to the ***Topcon Total Stations*** or ***Sokkia Total Stations*** device directory and click the device icon.
4. Click the icon for the connected total station.
5. Copy and paste, or drag-and-drop, the file to a directory on the computer.

6. Follow all instructions on the Upload file(s) to ***Total Station*** dialog box.

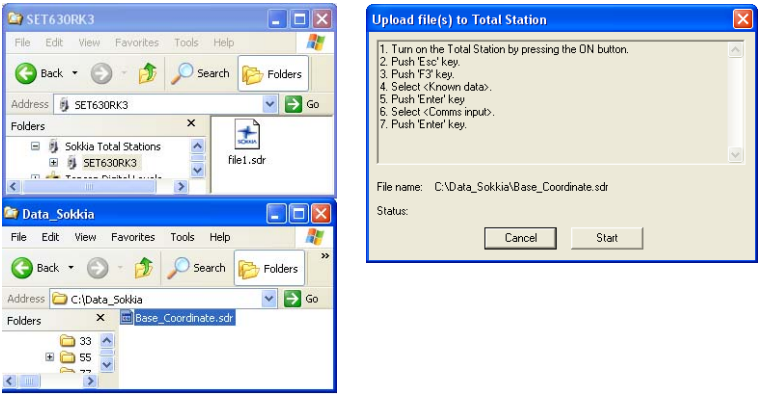


Figure 8-3. Export Using Windows Explorer – Sokkia Total Station

Data Views Reference

Topcon Link can open three views to display file data: a tabular view, CAD view, and layers view. Topcon Link displays CAD view only for Field Software job file. When opening a coordinate file, or total station raw data, or GPS + raw data, or digital level, or Field Software job file, Topcon Link reads the file and displays an appropriate tab or a set of tabs:

- Coordinate file – Points tab
- Total Station raw data file – Points and TS Obs tabs
- Digital Level file – Points and DL Obs tabs
- GPS+ raw data file - GPS Occupations tab
- Field Software job tabs:
  - Points tab, if the job contains points
  - GPS Occupations, if the job contains GPS occupations
  - TS Obs, if the job contains total station observations
  - GPS Obs, if the job contains GPS observations
  - Codes, if the job contains codes
  - Linework, if the job contains linework
  - Tap Dimensions, if the job contains tape measurements
  - Images, if the job contains images (such as data obtained using the GPS-7000i total station)
  - X-Section Templates, if the job contains road data
  - Roads, if the job contains road data

When viewing a Field Software job, the CAD view displays points and linework, and a Layers view can be displayed if the job file contains layers.

Coordinate View

Coordinate files contain data on points taken with total station, digital levels, or GPS receivers. The coordinate file data table contains only one tab to display data. Because coordinate files do not store unit and system information, you can select these settings using the advanced options while opening or in the status bar.

For details on editing coordinate information, see “Edit in the Point Properties Dialog Box” on page 6-3 (coordinate data can be contained in TS, DL, or GPS measurements).

Points Tab

For coordinate files, the *Points* tab has the following default columns.

- Icon – the symbol used for the point
- Name – the name of the point
- Latitude\Northing – the measured northing coordinate for the point and coordinate type
- Longitude\Easting – the measured Easting coordinate for the point and coordinate type
- Elevation – the elevation of the point
- Note – any notes associated with the point
- Code – any codes associated with the point

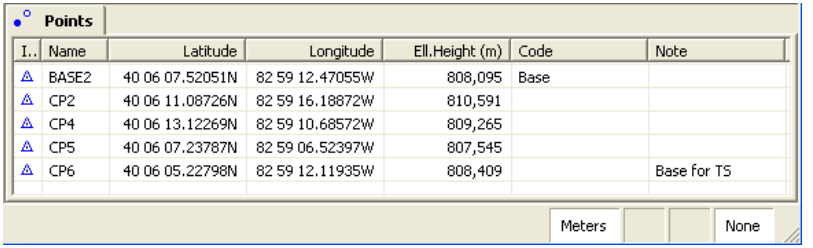


Figure A-1. Coordinate File Data Table

Icon Descriptions

Table A-1 lists the icons used to represent different information in the data table.

Table A-1. Coordinate File Icons

Location	Icon	Description
Points Tab		Unknown point
		Fixed coordinates point
		Offset point (only for GTS-7 Points)

TS Observations View

Total Station observation files contain data on points and observations taken with a total station instrument. The TS observations file data table contains two tabs to display data. Because total station files do not store system information, you can select these settings using the advanced options while opening or in the status bar.

For details on editing total station observation information, see “Editing TS Observations” on page 6-12.

Points Tab

For files which contain TS observations, the *Points* tab has the following default columns:

- Icon – the symbol used for the point
- Name – the name of the point
- Latitude\Northing – the measured northing coordinate for the point and coordinate type
- Longitude\Easting – the measured easting coordinate for the point and coordinate type
- Elevation – the elevation of the point
- Code – any codes associated with the point

- Control – the coordinate fix of the point (None, Horizontal, Vertical, Both)
- Note – any notes associated with the point

Icon	Name	Ground Northing (USft)	Ground Easting (USft)	Elevation ...	Code	Control	Source	Note
	TS01	0.000	0.000	0.000		None		Base#1
	BS01	40.580	-67.500	3.570		None		
	31	1.140	-4.715	-0.155		None		
	001	3.470	13.145	-1.945	TWW	None		
	002	12.330	12.960	-1.880	TWW	None		
	003	0.280	16.580	-7.375	BWW	None		
	004	14.960	15.625	-5.900	BWW	None		
	005	-21.880	33.960	1.460	X01	None		
	006	-50.275	38.020	-2.490	X01	None		

Figure A-2. TS Obs File Data Table – Points Tab

TS Obs Tab

For raw files, which contain TS observations, the *TS Obs* tab has two panels, the left for points with known coordinates, the right for points with unknown coordinates measured from the point selected in the left panel.

The left panel contains the following default columns:

- Icon – the symbol of the point
- # – the number of the point
- Point Name – the name of the point
- Instrument Height – the height of the instrument in the selected units
- Instrument Centering Error/ Reflector Centering Error - centering error of Total Station/Reflector over the mark. This error will be take into account when estimating adjustment results.
- Instrument Height Error/Reflector Height Error - measurement error of the Total Station/Reflector height over the mark. This error will be take into account when estimating adjustment results.

The right panel contains the following default columns:

- Icon – the symbol of the point

- # – the number of the point
- Point From – the beginning of the vector
- Point To – the end of the vector
- Reflector Height – the height of the reflector
- Azimuth, Horizontal Circle, Zenith Angle, Slope Distance – angular and linear measurements in the selected units (DMS, qon, mil, radian, ft, m)
- Note – any notes associated with the point
- Code – any code associated with the point
- Type – the type of point
  - *SS*: side shot point
  - *BS*: backsight point (the previous occupation point)
  - *FS*: foresight point (the next occupation point)
  - *BKB*: backsight bearing point
  - *Center* and *Side*: These two types of TS measurements are created if the user selected Horizontal Angle Offset in the Total Station or TopSURV/SSF software. The *Center* measurement contains only horizontal angle to the target (offset point), *Side* measurement contains: horizontal/vertical angles and distance to the prism (see Figure A-3). Both measurements (*Center* and *Side*) relate to one point. After clicking **Compute Coordinates**, Topcon Link calculates the coordinates of this point using both measurements:

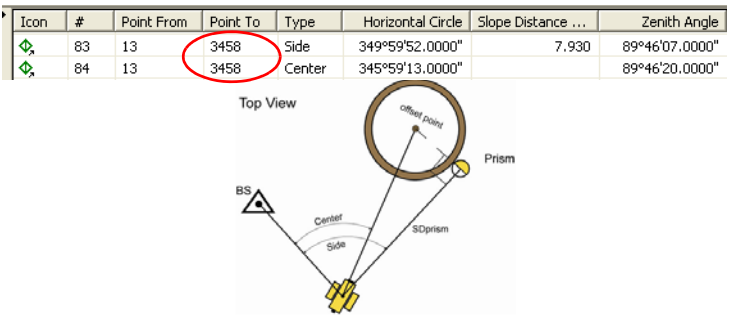


Figure A-3. Example of Horizontal Angle Offset in Total Station or TopSURV/SSF

– *Vertical* and *Horz.Vertical*: These two types of TS measurements are created if the user selected Horizontal/ Vertical Angle Offset in the Total Station or TopSURV/SSF. The *Horz.Vertical* measurement contains only angle (horizontal/vertical) measurements to the target (offset point), *Vertical* measurement contains horizontal/vertical angles and distance to the reflector (see Figure A-4). Both measurements (*Vertical* and *Horz.Vertical*) relate to one point. After clicking **Compute Coordinates**, Topcon Link calculates the coordinates of this point using both measurements

Icon	#	Point From	Point To	Type	Horizontal Circle	Slope Distance ...	Zenith Angle
	82	30	3072	Vertical	91°46'36.0000"	58.580	88°22'16.0000"
	83	30	3072	Horz. Vertical	91°46'36.0000"		76°05'25.0000"

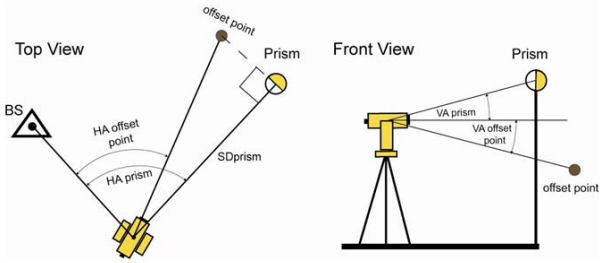
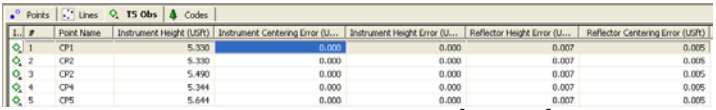


Figure A-4. Example of Horizontal/Vertical Angle Offset in Total Station or TopSURV/SSF

– *Horizontal Resection/Vertical Resection*: plane / vertical coordinates of station point are computed using measurements from two (or more) points with known coordinates

– *Resection*: plane and vertical coordinates of station point are computed using measurements from two (or more) points with known coordinates

left panel



right panel

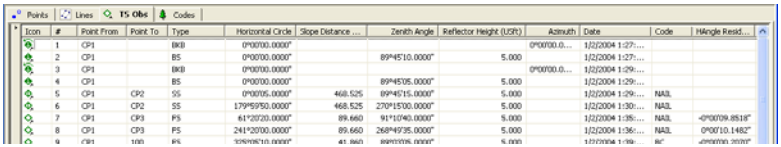


Figure A-5. TS Obs File Data Table – TS Obs Tab

Icon Descriptions

Table A-2 lists the icons that represent different Topcon Link parameters in the data table.

Table A-2. Total Station Raw Data File Icons

Location	Icon	Description
Points Tab		TS station
		TS point
		Fixed coordinates point
		Fixed Horizontal control
		Fixed Vertical control
TS Obs Tab, Left Panel		TS station
TS Obs Tab, Right Panel		ForeSight measurement
		SideShot measurement
		BackSight

Table A-2. Total Station Raw Data File Icons (Continued)

Location	Icon	Description
TS Obs Tab, Right Panel (Continued)		BackSightBearing point measurement
		TS Resection Observation

GPS+ Raw Data View

GPS+ Raw Data file contains GPS/GLONASS code and carrier phase measurements collected for point or points where was mounted a GPS antenna. Topcon Link directly (that is using its own technique) opens the following GPS+ raw data files:

- RINEX 2.11 and RINEX 3.0 is the version of standard format for exchanging GPS Raw Data. For a static/kinematic observation(s) 2 or 3 files are created; the first usually having an extension beginning with the letter 'O' and stores the observations; the second usually has extensions beginning with the letter 'N' or 'G', depending on GPS/GLONASS capability, and stores GPS and GLONASS navigational data (orbits) for those observations.
- Compact RINEX/Compact Rinex3 file (or a Hatanaka compressed file) is the compression of RINEX 2.11 / RINEX 3.0 observation files. This file type contains a "D" extension.
- TPS/JPS files are the raw data files logged by Topcon receivers.
- TPD files are a Topcon proprietary format for storing GPS raw data, and can be used to backup raw data or exchange raw data between different jobs.
- Sokkia PDC files are the new raw data files logged by Sokkia receivers (GSR2600, GSR2700 and GSR1700)
- Sokkia Stratus files are the raw data files logged by Sokkia Stratus receiver

Also Topcon Link allows the user to open native binary formats of GPS receivers manufactured by Ashtech (B*.*, E*.*, S*.*), Leica

Geosystems (*.lb2, *.mdb,*.m00), Trimble (*.dat), Septentrio Satellite Navigation NV (*.sbf) companies. For opening these formats, Topcon Link applies TEQC software (http://facility.unavco.org/software/teqc/teqc.html).

When the user opens one of the above formats in Topcon Link, the following scheme of converting the file begins to work automatically:

1. TEQC converts the native binary format to RINEX 2.11 file format.
2. The created RINEX file is opened by Topcon Link.

NOTE:

1. The current default setting for the TEQC allows opening only static occupations (provided there is **only one** *Marker Name* in the file for this occupation). In other words, it is impossible to open kinematic and Stop&Go files of native formats of these companies into Topcon Link.
2. When opening binary files of third-party companies, Topcon Link uses default settings of the TEQC program. If a binary file failed to be opened by Topcon Link, we recommend to repeat the conversion to the RINEX file using own settings of TEQC (out of the Topcon Link program) for the given binary file. After obtaining an appropriate RINEX file, this file can be opened by Topcon Link.

After opening a raw data file in Topcon Link, the GPS Occupations tab displays all information about occupation(s), which the raw data file contain.

GPS Occupations Tab

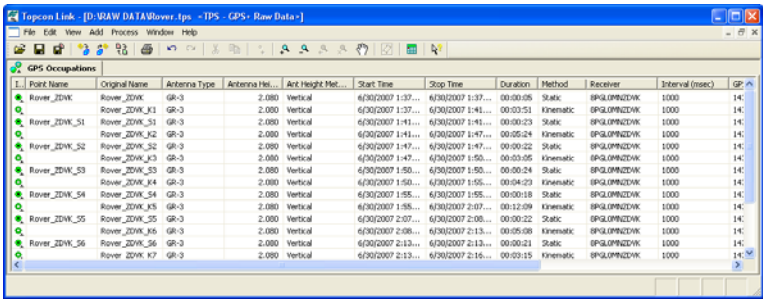
For a GPS+ raw data file, the *GPS Occupations* tab has the following columns:

- Icon – displays a symbol associated with the occupation.
- Point Name – displays the name of the occupation.
- Original Name – displays the original occupation name.
- Antenna Type – the antenna type used on the occupation.
- Antenna Height – the antenna height.

- Antenna Height Method – the method used to measure the antenna height, either Vertical or Slant.
- Start Time and Stop Time – displays the beginning and end dates (day/month/year) and starting and stopping epoch time of the occupation.
- Duration – the duration of time in which the observational data was acquired (duration = start time/stop time).
- Method – the surveying method used at the occupation; either Static, Stop-and-Go, Kinematic, RTK (RTK base, RTK Topo, and RTK Autotopo), or Autonomous.
- Note – displays user comments.
- Source – displays the path of the raw data on the computer disk drive, local area network, or storage media.
- Interval – displays the occupation logging interval.
- Receiver – displays the TPS receiver serial number used for the occupation.
- GPS week, day – displays the GPS week and day of the occupation start time.
- NEpoch – displays the number of epochs for the given GPS occupation.
- Antenna Centering Error – centering error of Antenna Reference Point (ARP) position over the mark. This error will be take into account when estimating adjustment results.
- Antenna Height Error - measurement error of the antenna height over the mark. This error will be take into account when estimating adjustment results.
- Azimuth – offset line azimuth.
- Offset Dist – displays the occupation's distance offset.
- Offset dHt – displays the occupation's height offset.
- Offset Across – displays the occupation's across offset.
- H RMS - horizontal position error for the given occupation
- V RMS - vertical position error for the given occupation

- Receiver vendor - displays the name of the vendor which developed this GPS receiver. The user can select a desired company from the list. This selects a vendor of the receiver to accommodate differences in post - processing GLONASS measurements by different companies. If the receiver's class is not included in the IGS list, select "*Unknown*" from the list.

for the file that contains static and kinematic occupations



for the file that contains static occupation

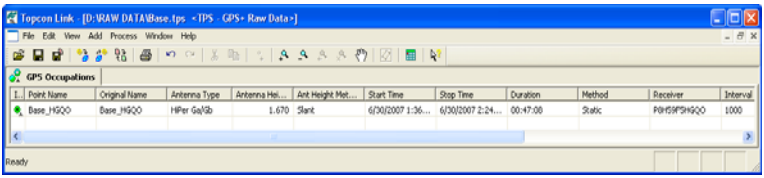


Figure A-6. GPS+ Raw Data File – GPS Occupations Tab

Digital Level Data View

Digital level files contain data on points measured with a digital level instrument. The DL observations file data table contains two tabs to display data.

For details on editing level measurements, see “Editing Digital Level Observations” on page 6-19.

Points Tab

For a Digital Level file, the *Points* tab has the following default columns:

- Icon – the symbol used for the point
- Name – the name of the point
- Latitude\Northing – the measured northing coordinate for the point and coordinate type
- Longitude\Easting – the measured easting coordinate for the point and coordinate type
- Elevation – the elevation of the point
- Code – any codes associated with the point
- Control – the coordinate fix of the point (None, Horizontal, Vertical, Both)
- Note – any notes associated with the point

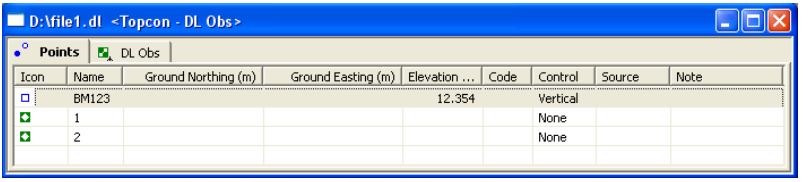


Figure A-7. DL Obs File Data Table – Points Tab

DL Obs Tab

For a Digital Level file, the *DL Obs* tab has two panels, the left for start and end points of a job, the right for all level measurements for the job selected in the left panel.

The left panel contains the following columns:

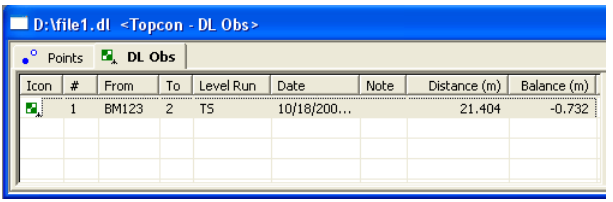
- Icon – the symbol of the leveling job
- # – the number of the leveling job
- From – the start leveling point of the job
- To – the finish leveling point of the job
- Level Run – the name of the leveling job created in a Topcon digital level
- Date – the start date (day/month/year) and time of job creation
- Note – displays user comments
- Distance – the sum of all backsight and foresight distances
- Balance – the sum of differences between DL to BS point and DL to FS point of the job

The right panel contains the following columns:

- Icon – displays a symbol associated with turning points
- # – the number of the measurement
- Point – the name of the turning point
- BS – the measurement for backsight point
- FS – the measurement for foresight point
- Distance – measured distance
- Elevation – the orthometric heights of the point (or the height of the point is calculated from a point with known height)
- Vert. Offset – displays the vertical offset from the horizontal plane for traverse and sideshot points
- Note – any comment for the level measurement

- Std Dev – standard deviation for the level measurement. This value is created in the digital level
- Date – the date and time of level measurement
- Level Run – the name of the leveling job created in a Topcon digital level

left panel



right panel

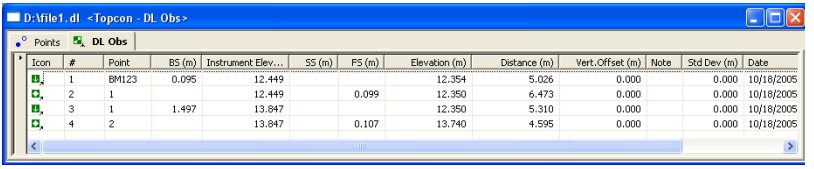


Figure A-8. DL Obs File Data Table – DL Obs Tab

Icon Descriptions

Table A-3 lists the icons that represent different Topcon Link parameters in the data table.

Table A-3. DL OBS File Icons

Location	Icon	Description
Points Tab		Traverse Point for digital level observation
		Side Shot
		Fixed coordinates point
		Fixed Horizontal control
		Fixed Vertical control
DL Obs Tab, Left Panel		Leveling job

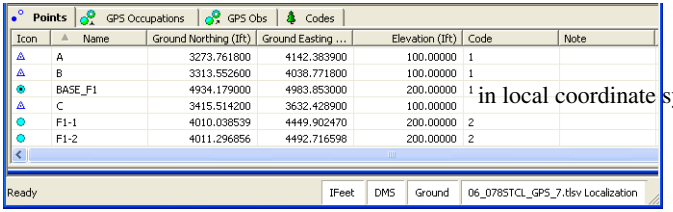
Table A-3. DL OBS File Icons (Continued)

Location	Icon	Description
DL Obs Tab, Right Panel		BackSight level measurement
		ForeSight level measurement
		SideShot level measurement

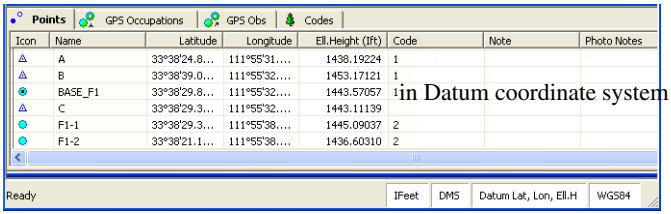
Field Software Job View

A Field Software job contains information on the various GPS, total station, digital level, tape dimension, and cross-section template data measured/recorded with an instrument running TopSURV/SSF. The type of information in the Field Software job determines the tabs that will display. Field Software jobs also display linework and points in a graphical CAD view. If the Field Software job includes layers, another view is available for managing this data.

If Field Software job contains localization, Topcon Link displays the point coordinates in the both coordinate systems (WGS-84/Datum and Ground/Localization). Topcon Link does not recalculate localization parameters which were created in TopSURV/SSF.



in local coordinate system



in Datum coordinate system

For details on editing Field Software job information, see Chapter 6 (Field Software job can contain TS, DL, or GPS measurements).

CAD View for Field Software Job

The CAD view is a two-dimensional, graphical representation of linework road and surface data, with associated points, in a Field Software Job. To view the CAD graphic, click View ▸ CAD View. Depending on the file's data and the filters used, the following information will be displayed. To set filters, see "Setting CAD View Options" on page 3-26.

- Points display with the associated symbols. If the point does not have a symbol assigned, its survey symbol will be used.
- Lines display with the associated code/layer color, style, and width.
- Control codes (/AS, /AE, /C) display as an arc or closed polyline, respectively.
- Codes with a polygon entity display as closed and filled (if a fill color has been set).
- Roads display in the color applied to the corresponding layer(s).

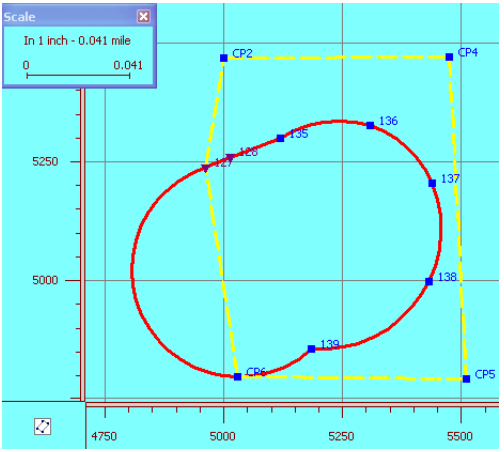


Figure A-9. Field Software Job CAD View

The Roads tab and X-Section Templates tab have independent CAD graphical views associated with the selected data element.

Layers View for Field Software Job

The Layers view lists all layers in the file with associated properties. To view the layers, click View ▸ Layers. The following information will be displayed for each layer. To edit a layer's properties, see "Editing Layers" on page 6-51.

- Name – the name of the layer
- Visible – if the layer is visible in the CAD view
- Line Style – the style used for lines in this layer
- Line Width – the width of lines in this layer
- Color – the color of points and lines in this layer
- Point Symbol – the icon used for points in this layer
- Breakline Type – the type of breakline for the layer (Auto, Breakline, Boundary, or Exclusion)
- Note – any notes associated with the layer
- Area Fill Style – displays the type of fill.
- Fill Transparency - displays the value of an area's transparency. Changing of this value does not affect transparency of the area because this option does not work in graphical mode in Topcon Link ver 7.3.

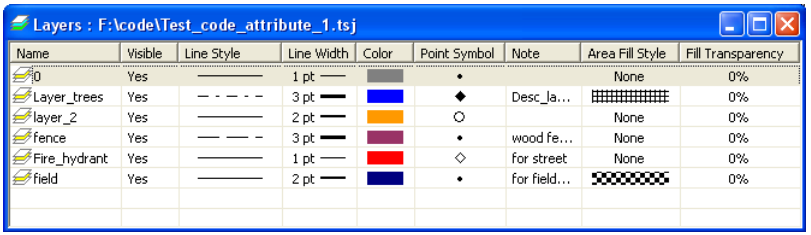
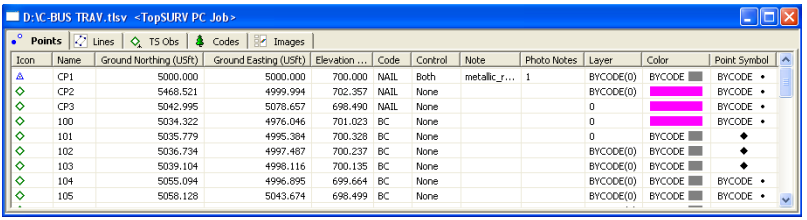


Figure A-10. Field Software Jobs Layers View

Points Tab

For a Field Software Job, the *Points* tab has the following default columns:

- Icon – the symbol of the point
- Name – the name of the point
- Latitude\Northing – the measured northing coordinate for the point and the coordinate type
- Longitude\Easting – the measured easting coordinate for the point and the coordinate type
- Elevation – the elevation of the point
- Code – any codes associated with the point
- Control – the coordinate fix of the point (None, Horizontal, Vertical, Both)
- Note – any notes associated with the point
- Photo Notes - displays the number of a photo note per point.
- Layer - the layer for the point
- Color - the color of points and lines
- Point Symbol - the icon used for point



Icon	Name	Ground Northing (USft)	Ground Easting (USft)	Elevation ...	Code	Control	Note	Photo Notes	Layer	Color	Point Symbol
	CP1	5000.000	5000.000	700.000	NAIL	Both	metallic_r...	1	BYCODE(0)	BYCODE	BYCODE
	CP2	5468.521	4999.994	702.357	NAIL	None			BYCODE(0)		BYCODE
	CP3	5042.995	5078.657	698.490	NAIL	None			0		BYCODE
	100	5034.322	4976.046	701.023	BC	None			0		BYCODE
	101	5035.779	4995.384	700.328	BC	None			0	BYCODE	
	102	5036.734	4997.487	700.237	BC	None			BYCODE(0)	BYCODE	
	103	5039.104	4998.116	700.135	BC	None			BYCODE(0)	BYCODE	
	104	5055.094	4996.895	699.664	BC	None			BYCODE(0)	BYCODE	BYCODE
	105	5058.128	5043.674	698.499	BC	None			BYCODE(0)	BYCODE	BYCODE

Figure A-11. Field Software Job – Points Tab

GPS Occupations Tab

For a Field Software Job, the *GPS Occupations* tab has the following default columns:

- Icon – displays a symbol associated with the occupation.
- Point Name – displays the name of the occupation.
- Original Name – displays the original occupation name.
- Antenna Type – the antenna type used on the occupation.
- Antenna Height – the antenna height.
- Antenna Height Method – the method used to measure the antenna height, either Vertical or Slant.
- Start Time and Stop Time – displays the beginning and end dates (day/month/year) and starting and stopping epoch time of the occupation.
- Duration – the duration of time in which the observational data was acquired (duration = start time/stop time).
- Method – the surveying method used at the occupation; either Static, Stop-and-Go, Kinematic, RTK (RTK base, RTK Topo, and RTK Autotopo), or Autonomous.
- Note – displays user comments.
- Source – displays the path of the raw data on the computer disk drive, local area network, or storage media.
- Interval – displays the occupation logging interval.
- Receiver – displays the TPS receiver serial number used for the occupation.
- GPS week, day – displays the GPS week and day of the occupation start time.
- NEpoch – displays the number of epochs for the given GPS occupation.
- Antenna Centering Error – centering error of Antenna Reference Point (ARP) position over the mark. This error will be take into account when estimating adjustment results.

- Antenna Height Error - measurement error of the antenna height over the mark. This error will be take into account when estimating adjustment results.
- Azimuth – offset line azimuth.
- Offset Dist – displays the occupation's distance offset.
- Offset dHt – displays the occupation's height offset.
- Offset Across – displays the occupation's across offset.
- H RMS - horizontal position error for the given occupation
- V RMS - vertical position error for the given occupation
- Receiver vendor - displays the name of the vendor which developed this GPS receiver. The user can select a desired company from the list. This selects a vendor of the receiver to accommodate differences in post - processing GLONASS measurements by different companies. If the receiver's class not included in the IGS list, plase select "*Unknown*" from the list

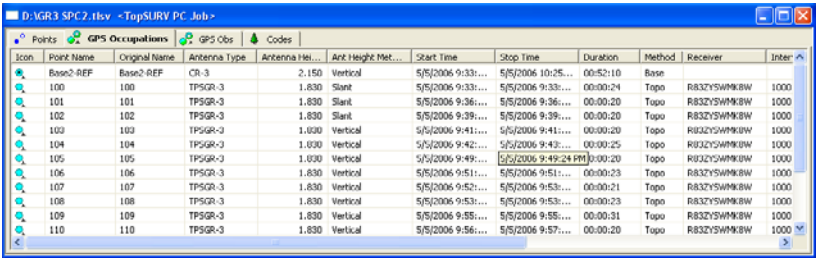


Figure A-12. Field Software Job – GPS Occupations Tab

TS Obs Tab

For a Field Software Job, the *TS Obs* tab has two panels, the left for points with known coordinates, the right for points with unknown coordinates measured from the point selected in the left panel.

The left panel contains the following default columns:

- Icon – the symbol of the point
- # – the number of the point
- Point Name – the name of the point

- Instrument Height – the height of the instrument in the selected units (ft, m)
- Instrument Centering Error/ Reflector Centering Error - centering error of Total Station/Reflector over the mark. This error will be take into account when estimating adjustment results.
- Instrument Height Error/Reflector Height Error - measurement error of the Total Station/Reflector height over the mark. This error will be take into account when estimating adjustment results.

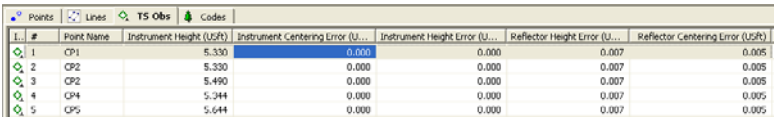
The right panel contains the following default columns:

- Icon – the symbol of the point
- # – the number of the point
- Point From – the beginning of the vector
- Point To – the end of the vector
- Reflector Height – the height of the reflector
- Azimuth, Horizontal Circle, Slope Distance, Vertical Angle, Zenith Angle – angular and linear measurements in the selected units (DMS, qon, mil, radian, ft, m)
- Code – any code associated with the point
- Type – the type of point
  - SS: side shot point
  - BS: backsight point (the previous occupation point)
  - FS: foresight point (the next occupation point)
  - BKB: backsight bearing point
  - Horizontal/Vertical Resection: plane or vertical coordinates of station point are computed using measurements from two (or more) points with known coordinates
  - Resection: plane and vertical coordinates of station point are computed using measurements from two (or more) points with known coordinates
  - Note – any notes associated with the point
  - Date – date and time of the point measurement

– *Center* and *Side*: These two types of TS measurements are created if the user selected Horizontal Angle Offset in the Total Station or TopSURV/SSF. The *Center* measurement contains only horizontal angle to the target (offset point), *Side* measurement contains: horizontal/vertical angles and distance to the prism (see Figure A-3 on page A-5). Both measurements (*Center* and *Side*) relate to one point. After clicking **Compute Coordinates**, Topcon Link calculates the coordinates of this point using both measurements

– *Vertical* and *Horz.Vertical*: These two types of TS measurements are created if the user selected Horizontal/ Vertical Angle Offset in the Total Station or TopSURV/SSF. The *Horz.Vertical* measurement contains only angle (horizontal/vertical) measurements to the target (offset point), *Vertical* measurement contains horizontal/vertical angles and distance to the reflector (see Figure A-4). Both measurements (*Vertical* and *Horz.Vertical*) relate to one point. After clicking **Compute Coordinates**, Topcon Link calculates the coordinates of this point using both measurements

left panel



right panel

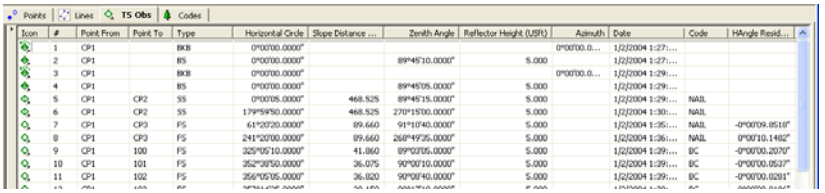
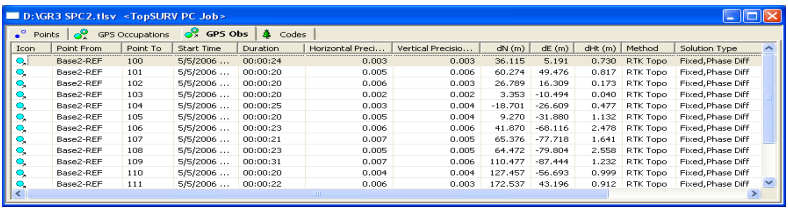


Figure A-13. Field Software Job – TS Obs Tab

GPS Obs Tab

For a Field Software Job, the *GPS Obs* tab has the following default columns for baseline measurements from the Base station to the Rover point:

- Icon – the symbol of the point
- Point From – the starting point of the baseline measurement
- Point To – the ending point of the baseline measurement
- Start Time – the date and time of the start of the measurement
- Duration – the time during which the measurement was taken
- Note – any note for the baseline measurement
- Horizontal Precisions, Vertical Precisions – the horizontal and vertical precisions of the measurement
- dN, dE, dU – the coordinate increments of the measurement in the current projection
- Method – the measurement method (RTK Topo or RTK AutoTopo)
- Solution type – the type of solution used for the measurement
  - Float,Phase Diff: float phase difference measurement
  - FixeMd,Phase Diff: fixed phase difference measurement
  - Float,Phase Diff, mm GPS: float phase difference measurement with mm GPS
  - Fixed,Phase Diff, mm GPS: fixed phase difference measurement with mm GPS



Icon	Point From	Point To	Start Time	Duration	Horizontal Preci...	Vertical Precisio...	dN (m)	dE (m)	dHt (m)	Method	Solution Type
	Base2-REF	100	5/5/2006 ...	00:00:24	0.003	0.003	36.115	5.191	0.730	RTK Topo	Fixed,Phase Diff
	Base2-REF	101	5/5/2006 ...	00:00:20	0.005	0.006	60.274	49.476	0.817	RTK Topo	Fixed,Phase Diff
	Base2-REF	102	5/5/2006 ...	00:00:20	0.006	0.003	26.789	16.309	0.173	RTK Topo	Fixed,Phase Diff
	Base2-REF	103	5/5/2006 ...	00:00:20	0.002	0.002	3.353	-10.494	0.040	RTK Topo	Fixed,Phase Diff
	Base2-REF	104	5/5/2006 ...	00:00:25	0.003	0.004	-18.701	-26.609	0.477	RTK Topo	Fixed,Phase Diff
	Base2-REF	105	5/5/2006 ...	00:00:20	0.005	0.004	9.270	-31.880	1.132	RTK Topo	Fixed,Phase Diff
	Base2-REF	106	5/5/2006 ...	00:00:23	0.006	0.006	41.870	-68.116	2.478	RTK Topo	Fixed,Phase Diff
	Base2-REF	107	5/5/2006 ...	00:00:21	0.007	0.005	65.376	-77.718	1.641	RTK Topo	Fixed,Phase Diff
	Base2-REF	108	5/5/2006 ...	00:00:23	0.005	0.005	64.472	-79.804	2.558	RTK Topo	Fixed,Phase Diff
	Base2-REF	109	5/5/2006 ...	00:00:31	0.007	0.006	110.477	-87.444	1.232	RTK Topo	Fixed,Phase Diff
	Base2-REF	110	5/5/2006 ...	00:00:20	0.004	0.004	127.457	-56.693	0.999	RTK Topo	Fixed,Phase Diff
	Base2-REF	111	5/5/2006 ...	00:00:22	0.006	0.003	172.537	43.196	0.912	RTK Topo	Fixed,Phase Diff

Figure A-14. Field Software Job – GPS Obs Tab

Codes Tab

For a Field Software Job, the *Codes* tab has two panels, the left for all available codes, the right for all attributes associated with the object (code) selected in the left panel.

The left panel contains the following default columns:

- Icon – the symbol of the object
- Code – the code of the object
- Layer – display the layer in which the code is used

The right panel contains the following default columns:

- Icon – the symbol of the attribute
- Name – a unique name for the attribute
- Default value – the value of the attribute
- Type – the type of attribute (integer, real number, text, menu, boolean or date)

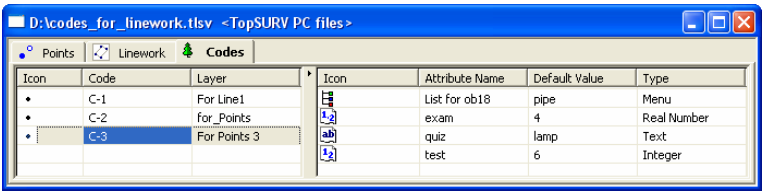


Figure A-15. Field Software Job – Codes Tab

Lines Tab

For aField Software Job, the *Lines* tab has two panels, the left for all lines (codes, layers, and strings) in the job, the right for all line segments associated with the line selected in the left panel.

The left panel contains the following default columns:

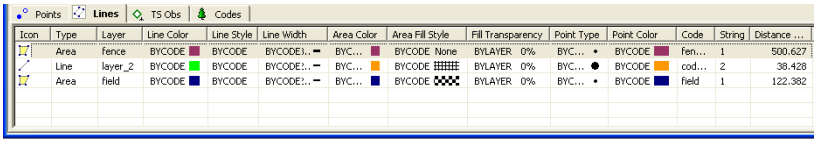
- Icon – the symbol associated with the line
- Code – the primary code used for the line
- String – the string for the line
- Layer – the layer for the selected line

- Color/Line Style/ Point Symbol/Line Width – the plotting style of the selected line
- Area Fill Style – displays the type of fill.
- Fill Transparency - displays the value of an area's transparency. Changing of this value does not affect transparency of the area because this option does not work in graphical mode in Topcon Link ver 7.3

The right panel contains the following default columns:

- Icon – the symbol associated with the line segment
- Order – the order of points associated with the line segment
- From – the beginning point of the line segment
- To – the end point of the line segment. If the line is closed, the "To" point for the last segment will be the same as the start point of the line.
- Control Code – (enable in Tabular view options) the control code of the point
  - Arc Start: the starting point of the arc
  - Arc End: the ending point of the arc
  - Close: the last point in a closed line

left panel



right panel

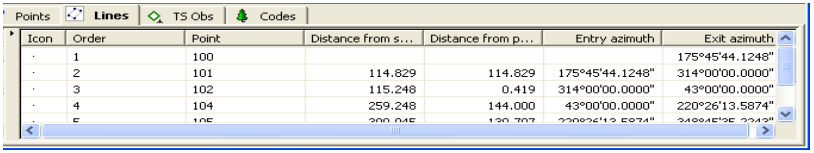


Figure A-16. Field Software Job – Linework Tab

Tape Dimensions Tab

For a Field Software Job, the *Tape Dimensions* tab has two panels, the left for all tape dimensions in the job, the right for tape measurements of the tape dimension selected in the left panel.

The left panel contains the following default columns:

- Icon – the symbol associated with the tape dimension
- Start Point – the name of the starting point for the dimension
- End Point – the name of the ending point for the dimension

The right panel contains the following default columns:

- Icon – the symbol of the point
- # – measurement sessions
- Point to – measurement direction
- Distance – the length of the line
  - the "-" sign stands for a left turn
  - the "+" sign stands for a right turn relative to the direction of the measurement the last line
- Date – the date and time of the measurement finished
- Note – any notes associated with the measurement

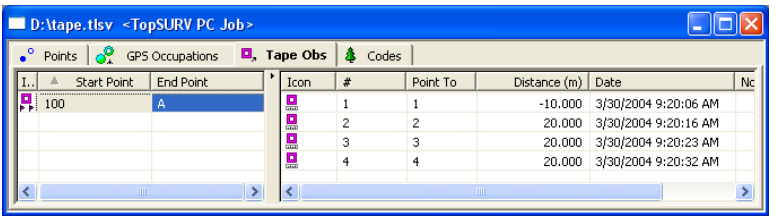


Figure A-17. Field Software Job – Tape Dimensions Tab

Images Tab

For a Field Software Job, the *Images* tab has two panels, the left for a thumbnail of all images in the job, the right for larger version of the thumbnail image selected in the left panel.

The left panel contains a thumbnail image of all images in the job, with the lowest image title (either numerically or alphabetically) listed first.

The right panel contains the selected image with measured points and linework associated with the image. The symbols of the points correspond to the settings selected in the Line and Code properties dialog boxes. The size of the symbol depends on the distance from the station.

Topcon Link expects images to reside in a folder with the same name as the data file. For example, data from the "050119.tlsv" file will be associated with images in the "050119" folder. The data file and image folder must reside in the same directory for the images to display.

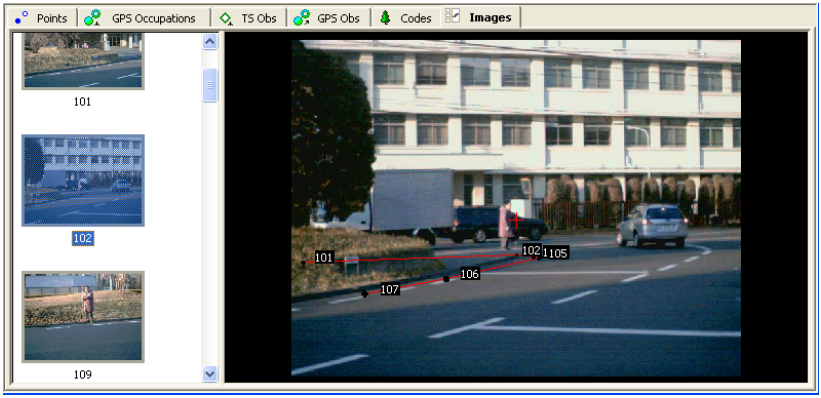


Figure A-18. Field Software Job – Images Tab

X-Section Templates Tab

For a Field Software Job, the *X-Section Templates* tab has two panels, the left for all cross-section templates in the job, the right for segments used in the cross-section template selected in the left panel.

The left panel contains the following default columns:

- Icon – the symbol associated with the template
- Name – the name of the template
- Cut Slope (1:n) – the percentage of cut for the slope
- Fill Slope (1:n) – the percentage of fill for the slope

The right panel contains the following default columns and a graph for the x-section template selected in the left panel:

- Icon – the symbol of the segment
- Order – the sequential order of the segment
- Code – the code used for the segment
- Hz. Dist – the horizontal offset from the central line for the segment
- V.Dist – the vertical offset from the horizontal plane for the segment. If a value is entered for this parameter, the Grade will be automatically calculated.
- Grade% – the ratio of Hz. Dist and V.Dist multiplied by 100%. If a value is entered for this parameter, the V.Dist will be automatically calculated.
- Hz. Offset from CL (m) – horizontal offset from the central line for the segment start point. Calculated using the corresponding values of the previous segment(s).

- V. offset from CL (m) – vertical offset from the horizontal plane for the start point of the segment. Calculated using the corresponding values of the previous segment(s).

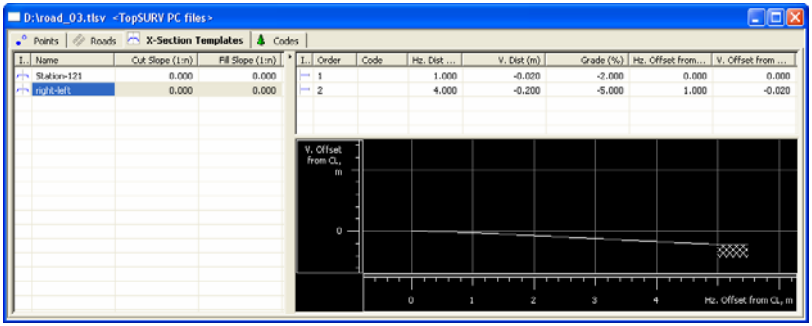


Figure A-19. Field Software Job – X-Section Templates Tab

Roads Tab

TopSURV version 8.0 and later allows one to create a road using one of two following ways:

1. Through horizontal and vertical projections of the center line (alignments) and lines representing the surface of the road and lying in the planes perpendicular to the center line (X-Section). To use this way in TopSURV, the user has to click ***X-Sec Set*** in the *Surface* tab of the **Edit Road** screen and select a pre-defined X-section set:

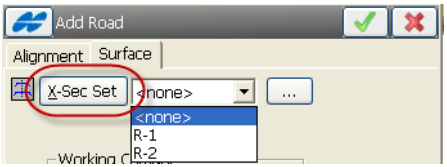


Figure A-20. TopSURV: Creating Road with X-Section

2. Through a set of several strings (String Set). Every separate string in the set is defined by one or several pairs of the horizontal and vertical alignments. To use this way in TopSURV, the user

has to click ***String Set*** in the *Surface* tab of the **Edit Road** screen and select a pre-defined string set:

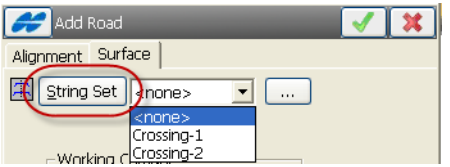


Figure A-21. TopSURV: Creating Road with String Set

Road with X-Section

For a Field Software Job that contains a road with X-sections, the Roads tab displays two panels:

- the left - the name of every road in the job and the names of components of the road,
- the right - in table and graphic view, parameters of horizontal alignments/vertical alignments/x-section templates for the road selected in the left panel.

The left panel contains a data tree with the following entries for each road in the job.

- Horizontal alignment – select to show both table and graph; expand to select and show just the table or graph
- Vertical alignment – select to show both table and graph; expand to select and show just the table or graph
- X-Sections – select to show both table and graph; expand to select and show just the table or graph

The right panel contains information for the object selected in the left panel, whether a road or an alignment/x-section.

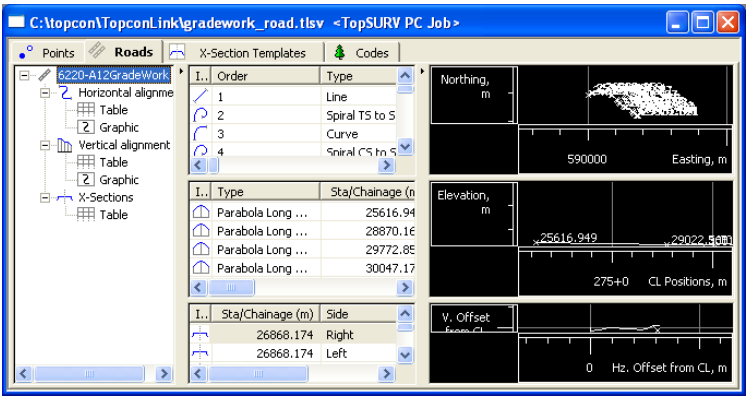


Figure A-22. Field Software Job – Roads Tab for Road with X-Section

The horizontal alignment table has the following default columns and/or a graph for the road or horizontal alignment selected in the left panel.

- Icon – the symbol associated with the element of the alignment
- Order – the order of the element in the horizontal alignment
- Type – the type of element (line, curve, spiral, or intersection)
- Azimuth – the azimuth of the element
- Length – the length of the element; editable for all types of elements except Intersection, where the length is calculated for the compound curve consisting of two spirals and one curve
- Turn – the direction of the turn for a curve, a spiral, and intersection; “Right” is a clockwise direction, “Left” is a counter-clockwise direction
- Start Radius/End Radius – the radius of the curve or spiral
- Northing/Easting – the grid/ground coordinates of the intersection point
- Spiral 1 Len/Spiral 2 Len – the length of the spiral at the intersection point
- End Station – the number of the end station for the element

- Intersection Pt – the name of the intersection point
- Tangential to prev element – displays “True” if the azimuth for this element is the end azimuth for the previous element; displays “False” if the azimuth for this element is arbitrary
- End Northing /End Easting – the grid/ground coordinates of the end station of the element
- End Azimuth – the azimuth that sets the tangent to the end station of the element
- Spiral Dir – the spiral direction
- Delta – the angle between the radii corresponding to the curve
- Chord – the length of the segment joining start and end points of a curve
- Tangent – the length of the segment which touches the given curve
- Mid Ord – the distance from the midpoint of a chord to the midpoint of the corresponding curve
- External – the distance from the midpoint of the curve to the intersection point of the tangents
- Spiral Const – the square root of the product of the length and the radius of the spiral
- Spiral Const 1/Spiral Const 2 – the spiral constants used to define a compound curve

- Start Deg Chord/End Deg Curve – the angle in degrees used to compute the radius of curve whose chord is 100 units long.

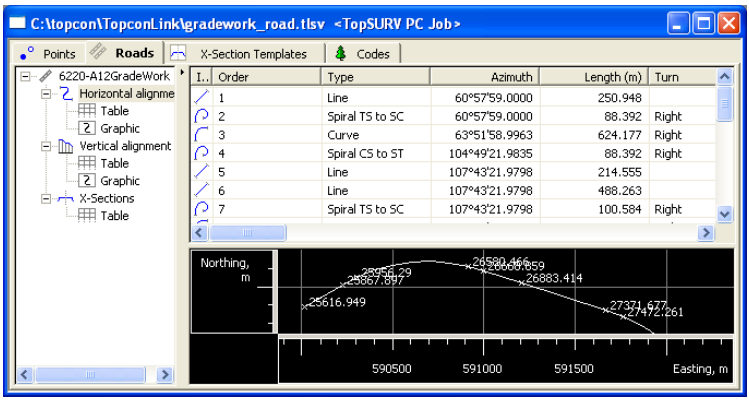


Figure A-23. Field Software Job – Roads Tab, Horizontal Alignment Panel

The vertical alignment table has the following default columns and/or a graph for the road or vertical alignment selected in the left panel.

- Icon – displays an image associated with the elements.
- Type – the type of the element (grade, parabola, or long section)
- Sta/Chainage – the number of the start station or chainage for the grade, parabola, and long section element
- Order – the order of the element in the vertical alignment
- Length – the length of the vertical element for the grade and parabola, and the length of the curve of the long section
- Start Grade / End Grade – the starting and ending percentages of grade of the element. If the grade is rising, the value should be positive; if the grade is falling, the value should be negative
- Elevation – the elevation value on the end station for the grade and parabola and the elevation value of the station used for creating of the long section

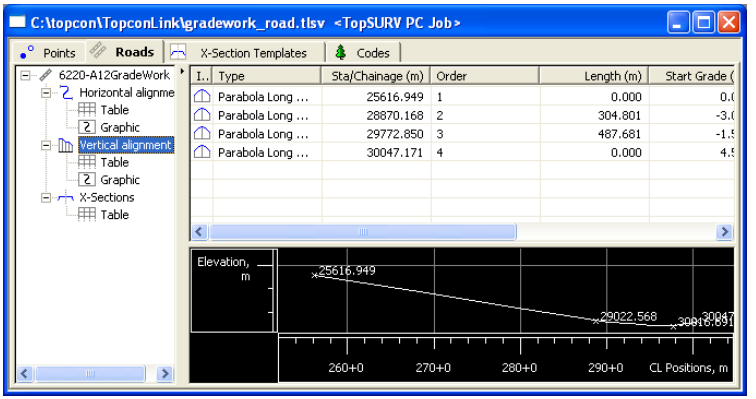


Figure A-24. Field Software Job – Roads Tab, Vertical Alignment Panel

The x-section table has the following default columns and/or a graph for the road or cross section selected in the left panel.

- Station – the station at which the template is applied
- Side – the left or the right side of the road relative to the central line where this template is used
- Template – the name of the template (selected from the list of existing templates in the current job)

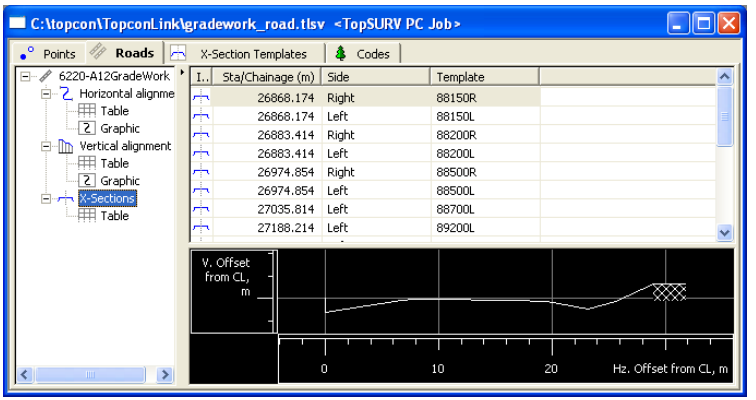


Figure A-25. Field Software Job – Roads Tab, X-Section Template Panel

Road with String Set

For a Field Software Job that contains a road with String Set, the Roads tab displays two panels:

- the left - the name of every road in the job and the names of components of the road,
- the right - in table and graphic view, parameters of horizontal and vertical alignment of the center line, and string sets for the road selected in the left panel.

The left panel contains a data tree with the following entries for each road in the job.

- Horizontal alignment of the center line– select to show both table and graph; expand to select and show just the table or graph
- Vertical alignment of the center line – select to show both table and graph; expand to select and show just the table or graph
- String set – select to show the list of strings; expand to show all strings which are included in the given set

The left panel of the *Road* tab displays the String Set configuration, as set of the strings. Every road string is described by the pair or pairs of the horizontal/vertical alignments (HA-VA).

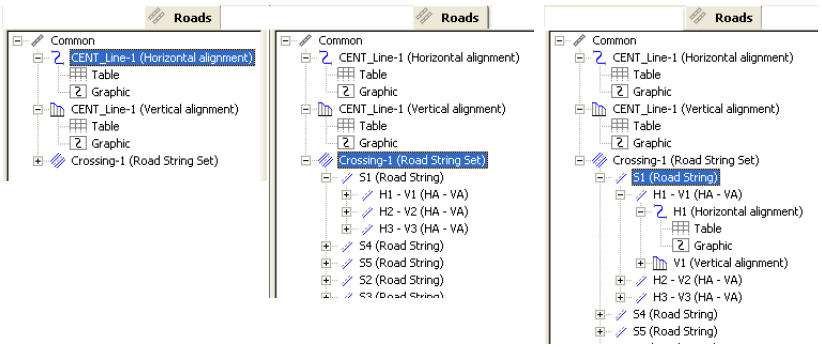


Figure A-26. Roads Tab for road with X-Section: Left Panel

The right panel contains information for the object selected in the left panel.

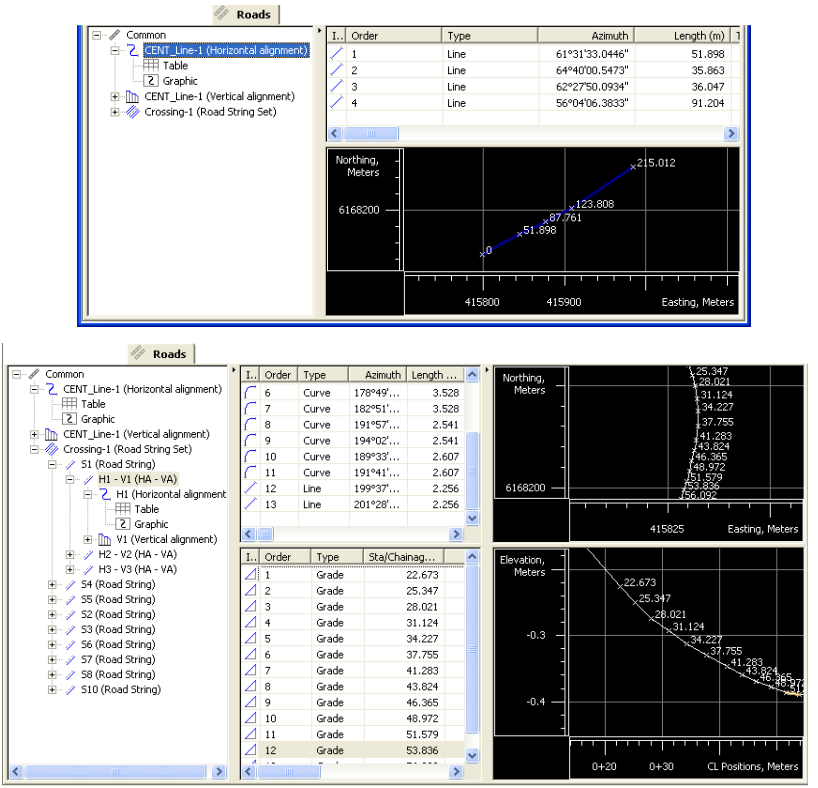


Figure A-27. Roads Tab for road with X-Section: Right Panel

All types of line, curves, spiral, intersection, grade, parabola and circular ark that are used for creating horizontal and vertical alignments of a road with String set are the same that are used for creating alignments of a road with X-section. See “Road with X-Section” on page A-30 for details.

Stakeout Report View

The *Stakeout Report* tab is displayed only if a TopSURV job that was opened into Topcon Link, contains a stake report. This stake report involves information about stake of different objects (point, line/arc, road, slope, surface). In Topcon Link, the view of this report depends on components which were included by the user during configuration of the TopSURV job. All parameters of this report are not editable:

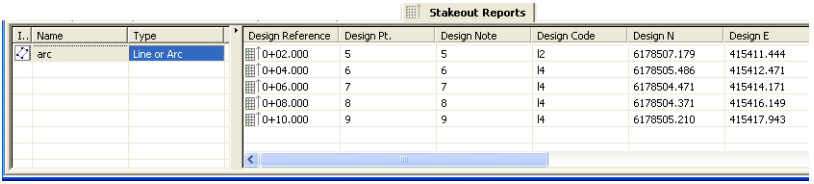


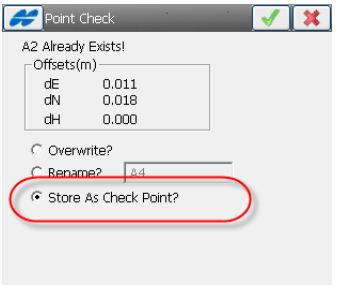
Figure A-28. Figure A-28. The Stakeout Report Tab

Displaying Check Points in Points Tab

With repeated measurements of a single point (for both GPS and TS measurements), the software TopSURV allows the user to select one of the following three methods (Figure A-29):

- to write the point with a new name
- to use the new coordinates and raw measurements and remove previous coordinates of this point
- to save this point as a check point

for TS measurements



for GPS measurements

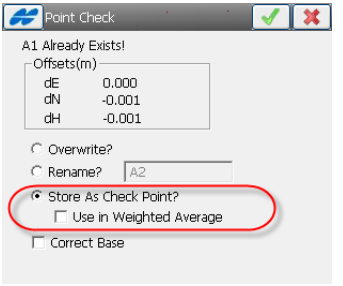


Figure A-29. TopSURV: Point Check Screen

When saving repeated measurements as measurements for check points, TopSURV shows the coordinates of only the first point in the *Points* screen. And the check points with their coordinates and offsets from the first point will be shown in the *Edit Point ->Check Points* tab (Figure A-30).

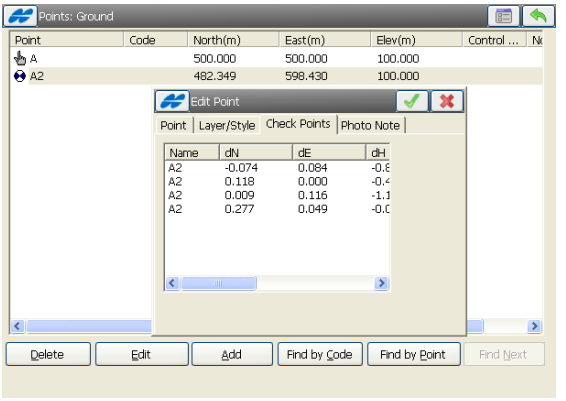


Figure A-30. TopSURV: Check Points Tab

TopSURV does not change the names of the check points: the all have the name of the first point. The repeated measurements are displayed in the *Raw Data* screen.

When you open a job in the Topcon Link, the software will display ALL control points in the *Points* tab and ALL repeated measurements in the *TS Obs/GPS Observations* tab. The names of these point

(except the name of the first point) will contain the prefix *check n,* where n - number of the check points.

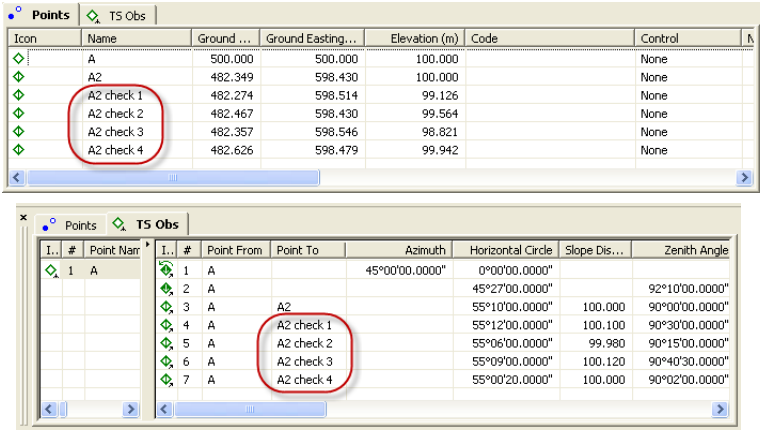


Figure A-31. Points Tab and TS Obs Tab Display Check Points

If the user saved repeated GPS measurements as measurements for check points, and selected the applying these measurements to weighted averaging in the TopSURV job, the software calculates point coordinates taking into account all repeated measurements for the point with mark

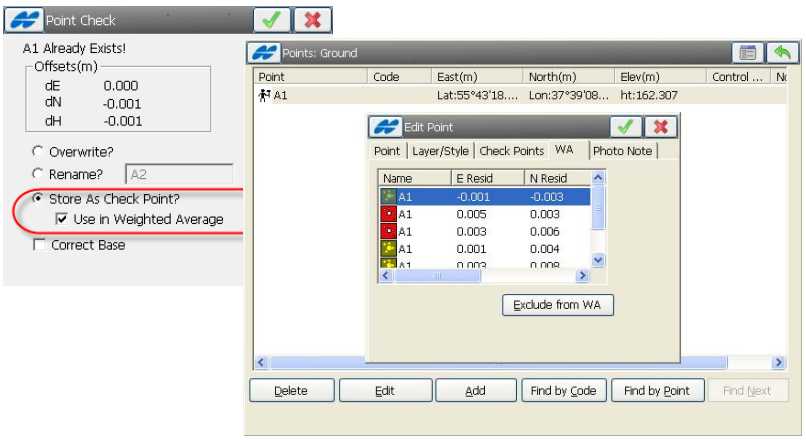


Figure A-32. TopSURV: Using Weighted Average

After opening this TopSURV job in Topcon Link, the *Points* tab will display the weighted averaging for the points and coordinates all

check points, The *GPS Observations* tab will display all repeated measurements of this job. The observations for points with name "*A1 check n*" were not used in calculation of the weighted averaging for the point "*A1*":

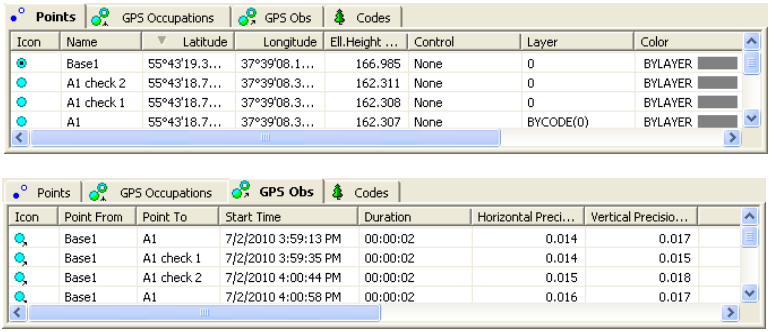


Figure A-33. Points Tab and GPS Obs Tab Displays Weighted Averaging Coordinates and Measurements

Icon Descriptions

Table A-4 lists the icons that represent different Topcon Link parameters in the data table. Note that the icons for codes and linework are user-selectable, and are not listed below.

Table A-4. Field Software Job Icons

Location	Icon	Description
Points Tab		TS station
		TS point
		TS BackSight point
		Point coordinates input manually
		Point coordinates calculated by means of COGO
		Design point
		Stakeout point
		Fixed coordinates point
		Fixed Horizontal control
		Fixed Vertical control
		Base station
		Topo point[a]
		Auto Topo point[b]
		PTL (point to line) offset point
		GPS offset point
		Tape Measurement Point

Table A-4. Field Software Job Icons (Continued)

Location	Icon	Description
TS Obs Tab, Left Panel		TS station
TS Obs Tab, Right Panel		ForeSight measurement
		SideShot measurement
		BackSight measurement
		BackSightBearing point measurement
		TS Resection Observation
		TS MLM Observation
GPS Occupations Tab		Base station occupation
		Auto Topo occupation[c]
		Topo occupation[d]
GPS Obs Tab		Baseline from the base station to a Topo point
		Baseline from the base station to an Auto Topo point
Tape Dimensions Tab Left Panel		Start reference line
Tape Dimensions Tab Right Panel		Tape Measurement Point

Table A-4. Field Software Job Icons (Continued)

Location	Icon	Description
Roads Tab		Horizontal Alignment
		Vertical Alignment
		X-Section Template
		View Table
		View Graphic
Roads Tab Horizontal Alignment Table		Line element
		Curve element
		Spiral element
		Intersection element
Roads Tab Vertical Alignment Table		Grade element
		Parabola element
		Long Section element

a. Topo point – the point collected during a static RTK measurement
b. Auto Topo point – the point collected during a kinematic RTK measurement
c. Auto Topo occupation – the kinematic occupation in the RTK survey
d. Topo occupation – the static occupation in he RTK survey

Notes:

Sample File Formats

Coordinate File Formats

Topcon Link can send, receive, and convert a number of different coordinate file data types. ASCII file formats are listed below.

KOF Coordinates Format

```
05 CP1        NAIL        48450.534  558462.743  246.368
05 CP2        NAIL        48579.742  558401.918  247.067
05 CP3        NAIL        48472.603  558478.853  245.887
05 100        BC          48456.890  558451.681  246.684
05 101        BC          48459.802  558456.825  246.468
05 102        BC          48460.338  558457.281  246.439
05 103        BC          48461.074  558457.147  246.408
```

Name,E,N,Z,Code/Name,N,E,Z,Code Coordinate Format

This file has the following format:

Name, Easting/Northing, Northing/Easting, Elevation, Code

```
CP1,1832223.183,158958.128,808.292,NAIL
CP2,1832023.626,159382.035,810.585,NAIL
CP3,1832276.036,159030.533,806.714,NAIL
100,1832186.891,158978.979,809.329,BC
101,1832203.767,158988.534,808.619,BC
102,1832205.263,158990.294,808.526,BC
103,1832204.823,158992.706,808.423,BC
104,1832196.907,159006.653,807.951,BC
```

If the code information is absence in the file:

```
CP2_NAD83,1832023.616,159382.018,810.587,
```

Name,Lat,Lon,Ht,Code Coordinate Format

This file has the following format:

Name, Lat, Lon, Ht, Code

```
CP1,40 06 06.90974,-82 59 13.59001,808.292,NAIL
CP2,40 06 11.08744,-82 59 16.18833,810.585,NAIL
CP3,40 06 07.62810,-82 59 12.91513,806.714,NAIL
100,40 06 07.11376,-82 59 14.05850,809.329,BC
101,40 06 07.20911,-82 59 13.84203,808.619,BC
102,40 06 07.22658,-82 59 13.82291,808.526,BC
103,40 06 07.25040,-82 59 13.82875,808.423,BC
```

If the code information is absence in the file:

```
CP2_NAD83,40 06 11.08726,-82 59 16.18847,810.587,
```

FC-4 Coordinate Format

This file has the following format:

Name

Northing

Easting

Elevation

Code

```
CP1
158958.12838
1832223.18323
808.29207
NAIL
CP2
159382.03548
1832023.62629
810.58455
NAIL
```

GTS-210/310-10 Coordinate Format

```
Ъ_+CP1        _ x+001524003_ y+001524003_ z+000213360_*NAIL_+CP2        _
x+001666808_ y+001524001_ z+000214079_*NAIL_+CP3        _ 0048Ъ
Ъx+001537109_ y+001547977_ z+000212900_*NAIL_+100        _ x+001534464_
y+001516702_ z+000213672_*BC_+101        _ x+001534908_ y+01073Ъ
Ъ01522596_ z+000213460_*BC_+102        _ x+001535200_ y+001523237_
z+000213433_*BC_+103        _ x+001535922_ y+001523429_ z+0002132023Ъ
Ъ401_*BC_+104        _ x+001540796_ y+001523056_ z+000213258_*BC_+105        _
x+001541721_ y+001537314_ z+000212903_*BC_+106      3057Ъ
Ъ _ x+001541978_ y+001541972_ z+000212840_*BC_+107        _ x+001528084_
y+001534145_ z+000213366_*BC_+108        _ x+001527955_ y+4039Ъ
Ъ001532304_ z+000213372_*BC_+109        _ x+001527571_ y+001531580_
z+000213377_*BC_+110        _ x+001526026_ y+001531069_ z+000215019Ъ
```

GTS-7 Coordinate Format

This file has the following format:

Name, Northing, Easting, Elevation, Code

```
CP1,5000.0000,5000.0000,700.0000,NAIL
CP2,4999.9943,5468.5206,702.3573,NAIL
CP3,5078.6555,5042.9982,698.4903,NAIL
100,4976.0449,5034.3210,701.0230,BC
101,4995.3832,5035.7784,700.3283,BC
102,4997.4859,5036.7339,700.2372,BC
103,4998.1150,5039.1041,700.1345,BC
104,4996.8930,5055.0934,699.6638,BC
105,5043.6716,5058.1299,698.4984,BC
```

If the code information is absent in the file

```
CP2_NAD83,4999.9771,5468.5091,702.3597,
```

Field Software Job Coordinate File

This file has the following format:

Name, Northing, Easting, Elevation, Note, Code

```
CP1,5000.000,5000.000,700.000,Base St,NAIL
```

If the note information is absence in the file:

```
CP3,5042.998,5078.655,698.490,,NAIL
```

If the note and code information is absence in the file

```
CP2_NAD83,5468.509,4999.977,702.360,,
```

GPS Vector File Format

GPS Vector files have the following format:

Header(//Topcon Vector Format:v.number of the version,linear units,)

VPP(for vector),Name_Point1,Name_Point2,dX,dY,dZ,sigma_dX,sigma_dY,sigma_dZ,cor_XY,cor_XZ,cor_YZ,

P(for point),Nane_Point,Lat(DD MMSS.ss),Lon(DD MMSS.ss),Ell.Height,Code,Note,

```
//TopconVectorFormat:v.1,USFeet,
VRTK Topo,Base1,154,161.2419,-89.8123,-68.3288,0.00773025,0.01944847,0.01418940,0.0900,-0.0300,-0.2800,LT+T
VRTK Topo,Base1,155,57.3292,-27.0161,-17.1042,0.00894811,0.02141176,0.00965958,0.2500,-0.1300,-0.2900,LT+T
VRTK Topo,Base1,156,27.2449,-40.4948,-43.0569,0.00796278,0.01099455,0.01267762,0.2000,-0.0300,-0.3500,LT+T
VRTK Topo,Base1,157,29.8279,14.0509,26.5551,0.00803396,0.01335403,0.01057974,0.4300,-0.1200,-0.4200,LT+L
P,Base1,39 32 17.80191,-104 54 00.37541,5879.325,CP,LT+T PL COR
P,154,39 32 16.99613,-104 53 58.09238,5870.788,CP,LT+T
P,155,39 32 17.60009,-104 53 59.57981,5877.202,CP,LT+T
P,156,39 32 17.27175,-104 53 59.90657,5876.692,CP,LT+T
P,157,39 32 18.13790,-104 54 00.05369,5879.843,CP,LT+L
```

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ISO 9001:2000
FM 69449

Topcon Link Reference Manual
P/N: 7010-0522 Rev M 11/10