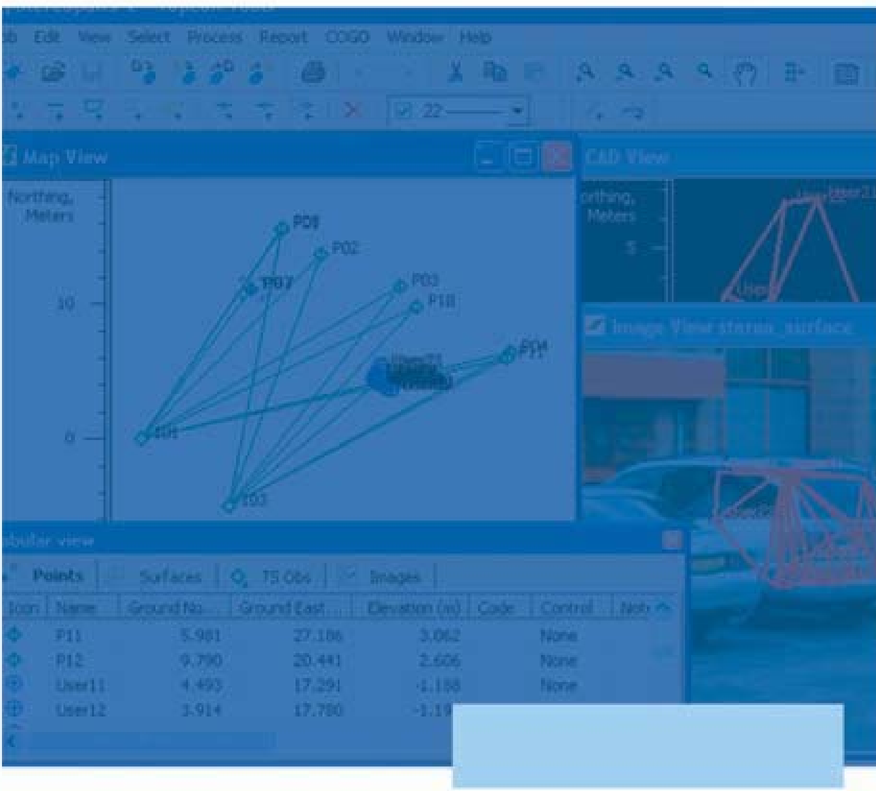
TOPCON

Topcon Tools

Post-processing Software



Reference Manual

POSITIONING SYSTEMS

Topcon Tools Reference Manual

Part Number 7010-0612
Rev G

ECO#2776

Table of Contents

Preface

Thank you for purchasing your Topcon receiver, survey product or accessory (the “Product”). The materials available in this manual (the “Manual”) have been prepared by Topcon Positioning Systems, Inc. (“TPS”) for owners of Topcon products. This Manual is designed to assist owners with the use of software (the “Software”) to be used with the Product and its use is subject to these terms and conditions (the “Terms and Conditions”).

NOTICE *NOTICE*

Please read these Terms and Conditions carefully.

Terms and Conditions

USE – This product is designed to be used by a professional. The user should have a good knowledge of the safe use of the product and implement the types of safety procedures recommended by the local government protection agency for both private use and commercial job sites.

COPYRIGHT – All information contained in this Manual is the intellectual property of, and copyrighted material of TPS. All rights are reserved. You may not use, access, copy, store, display, create derivative works of, sell, modify, publish, distribute, or allow any third party access to, any graphics, content, information or data in this Manual without the expressed written consent from TPS and may only use such information for the care and operation of your Product. The information and data in this Manual are a valuable asset of TPS and are developed by the expenditure of considerable work, time and money, and are the result of original selection, coordination and arrangement by TPS.

DISCLAIMER OF WARRANTY – EXCEPT FOR ANY WARRANTIES IN AN APPENDIX OR A WARRANTY CARD ACCOMPANYING THE PRODUCT, THIS MANUAL, THE PRODUCT, AND ANY ACCOMPANYING SOFTWARE ARE PROVIDED "AS-IS." THERE ARE NO OTHER WARRANTIES. TPS DISCLAIMS ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE OR PURPOSE. TPS AND ITS DISTRIBUTORS SHALL NOT BE LIABLE FOR TECHNICAL OR EDITORIAL ERRORS OR OMISSIONS CONTAINED HEREIN; NOR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE FURNISHING, PERFORMANCE OR USE OF THIS MATERIAL, THE SOFTWARE, OR THE PRODUCT. SUCH DISCLAIMED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, LOSS OF TIME, LOSS OR DESTRUCTION OF DATA, LOSS OF PROFIT, SAVINGS OR REVENUE, OR LOSS OF THE PRODUCT'S USE. IN ADDITION, TPS IS NOT RESPONSIBLE OR LIABLE FOR DAMAGES OR COSTS INCURRED IN CONNECTION WITH OBTAINING SUBSTITUTE PRODUCTS OR SOFTWARE, CLAIMS BY OTHERS, INCONVENIENCE, OR ANY OTHER COSTS. IN ANY EVENT, TPS SHALL HAVE NO LIABILITY FOR DAMAGES OR OTHERWISE TO YOU OR ANY OTHER PERSON OR ENTITY IN EXCESS OF THE PURCHASE PRICE FOR THE PORDUCT.

LICENSE AGREEMENT – Use of the Software and any other computer programs or software supplied by TPS or downloaded from a TPS website (the “Software”) to be used with a Topcon Product constitutes acceptance of these Terms and Conditions in this Manual and an agreement to abide by these Terms and Conditions. The user is granted a personal, non-exclusive, non-transferable license to use such Software under the terms stated herein and in any case only with a single Product or single computer. You may make one (1) backup copy of the Software. Otherwise, the Software may not be copied or reproduced. You may not assign or transfer the Software or this license without the express written consent of TPS. This license is effective until terminated. You may terminate the license at any time by destroying the Software and Manual. TPS may terminate the license if you fail to comply with any of the Terms or Conditions. You agree to destroy the Software and manual upon termination of your use of the Product. All ownership, copyright and other intellectual property rights in and to the Software belong to TPS. If these license terms are not acceptable, return any unused Software and the Manual.

CONFIDENTIALITY – This Manual, its contents and the Software (collectively, the “Confidential Information”) are the confidential and proprietary information of TPS. You agree to treat TPS’ Confidential Information with a degree of care no less stringent than the degree of care you would use in safeguarding your own most valuable trade secrets. Nothing in this paragraph shall restrict you from disclosing Confidential Information to your employees as may be necessary or appropriate to operate or care for the Product. Such employees must also keep the Confidentiality Information confidential. In the event you become legally compelled to disclose any of the Confidential Information, you shall give TPS immediate notice so that it may seek a protective order or other appropriate remedy.

WEBSITE; OTHER STATEMENTS – No statement contained at the TPS website (or any other website) or in any other advertisements or TPS literature or made by an employee or independent contractor of TPS modifies these Terms and Conditions (including the Software

License Agreement, Disclaimer of Warranty and limitation of liability).

SAFETY – Improper use of a Topcon Product can lead to injury to persons or property and/or malfunction of the Product. The Product should only be repaired by authorized TPS warranty service centers. Users should review and heed the safety warnings in the manual accompanying the Product.

MISCELLANEOUS – The above Terms and Conditions may be amended, modified, superseded, or canceled, at any time by TPS. The above Terms and Conditions will be governed by, and construed in accordance with, the laws of the State of California, without reference to conflict of laws.

Technical Support

For technical support, contact Topcon Positioning Systems at http://www.topconps.com or support@topconps.com for a technical support specialist through email.

Manual Conventions

This manual uses the following conventions:

Example	Explanation
File ▸ Exit	Click the File menu and click Exit.
Enter	Indicates the button or key labeled Enter.
Topo	Indicates the name of a dialog box or screen.
Notes	Indicates a field on a dialog box or screen, or a tab within a dialog box or screen.

TIP

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

NOTICE

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

CAUTION

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

Notes:

What's New with Topcon Tools

The following briefly describes some of the new features and functions for Topcon Tools.

- ➩ An Imaging module is included in Topcon Tools. This module processes Stereopairs and Scan Sessions.
- ➩ The following features are available for Stereopairs:
  - Import to the current job.
  - View in the Orientation and Stereo Views.
  - Measure points.
  - Create linework and surfaces on the Stereopair.
- ➩ New functionality has bee added for Scan Sessions:
  - Importing, viewing and editing Scan Session data
  - Surfaces can be created using Scan points.
- ➩ Increased surface functionality:
  - New attribute Breakline type has been added for layers. Breaklines are useful for creating surfaces.
  - A new options can automatically or manually update surfaces after making any changes.
  - Surface triangles can be selected and/or deleted in the CAD View.
- ➩ An Advanced module provides the following additional features:
  - In the Residual View window, an occupation can be edited.
  - In the Process Properties dialog, a Troposphere tab contains meteo parameters for troposphere model.

- ➪ Data can be imported from a Topcon Receiver Memory Card.
- ➪ A Photo note can be attached to any point.
- ➪ A new toolbar option controls and displays available Layers. The plotting styles of new objects, created in Topcon Tools, are specified by the active layer.
- ➪ The display of a coordinate type selection has been changed. The list of coordinate types depends on the settings of the Datum/ Projection and the status of the Grid to Ground check box in the Job Configuration.
- ➪ New file formats have been added for importing data into a Topcon Tools job and exporting data to an external file format.
- ➪ Advanced options for importing and exporting data have been updated and/or changed.

Introduction

Welcome to Topcon Tools™, an easy and powerful post-processing program. Topcon Tools provides a full-featured environment for processing and adjusting field observations created with the family of Topcon instruments. Depending on the purchased module, Topcon Tools processes TS observations, RTK observations, and post-processes GPS observations, or some combination of the three module options.

Beginner and experienced geodesists can use Topcon Tools for:

- Post-processing GPS base lines
- Processing TS and/or RTK observations
- Network adjustment
- Importing files on a computer or from a device
- Exporting data to files on a computer or to a device

Topcon Tools has tabular and graphical representations of data:

- Use the Tabular view for viewing points information, viewing vector or occupation information, viewing data with the same names, and sorting lines in alphabetical order by time or by increasing or decreasing values.
- Use the Map view for displaying a common network configuration, estimating the mutual position of points and vectors, and finding the necessary vector or point.
- Use the Occupation View for displaying occupations.
- Use the CAD view for displaying view of linework and surfaces with the associated points and lines.
- Use the Design view for creating and editing a digital terra model (“surface”), and for creating, viewing and editing road and X-section templates.

- Use the Imaging view for working with stereopairs and scan sessions.

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

Installing Topcon Tools

Topcon Tools software comes on a CD to install on a computer. The latest version of Topcon Link also installs on the computer.

If earlier versions of Topcon Tools or Topcon Link are already installed, the InstallShield® Wizard will first uninstall these earlier versions before installing the latest version.

1. Insert the Topcon Tools CD into the CD-ROM drive. The InstallShield Wizard starts up.
2. Click **Next** to start the installation process.
3. Click **Yes** to accept the License Agreement (Figure 1-1). Clicking **No** terminates the installation.
4. Type *User Name* and *Company Name* information, then click **Next** (Figure 1-1).
5. Either keep the default installation folder or click **Browse** to select a different folder in which to install the Topcon Tools. Click **Next** to continue (Figure 1-1).

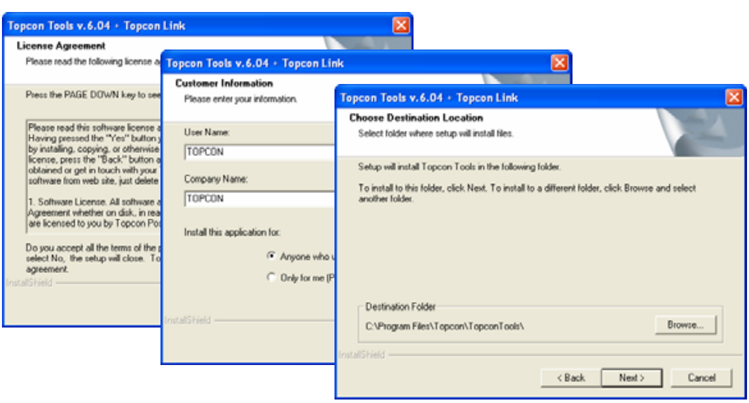


Figure 1-1. Begin the Installation

6. If desired, type a new folder in which to add program icons. Then click **Next** (Figure 1-2).

   Topcon Tools is installed on the computer (Figure 1-2)

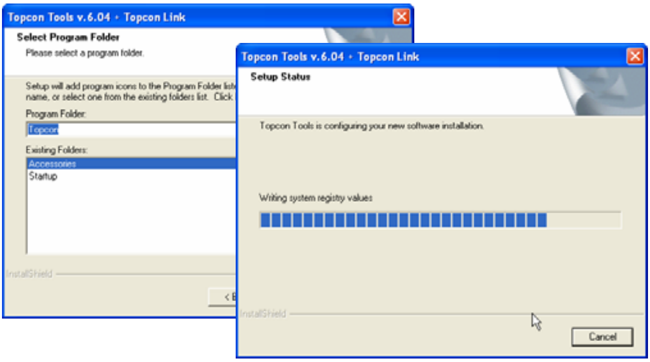


Figure 1-2. Select Program Folder and Installation Progress

7. Click **Finish** to exit the installation.
8. Create a Topcon Tools shortcut (Figure 1-3) on the computer desktop from which to quickly start the program.

Figure 1-3. Topcon Tools Desktop Shortcut

Installing and Configuring Microsoft ActiveSync

To import data from a TPS Controller to Topcon Tools, first install Microsoft® ActiveSync® onto the computer. ActiveSync establishes a connection between the computer and a mobile device, such as a TPS Controller. The mobile device must have the Windows CE operating system. ActiveSync is available for free from the Microsoft website (http://www.microsoft.com).

To establish a connection between the computer and a TPS Controller, do the following:

1. If needed, download and install Microsoft ActiveSync, following the on-screen instructions from microsoft.com and the ActiveSync Install Wizard.
2. Connect your device and computer using the desired connection method (serial cable, USB cable, ethernet cable to connect to a network, or Bluetooth® wireless technology).
3. Switch on the device and computer.
4. Start Microsoft ActiveSync.
5. Click **Next** on the ***Get Connected*** dialog box (Figure 1-4).

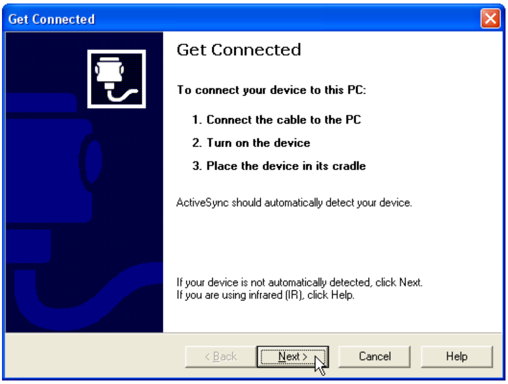


Figure 1-4. ActiveSync – Get Connected

The computer establishes a connection with the device. If the device is switched on, and the correct COM Port, USB port or LAN is selected, the ***Connected*** dialog box displays (Figure 1-5).

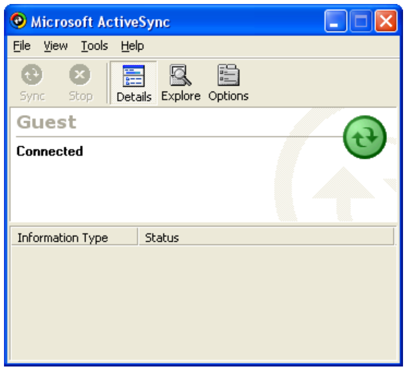


Figure 1-5. Computer and Device Connected

The system tray also displays a green ActiveSync circle, indicating a successful computer-to-device connection (Figure 1-6).

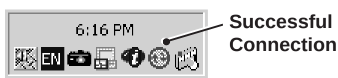


Figure 1-6. Connection Established

NOTICE

*TopSURV keeps *.tsv files in a format that can be opened only on Windows CE devices, not on the computer. When importing these files from a TPS controller to a computer, Topcon Tools converts them to an accessible file format (*.tlsv).*

CAUTION

To avoid data loss while exporting *.tsv files from a TPS Controller to a computer, use only Topcon Tools or Topcon Link.

If the computer has only one COM port:

1. Start Microsoft ActiveSync.
2. Click **File ▸ Connection Settings** (Figure 1-7).

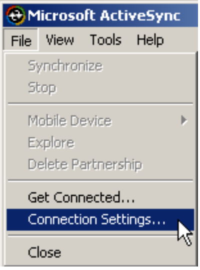


Figure 1-7. Open Connection Settings

3. Select the following parameters (Figure 1-8):
   - "Allow network (Ethernet) and Remote Access Service (RAS) server connection with this desktop computer"
   - "Show status icon in Task bar"

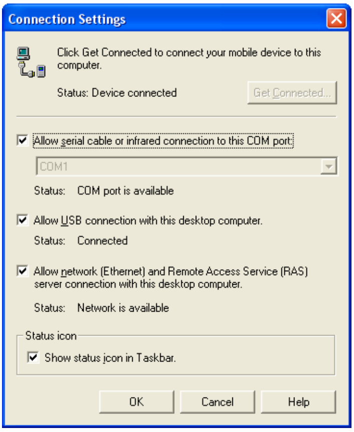


Figure 1-8. Connection Settings

In this case, ActiveSync does not request the COM Port after disconnecting the TPS controller from the computer. The COM Port connects the computer with a TPS GPS+ receiver or Total Station.

If there are two or more COM ports on the computer:

1. Start Microsoft ActiveSync.
2. Click **File ▸ Connection Settings**.
3. Select the following parameters (Figure 1-9):
   - click and enable “Allow serial cable or infrared connection to this COM port”
   - select a COM port from the drop-down list (usually COM 1)

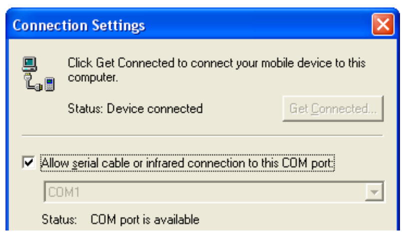


Figure 1-9. Connection Settings for Multiple COM Ports

In this case, Microsoft ActiveSync requests the COM Port after disconnecting the controller and computer. The COM Port is available only for devices that use the Windows CE operating system.

TIP

Use separate COM Ports for computer-to-controller connections and computer-to-receiver/Total Station connections.

When reconnecting the computer and TPS Controller, use the same serial interface port set in the ***Connection Settings*** dialog box.

Starting Topcon Tools

Depending on your software module, you will need either a hardware lock or an access code to start Topcon Tools.

- If your package has a hardware lock (LPT or USB dongle), insert it into the computer's appropriate port (Figure 1-10). Topcon Tools requires this to start.
- Upon initial startup for other packages, Topcon Tools requires an access code to start.

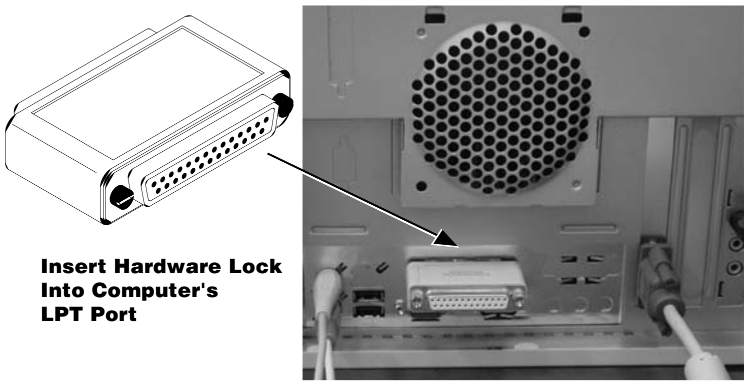


Figure 1-10. Insert Hardware Lock – LPT Dongle Example

1. To start Topcon Tools, do one of the following:
   - click **Start** ▸ **Programs** ▸ **Topcon** ▸ **TopconTools**
   - double-click the **Topcon Tools shortcut**

   Continue below for packages without the hardware lock.
2. Record the key value of the machine (Figure 1-11 on page 1-9). TIP: click **Copy** for quick, electronic recording to paste into email.
3. Contact your Topcon representative to acquire an access code.
4. After receiving the access code, click **Add code** and enter (or paste) the code into the editable field that appears in the *Available modules* table. Press **Enter** or click outside the box to apply. If accepted, available modules will display in the *Enabled modules* field (Figure 1-11 on page 1-9).

5. Click the desired module(s) to enable them for Topcon Tools (Figure 1-11). Click **Close**.
6. Click **OK** on the restart confirmation. Close and open Topcon Tools to activate the new/selected module(s).

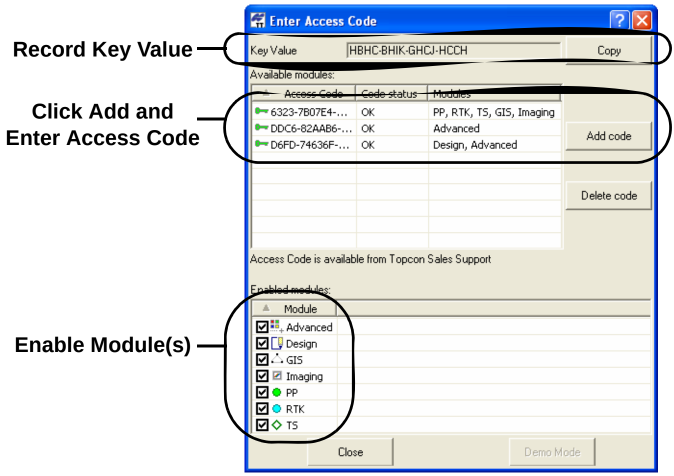


Figure 1-11. Enter Access Code

Topcon Tools also has a Demo Mode, where you can use a full-featured version of the software, but can only view and process five points in a job. To run Topcon Tools in Demo Mode, click **Demo Mode** on the ***Enter Access Code*** dialog box.

With access codes entered or the hardware lock inserted, Topcon Tools will open to the main window (Figure 1-12).

Figure 1-12. Topcon Tools Startup Example Window

The ***Startup*** window (Figure 1-12 on page 1-9) automatically displays from which to create new jobs or open earlier jobs.

- See “Getting Acquainted” on page 1-11 for details on the various tools and menus available in Topcon Tools.
- See “Working with a Job” on page 2-1 for details on the Startup window and its selections.
- See “Data Views” on page 4-1 for details on the data views available in Topcon Tools.

Topcon Tools also supports the drag-and-drop technique for opening files. A Topcon Tools job can be open or closed.

1. Run Windows Explorer on the computer and navigate to the location of the desired files.
2. Click and hold the file(s) to open.
3. Drag-and-drop the file(s) to the open Topcon Tools software (Figure 1-13).
   - If dropping a job onto the Topcon Tools main window, the job will open.
   - If dropping a job or data onto a currently open job, the job or data will be imported.

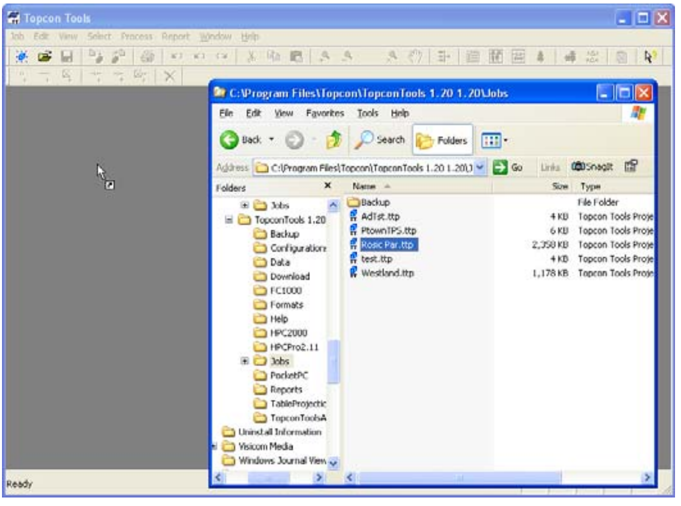


Figure 1-13. Open File Using Drag-and-drop

Getting Acquainted

This section introduces the various functions available in Topcon Tools for viewing, configuring, or editing data files.

NOTICE *NOTICE*

Depending on the purchased module, options, views, and functions may vary.

Topcon Tools Modules

Topcon Tools can be packaged as a module based on the needs and requirements of different jobs.

PostProcessing Module

Includes the engine for postprocessing GPS+ data.

RTK Module

Includes functionality for importing, displaying, adjusting, exporting, and reporting RTK data (data collected with RTK surveying using TopSURV or other data collection software).

TS Module

Includes functionality for importing, displaying, adjusting, exporting, and reporting data collected with total stations.

GIS Module

A less precise, less sophisticated version of the GPS+ PP module for processing DGPS data.

Design Module

Includes functionality for working with digital terrain models (surfaces) and creating and editing roads.

Imaging Module

Includes functionary for working with images, stereopair, and scan session.

Advanced Module

Includes additional options for processing and adjustment.

Main Window

The Topcon Tools main window (Figure 1-14) has the following components:

- Menu bar – contains drop-down menus for the various Topcon Tools functions.
- Toolbar – contains shortcut buttons to frequently used options.
- Status bar – displays informative messages about Topcon Tools and various files, as well as pop-up boxes for quickly changing units and coordinate systems.

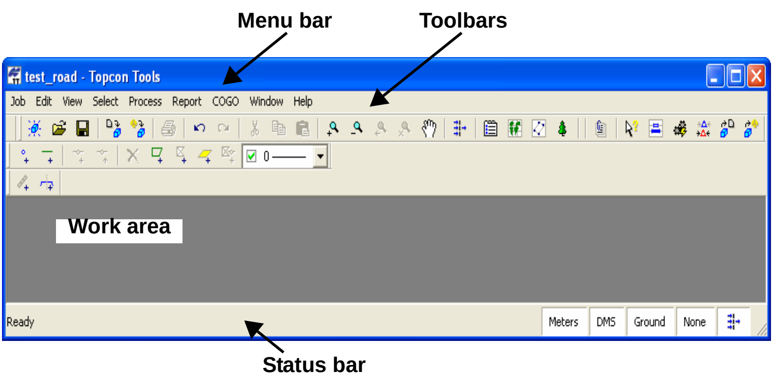


Figure 1-14. Topcon Tools Main Window

Upon startup, the ***Startup*** window displays (Figure 1-12 on page 1-9) the following:

- available jobs, including the job's name, locations, date created, and date last accessed
- buttons for creating a new job, opening a selected job, browsing for a job, and closing the startup window

Menu Bar

The menu bar (Figure 1-15) provides access to most options available using Topcon Tools.

Figure 1-15. Menu Bar

Table 1-1 describes the functions available in each menu.

Table 1-1. Topcon Tools Menu Options

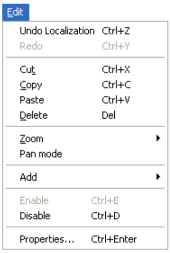
Menu	Functions
Job menu 	• creates, opens, saves, saves a copy of, and closes a job • prints information from an active job • imports from a file or exports to a file • imports from a device or exports to a device • defines printing variables • defines a configuration for an active job • views job information • displays recently accessed files
Edit menu 	• allows a redo or undo of the last operation • cuts, copies, pastes, or deletes information • sets the Pan mode or Zoom mode • adds a layer, a point, a line, a surface, area, road, or x-section • appends a point to a or inserts a point to a line • prohibits or permits the use of points and observations in adjustment/post-processing observations • displays properties for selected data

Table 1-1. Topcon Tools Menu Options (Continued)

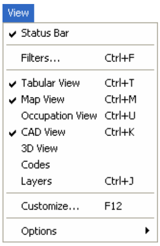
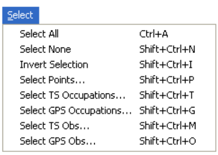
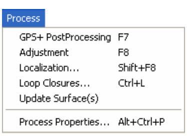
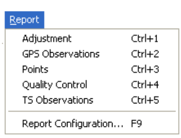
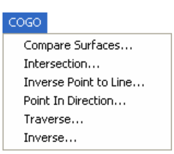
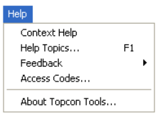
Menu	Functions
View menu 	• provides access to viewing and hiding the Status bar and various views • displays the Filters settings and dialog box • displays or hides data in either the Tabular view, Map view, Occupation view, CAD view, Codes view, 3D view, and Layers view • customizes toolbars to user specifications • sets Map, Occupation, Tabular, Cad, Images, and Stereopair view options
Select menu 	selects points, occupations, and observations based on user-defined criteria
Process menu 	• processes GPS observations • adjusts observations • computes localization parameters • displays loop closures • updates surfaces • sets processing properties
Report menu 	• displays data reports in a separate window, including adjustment results, points and observations details, and the results of quality control tests • customizes existing reports and creates user-defined reports
COGO menu 	• calculates the inverse for selected points with respect to a known point • calculates the coordinates of the intersection of two sections or rays and displays this information in the Point tab and on the CAD view • calculates the difference in volume between two surfaces • calculates the coordinates of a point location on a line (or ray) • calculates traverse point coordinates • calculates offsets of a point from the line (or ray)

Table 1-1. Topcon Tools Menu Options (Continued)

Menu	Functions
Window menu  	• arranges open windows in cascade (stacked) or tile (adjacent) views • arranges icons • displays the current view (Map, Occupation, Codes)
Help menu  	• adds a question mark to the cursor with which to get help about certain items • displays the help topics for Topcon Tools • accesses the computer's email system to send a bug report or question to Topcon Support • access the Topcon GPS website on the Internet • displays access codes information and customizes enabled modules • gives Topcon Tools version, build date, and purchased modules information

Toolbar

The toolbar for Topcon Tools (Figure 1-16) contains buttons for frequently used functions. To create a custom toolbar, see "Customizing the Toolbar" on page 1-20.

Figure 1-16. Toolbar

Upon startup, the toolbars display beneath the menu bar.

- To display or hide the toolbar, click **View ▸ Customize** and enable/disable the desired toolbar.
- To move the toolbar, click the background behind the buttons, then drag the toolbar to a new location.

To display CAD toolbar buttons using a customized toolbar, see "Customizing the Toolbar" on page 1-20.

Table 1-2 describes the various buttons available on the standard Toolbar.

Table 1-2. Toolbar Button Functions

Button	Description
	New Job – Creates a new job. 1. Click the button to display the ***Create a new job*** dialog box. 2. Type the name of the job and select its location. 3. Type the user name in the *Created by* field and enter comments in the *Comments* box, if needed.
	Open Job – Opens an existing job. 1. Click the button to display the ***Open Job*** dialog box. 2. Select the desired job. 3. Click **Open Job**.
	Save – Saves a job to the directory defined during job creation.
	Import from Files – Imports observation files into a job from a hard disk drive, local area network, or storage media. 1. Click the button to display the ***Import from files*** dialog box. 2. Select the path or folder, the type of format, and then select the names of observed files. Click **Open**.
	Import File from Device – Imports observation files from TPS GPS+ receivers, controllers, total stations, and Topcon memory cards. 1. Click the button to display the ***Import file from device*** dialog box. 2. Select the device(s) and click **Next**. See "Importing From a Device" on page 3-33 for more details.
	Export to File – Exports data from job files onto a hard disk drive, local area network, or storage media. 1. Click the button to display the ***Export to file*** dialog box. 2. Select the path or folder, type the name of file, and click **Save**.
	Print – Prints the current window or table.
	Undo – Reverses the last action.
	Redo – Returns the last action.
	Cut – Removes the selected object(s).

Table 1-2. Toolbar Button Functions (Continued)

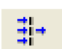
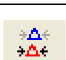
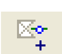
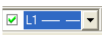
Button	Description
	Copy – Copies the selected object(s).
	Paste – Places object(s) from the Windows clipboard to the current cursor position.
	Zoom In – Switches the active Map, Occupation, and CAD view into zoom mode.
	Zoom Out – Switches the active Map, Occupation, and CAD view into zoom mode.
	Zoom back – Zooms back on the Map, Occupation, and CAD view.
	Restore All – Fits all data in the active Map, Occupation, and CAD view into the viewable extents of the active view.
	Pan – Changes the pointer to a “hand” with which to “grab” and move the Map, Occupation, and CAD view.
	Filters – Applies user-defined filters for observations and points. 1. Click the button to display the ***Filters*** dialog box. 2. Select the desired filters and click **Apply**.
	Tabular View – Opens and closes a spreadsheet/table presentation of data in a job.
	Map View – Displays observations and observed points.
	CAD View – Displays design data (points, linework, roads, and surface).
	Occupation View – Opens and closes the graphical occupation view for the job.
	Codes – Opens a table with the job’s codes.
	GPS+ PostProcessing – Uses the PostProcessing engine to process all GPS observations in a job.
	Adjustment – Adjusts the network.
	Configure Reports – Opens the Report Configuration window.

Table 1-2. Toolbar Button Functions (Continued)

Button	Description
	Context Help – Displays a pop-up tip with information about the selected view, button, information, 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.

CAD Toolbar Buttons

Button	Description
	Add point – Adds a point to the job. 1. Click the button. The pointer changes to an “add point” pointer. 2. Click anywhere on the CAD view. 3. Enter information for the point on the ***Add Point*** dialog box. 4. Click **OK**. Click the button again to return the pointer to normal.
	Add line – Adds a line to the job. 1. Click the button. The pointer changes to an “add point” pointer. 2. Click anywhere, or at the desired point, on the CAD view. A line is created between two points.
	Add Surface – Creates a new surface from selected points and lines.
	Append points to line – Adds points onto the end of a line.
	Add points to line – Breaks the line at the selected point and adds a point, essentially creating two lines out of one line.
	Add points and lines to surface – Adds points and/or lines to the surface.
	Erase – Deletes the selected object.
	Add road 1. Click the button. 2. Enter information for the road on the ***Add Road*** dialog box. 3. Click **Ok**.
	Add X-Section Template 1. Click the button. 2. Enter a name and cut/fill slope for the X-Section template on the ***Add X-Section template*** dialog box. 3. Click **Ok**.

Button	Description
	Add Area - closes the lines that have been created.
	Add Layer 1. Click the button. 2. Enter information for the layer on the ***Add Layer*** dialog box. 3. Click **Ok**.
	Layers Control 1. Click the combo box. 2. Clicking on layer name selects the layer as active.

Status Bar

The status bar (Figure 1-17) displays various informative messages about current Topcon Tools activities and data.

Double-click the boxes to display pop-up lists that provide quick access to some of the most commonly changed job configuration options (Figure 1-17).

- metric and angular units
- coordinate and projection systems

The box on the far right of the status bar displays the filter icon if the job uses a filter.

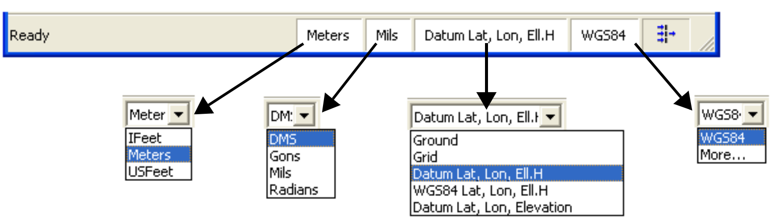


Figure 1-17. Status Bar and Pop-up Lists

Customizing the Toolbar

The standard toolbar contains the most frequently used functions; however, user toolbars can be customized to display the functions most frequently used for individual jobs. Toolbars can also be displayed or hidden as needed.

1. To customize toolbar options, click **View ▸ Customize**. The *Toolbars* tab in the ***Customize toolbars*** dialog box displays all available toolbars for activating or inactivating, and adds or deletes toolbars. (Figure 1-18).

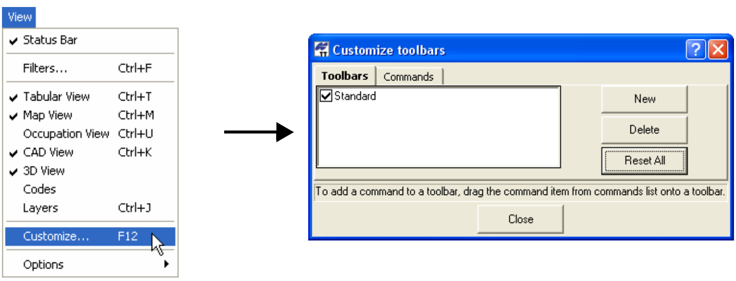


Figure 1-18. Customize Toolbars

2. Click **New** to add a new toolbar to the main window. Name the toolbar and click **OK** (Figure 1-19).

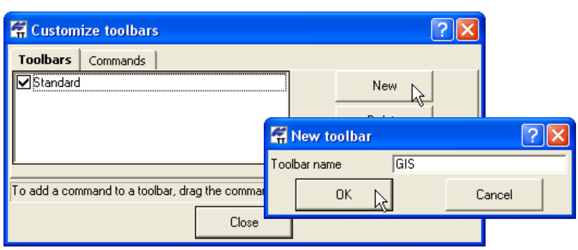


Figure 1-19. Add New Toolbar

The customized toolbar is added to the *Toolbars* tab and displays as an empty toolbar on the main screen (Figure 1-20).

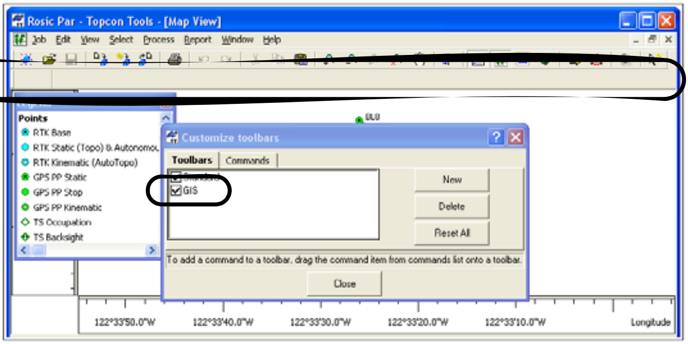


Figure 1-20. New Toolbar

3. Click the *Commands* tab. The left panel displays a list of menus and the right panel displays commands available for the selected menu (Figure 1-21).

Figure 1-21. Toolbar Commands

4. To add a command, select the applicable menu, then click and drag the desired toolbar command to the empty toolbar (or to a location on any toolbar) on the main screen and release the mouse button (Figure 1-22 on page 1-22).

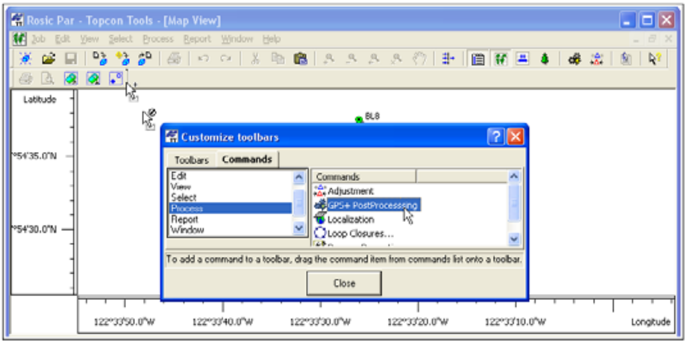


Figure 1-22. Adding Commands to Toolbar

5. When all desired commands have been added to the toolbar, rearrange the toolbar buttons as needed: click and drag the button to a location on the toolbar (Figure 1-23). When editing the toolbar, the ***Customize toolbars*** dialog box must be open.

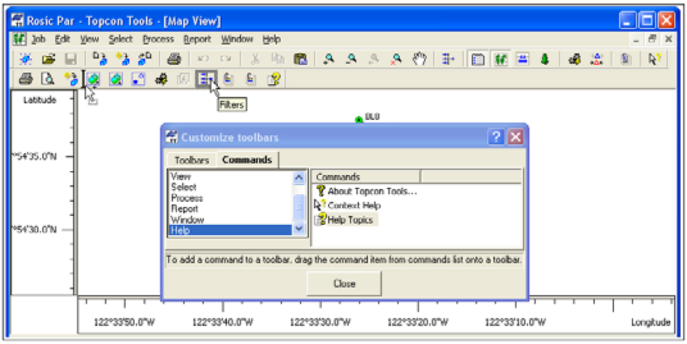


Figure 1-23. Editing Toolbar Button Location

See "Editing the Toolbar" on page 1-23 and "Custom Toolbar Tips" on page 1-24 for further customizing details.

6. When finished, click **Close** on the ***Customize toolbars*** dialog box to save the toolbar settings.

Editing the Toolbar

The ***Customize toolbars*** dialog box must be open (**View ▸ Customize**) before you can edit a toolbar.

Right-click the toolbar to display the toolbar pop-up menu for further editing (Figure 1-24 on page 1-24).

- Delete Button – deletes the selected button from the toolbar.
- Copy Button Image – copies the button's image for applying to another button.
- Paste Button Image – pastes a copied button image to another button.
- Set Default Image – sets the original (default) image for the selected button.
- Begin a Group – inserts a spacer bar before the selected button to set toolbar buttons in groups. A check mark indicates the beginning of the group. Click the menu option again to remove the check mark and button grouping.
- Command Properties – displays the ***Command Properties*** dialog box in which to select folder and filter properties for import/export toolbar buttons. See "Custom Toolbar Tips" on page 1-24 for details.
- Button Settings – displays the ***Button Settings*** dialog box for entering the *Button Name* (for when the cursor pauses over the button and when displaying the button as text) and the button's display properties (described below). See "Custom Toolbar Tips" on page 1-24 for details.
- Show Bitmap – displays an image for the button.
- Show Text – displays the button as text.
- Show Bitmap and Text – displays both an image and text for the button.

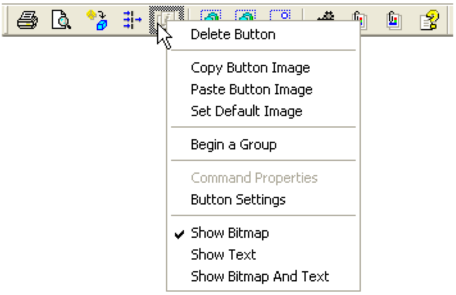


Figure 1-24. Toolbar Pop-up Menu

See “Custom Toolbar Tips” below for further customizing details.

Custom Toolbar Tips

The custom toolbar features in Topcon Tools are fully featured and interactive. Many button functions and display properties can be personalized to jobs, data types, or user preferences.

Command Properties

The ***Command Properties*** dialog box selects folder and filter properties for import/export toolbar buttons.

For example, use multiple import/export buttons on the toolbar to perform the import/export function from/to certain folders, or to always connect to a certain device. This is especially useful for storing different types of source data in different folders, or to skip the first step when importing from a device.

To do this, drag-and-drop two (or more) import/export buttons to a toolbar. Set the individual button properties to call certain folders and file types using the ***Command Properties*** dialog box. Give the toolbar button a unique name and display the text name for the button using the ***Button Settings*** dialog box.

1. Right-click an **import/export toolbar button** and click **Command Properties** on the pop-up menu (Figure 1-25).

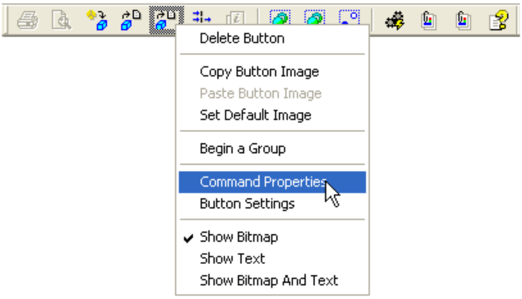


Figure 1-25. Display Command Properties

2. On the ***Command Properties*** dialog box, click the **browse** button to select the default folder to import files to or export files from (Figure 1-26).
3. Click the **Filter** drop-down list to select the default import/export format (Figure 1-26).
4. Click **OK** to save the settings and close the dialog box.

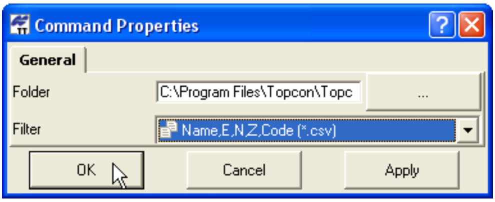


Figure 1-26. Apply Command Properties

5. Right-click the **same toolbar button** and click **Button Settings** on the pop-up menu. Assign a unique name to the button and set text display properties as described in “Button Settings” on page 1-26.

Button Settings

The ***Button Settings*** dialog box sets button name and text display properties.

1. Right-click a **toolbar button** and click **Button Settings** on the pop-up menu (Figure 1-27).

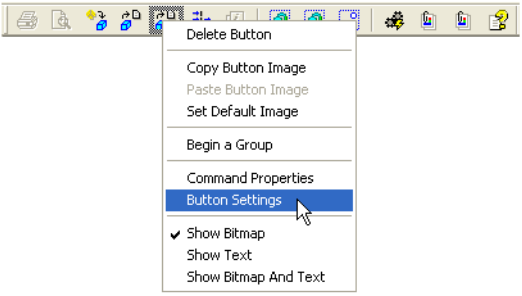


Figure 1-27. Display Command Properties

2. On the ***Button Settings*** dialog box, type a name for the button (or use the default name) (Figure 1-28).
3. Select a *Button appearance* (Figure 1-28):
   - Show Bitmap – displays the button as an image.
   - Show Text – displays the button as text.
   - Show Bitmap and Text – displays both an image and text for the button.
4. Click **OK** to save the settings and close the dialog box.

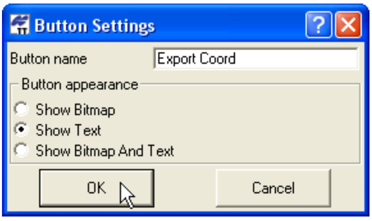


Figure 1-28. Apply Button Settings

Figure 1-29 displays the different button appearance options.

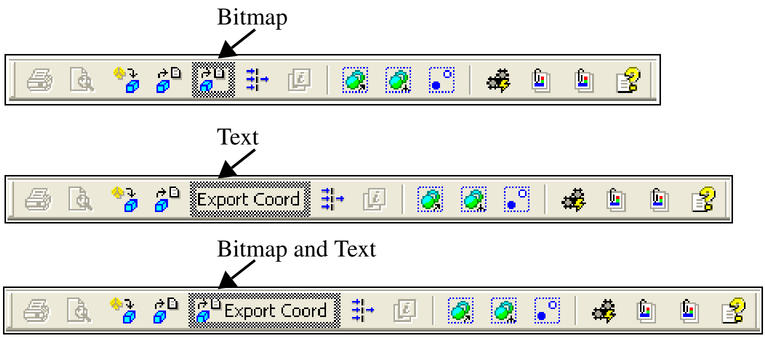


Figure 1-29. Button Appearance Options

Enabling Access Codes

Access codes are the licenses purchased to activate modules in Topcon Tools. Access codes can be enabled or disabled, added or deleted to providing more control over which features are available. To view access codes and enabled modules, click **Help ▸ Access Codes**.

The ***Enter Access Code*** dialog box (Figure 1-30 on page 1-28) provides the following information:

- Key Value – the identification number for the computer.
- Available modules – a table listing the codes for purchased modules, the status of each code, and the modules included with each code.
- Enabled modules – selectable boxes to enable or disable individual modules

To copy the Key Value:

Highlight the Key Value (double-click) and click **Copy**. This is useful for quick recording to send the value to Topcon.

To add an access code:

Click **Add code**. Enter the new code into the editable field that appears in the *Available modules* table. Press **Enter** to finish.

To delete an access code:

Select the access code and click **Delete code**.

To enable/disable a module:

Click the check box in the *Enabled modules* table. A check mark indicates an enabled module. Disabling a module will prevent that functionality from working in Topcon Tools.

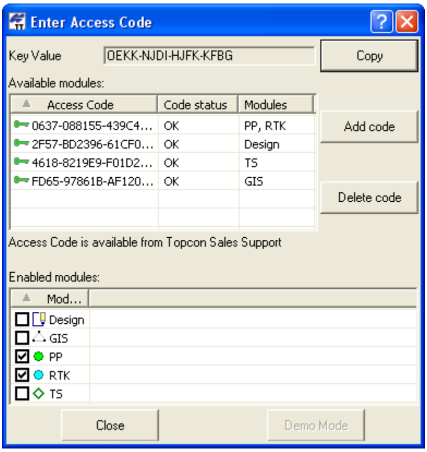


Figure 1-30. Topcon Tools Access Codes

Giving Feedback

The Feedback option in the Help menu offers a way for you to provide feedback. An option to connect directly to the Topcon GPS website is also available. These options require Internet access.

To send a bug report:

Click **Help** ▸ **Feedback** ▸ **Send Bug Report**. The computer's email activates and log files for the job are automatically attached. Describe activities being performed when the "bug" occurred and send the email to TPS Support.

To ask a question:

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

Printing the Selected View

All views in Topcon Tools can be printed for viewing offline.

TIP

Many views print best with a landscape orientation. The Job ▸ Page Setup option apply page and margin settings. Use Job ▸ Print Preview to view the potential result.

To Print Map, Occupation, or CAD Views:

To print Map, Occupation or CAD views, click once within the view and click **Job ▸ Print**.

These views are auto-scaled to fit the printed page.

To Print the Codes View:

To print codes from the Codes view, click within the left panel of the Codes view and click **Job ▸ Print**.

To print attributes from the Codes view, select codes with attributes in the left panel and click one of the attributes in the right panel, then click **Job ▸ Print**. To print attributes for multiple codes, press **Shift** while selecting the codes with attributes, then click within the right panel before printing.

To Print Tabular Views:

To print *Points*, *GPS Occupations* and *GPS Obs* tabs, click on the desired tab and click **Job ▸ Print**.

To print the left panel of *TS Obs* or *Tape Dimension* tabs, click within the left panel of the desired tab and click **Job ▸ Print**.

To print the right panel of *TS Obs* or *Tape Dimension* tabs, click within the right panel of the desired tab and click **Job ▸ Print**. To print data for multiple left-panel selections, press **Shift** while selecting the points, then click within the right panel before printing.

If panes do not fit horizontally on the page, they will be printed in several columns.

Notes:

Working with a Job

A Topcon Tools job file contains imported data intended for processing, as well as settings for data viewing and processing. Only one job may be open at a time. When opening another job, Topcon Tools automatically saves and closes a currently open job.

Using the Startup Dialog Box

When opening Topcon Tools, the ***Startup*** dialog box (Figure 2-1) automatically displays from which to create new jobs or open previous jobs.

The table displays a list of recently opened jobs. Click a column's title to sort listed jobs in ascending or descending order.

- the job's name
- the job file's location on the computer
- the date the job was created
- the date the job was last accessed

Use the buttons to open a selected job, create a new job, browse for current jobs, delete the selected job, or close the ***Startup*** dialog box.

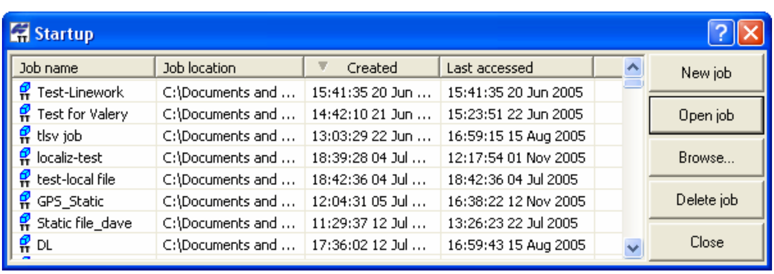


Figure 2-1. Startup Dialog Box

Creating a New Job

Creating a new job will open an empty job file in Topcon Tools, as well as automatically save the new file in the selected folder.

1. To create a new job, click one of the following (Figure 2-2):
   - click **New job** on the ***Startup*** dialog box
   - click the **New** button on the Toolbar
   - select **Job ▸ New Job**

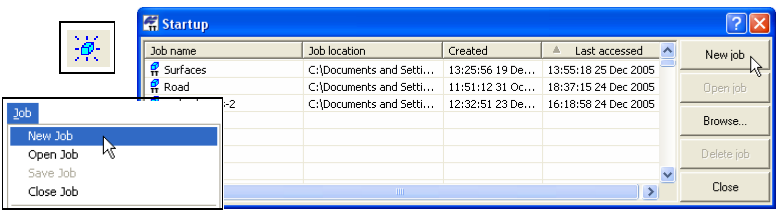


Figure 2-2. Ways to Create a New Job

2. Enter the following information (Figure 2-3 on page 2-2):
   - *Job name*, *Created by*, and *Comment* information.
   - Click the **browse** button (“**...**”) to select the folder in which to save the job.
   - Choose a configuration from the *Configurations* list or click **Edit configuration** (see “Job Configuration” on page 2-5 for information on editing the configuration).

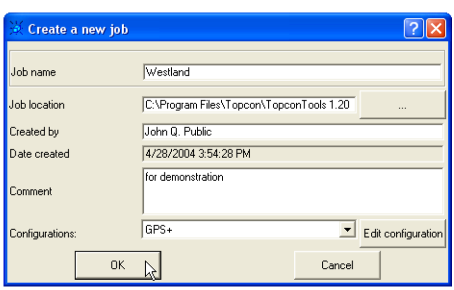


Figure 2-3. Create A New Job

3. Click **OK** to create, store, and open the new job.

Opening a Job

You can open a Topcon Tools job from within the program, double-click a *.tpp file, or drag-and-drop a *.ttp file into Topcon Tools.

1. To open a job, use one of the above techniques or click one of the following (Figure 2-4):
   - double-click the desired job from the list displayed on the ***Startup*** dialog box
   - click the desired job from the list on the ***Startup*** dialog box and click **Open Job**
   - click **Browse** on the ***Startup*** dialog box, then navigate to and select the desired job
   - click the **Open** button on the Toolbar
   - select **Job ▸ Open Job**

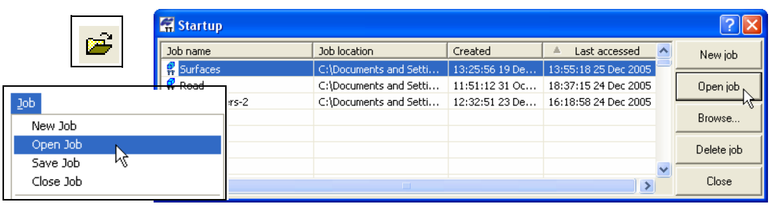


Figure 2-4. Ways to Open a Job

2. Navigate to the desired folder, click the desired job, and click **Open**. The selected job opens in Topcon Tools.

Saving a Job

To save a job, click one of the following (Figure 2-5):

- Click the **Save** button on the Toolbar.
- Click **Job ▸ Save Job**.
- Click **Job ▸ Save Job As** to save a copy of the job. Enter a new name on the ***Save As*** dialog box.

Figure 2-5. Ways to Save a Job

When opening another job or exiting the program, Topcon Tools will ask to save the currently open job.

Closing a Job

To close a job while leaving Topcon Tools open, click **Job ▸ Close Job** (Figure 2-6).

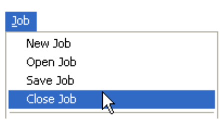


Figure 2-6. Close Job

If a job was modified without being saved, a dialog box displays a request to save the job. Click **Yes** to save the job in the same directory from which it opened.

Click **Job ▸ Exit** to exit Topcon Tools after saving and closing a job.

Deleting a Job

A Topcon Tools job file consists of three files containing job, option, and settings information. All three files must be deleted to successfully delete a job.

1. To delete a job, select the desired job using the ***Open a job*** or ***Startup*** dialog boxes and click **Delete** (Figure 2-7). Click **OK** on the confirmation message.

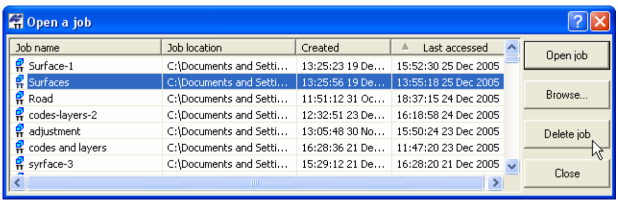


Figure 2-7. Select Job to Delete

Job Configuration

Use the ***Job configuration*** dialog box (Figure 2-8) to define Topcon Tools settings for data viewing and processing.

To access these settings, click **Job ▸ Job configuration** or click **Edit configuration** on the ***Create a new job*** dialog box.

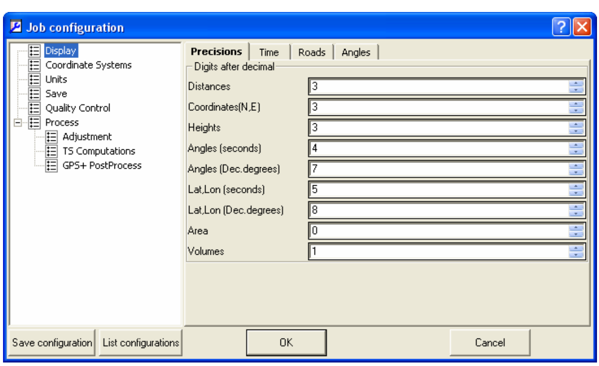


Figure 2-8. Job Configuration

- The left panel of the dialog box displays the items used to configure a job. The following sections describe these items.

- The right panel of the dialog box displays parameters for the selected item.
- Clicking the List configuration button displays the ***Configuration list*** dialog box (Figure 2-9). The default configurations differ in coordinate systems and precisions for Points, GPS Obs, TS Obs, DL Obs, and Loop Closure.

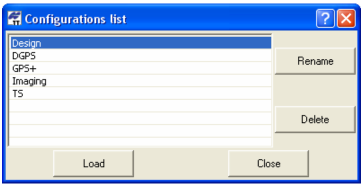


Figure 2-9. Configurations List

The user can select appropriate configuration for his tasks from the list. For example, for coordinate systems:

– Ground is set for Design, Imaging, TS configuration.

– Datum System is set for DGPS and GPS+ configurations.

Use this dialog box to rename or delete a selected configuration. Click Load to apply the selected configuration to the current job.

- The Save Configuration button opens the ***Enter configuration name*** dialog box in which to name a new configuration (Figure 2-10). See also "Creating a New Job" on page 2-2.

Figure 2-10. Enter Configuration Name

- The Cancel button cancels configuration settings or changes made in the right panel of the ***Job configuration*** dialog box.

Display Options

The Display item displays the following tabs in the right panel:

- The *Precisions* tab (Figure 2-11) sets the viewing number of digits after the decimal for the various measurements.

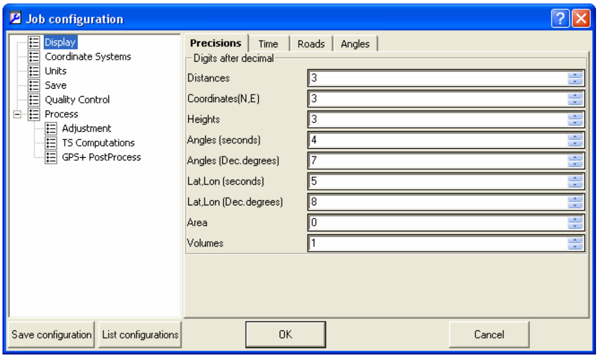


Figure 2-11. Job Configuration – Precisions Tab

- The *Time* tab (Figure 2-12) sets the GPS time zone offset.

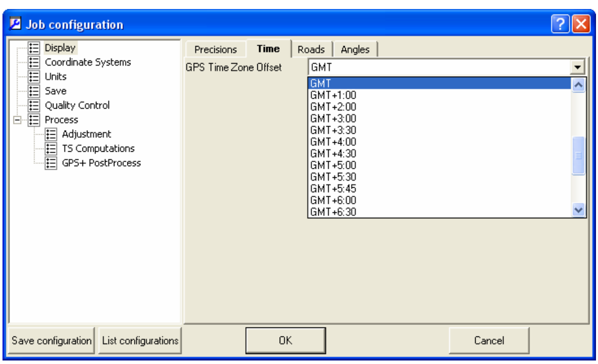


Figure 2-12. Job Configuration – Time Tab

- The Roads tab (Figure 2-13) sets the type of number to use for the centerline position.

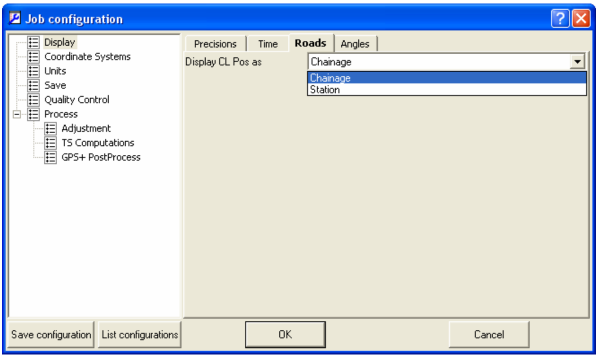


Figure 2-13. Job Configuration – Roads Tab

- The *Angles* tab (Figure 2-12) sets the format angular values.

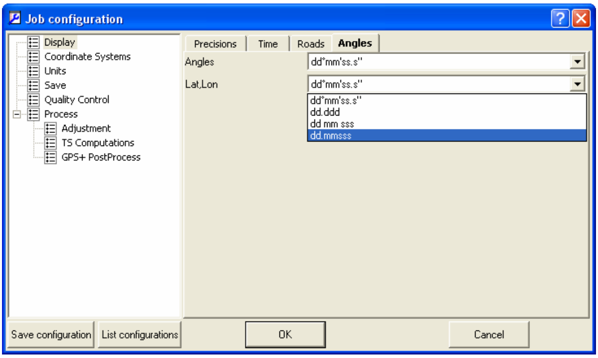


Figure 2-14. Job Configuration – Angles Tab

Coordinate Systems Setup

Any Topcon Tools job contains points, with coordinates either in a Grid system on corresponding Datum or a Ground coordinate system. To display point coordinates in the desired coordinate system, select the appropriate projection/datum in the Coordinate Systems window (Figure 2-15 on page 2-9) or in the Status Bar.

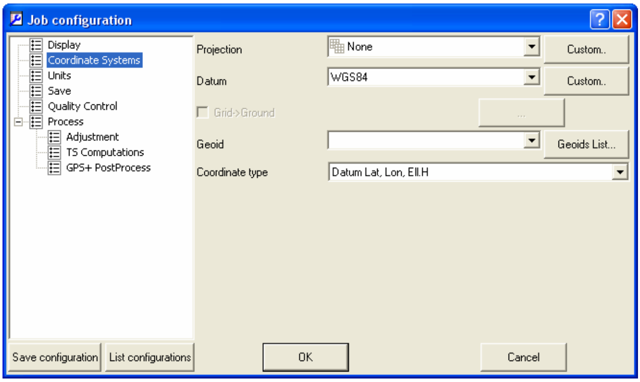
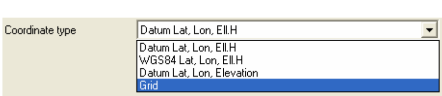
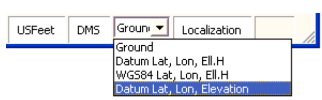


Figure 2-15. Job Configuration – Coordinate systems

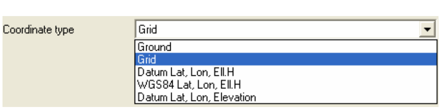
- The *Projection* drop-down list sets the pre-defined grid projection for the job. See “Add a Custom Projection” on page 2-12 for details on adding projections.
- When a projection (except Localization and None) is chosen, the *Grid->Ground* parameters check box is available.

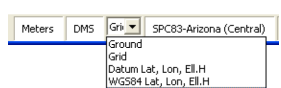
- If the *Grid->Ground* parameters check box is unchecked in the *Coordinate Systems* window, then ‘*Ground*’ is absent in the *Coordinate type* list in the *Coordinate Systems* window and in the list of coordinate systems in the *Status Bar*.



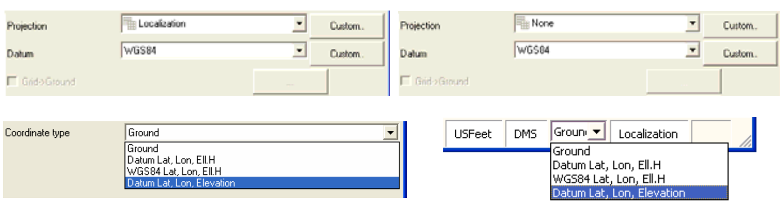


- If the *Grid->Ground* parameters check box is checked in the *Coordinate Systems* window, then ‘*Ground*’, ‘Grid’ and ‘Datum’ are displayed in the *Coordinate type* list and in the list of coordinate systems in the *Status Bar*.





- The *Grid->Ground* parameters check box and button opens a dialog box to set grid to ground transformation parameters. If unchecked, the coordinates will not be converted to grid and vice versa. See "Set Grid to Ground Parameters" on page 2-15 for applying these parameters.
- To display point coordinates in a local coordinate system (that is, in a system not related to any state grid system), select Localization or None from the *Projection* drop-down list.
  - Localization will display coordinates as ground, converted from grid using localization.
  - None will display only ground coordinates.
- When Localization or None are chosen from the projection list, the *Grid->Ground* parameters check box is not available in the ***Coordinate Systems*** window, 'Grid' is absent in the *Coordinate type* list in the ***Coordinate Systems*** window and in the list of coordinate systems in the Status Bar.



- The *Datum* drop-down list sets the datum (such as, WGS84) to be used to display and adjust data. This list is available if only a local coordinate system is selected or if the current grid projection allows different datums to be used (such as UTMNorth, UTMSouth, and UPS grids).

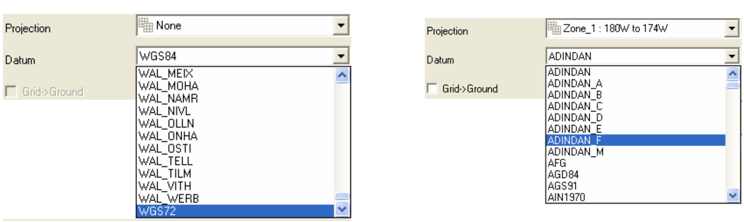


Figure 2-16. Example of selecting Datum for UTM (Zone 7)

In all other cases, the grid defines the datum, which is a reference datum for a selected projection.

Figure 2-17. Example setting of Datum for JAPAN_01 projection

- Topcon Tools allows the user to select the following datums for projections with NAD-83 as the reference datum:
  - NAD83 has the following transformation parameters (shifts, rotations and scale) to WGS-84 datum:

    DX=-0.9956 m, DY=1.9013 m, DZ=0.5215m
    RX=-0.025915", RY=-0.009426", RZ=-0.011599"
    Scale=0.00062

    This is the latest update of ITRF2000 parameters.
  - NAD83(ITRF96) has the following transformation parameters (shifts, rotations and scale) to WGS-84 datum:

    DX=-0.991 m, DY=1.9072 m, DZ=0.5129 m
    RX=-0.02579", RY=-0.00965", RZ=-0.01166"
    Scale=0.0

NOTICE

Use to support the previous version of NAD83<->ITRF96. This datum was used in Topcon Tools until version 5.04.

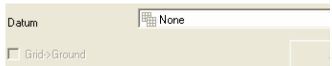
  - NAD83 _NO_TRANS has zero values of transformation parameters (shifts, rotations and scale) to WGS-84 datum.

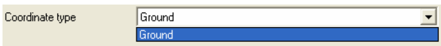
NOTICE

Use to support zero parameters in NAD83 (for CORS/VRS).

See “Add a Datum” on page 2-14 for details on adding a datum.

- When no datum is selected, the *Grid->Ground* parameters check box is not available in the *Coordinate Systems* window, only ‘*Ground*’ is displayed in the *Coordinate type* list in the *Coordinate Systems* window and in the list of coordinate systems in the Status Bar:





- The *Geoid* drop-down list sets the geoid model for the job. Select the necessary geoid model from the drop-down list. See "Add a Geoid" on page 2-17 to add a geoid.
- The *Coordinate type* drop-down list sets the type of coordinates used for the job. This setting can also be changed using the corresponding drop-down list in the status bar.
- If the geoid file is downloaded to the job and the geoid covers the area where job's points are located
  - orthometric heights will be displayed for the following selection in the *Coordinate type* list or in the Status Bar:

    Grid or Ground or Datum Lat, Lon, Elevation

    In this case the orthometric heights are displayed in the 'Elevation' column of the *Points* tab.
  - ellipsoidal heights will be displayed for the following selection in the Status bar:

    WGS84 Lat, Lon, Ell.H or Datum Lat, Lon, Ell.H

  In this case the ellipsoidal heights are displayed in the 'Ell.(ipsoidal)Height' column of the *Points* tab.

Add a Custom Projection

To define a custom projection...

1. Click the *Projection* **Custom** button.
2. On the ***Custom Projections List*** (Figure 2-18 on page 2-13):
   - Click **Add** to define a custom projection and continue below.
   - Click **Remove** to delete the selected custom projection.

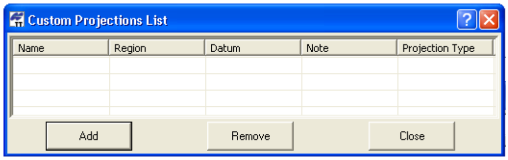


Figure 2-18. Custom Projections List

3. On the ***New Custom Projection*** dialog box, enter the following information and click **OK** (Figure 2-19 on page 2-13):
   - Name – type a name for the projection
   - Projection Type – select the type of projection (Transverse-Mercator, Lambert, Double Stereographic, Cassini-Soldner, Stereographic, Oblique Mercator, or Albers Equal Area)
   - Region – type a description for the region
   - Notes – type any desired notes
   - Datum – select the datum used for the projection

   The custom projection is added to the projections list.
4. When finished defining or removing custom projections, click **Close** on the ***Custom Projection List***. The new projections can then be selected from the *Projection* drop-down list on the Coordinate Systems panel.

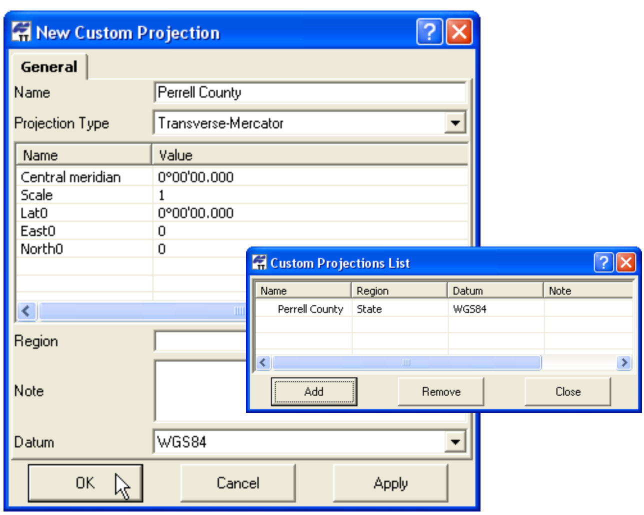


Figure 2-19. New Custom Projection

Add a Datum

To define a custom datum...

1. Click the *Datum* **Custom** button.
2. On the ***Custom Datums List*** (Figure 2-20):
   - Click **Add** to define a custom datum and continue with the next step.
   - Click **Remove** to delete the selected custom datum.

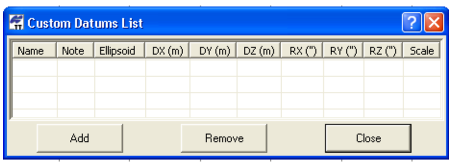


Figure 2-20. Custom Datums List

3. On the ***New Custom Datum*** dialog box, enter the following information and click **OK** (Figure 2-21). Enter the DX/DY/DZ, RX/RY/RZ, and Scale parameters with respect to the WGS84 datum.
   - Name – type a name for the datum
   - Ellipsoid – select the ellipsoid used to create the datum
   - DX, DY, DZ – enter the ellipsoid's shift parameters
   - RX, RY, RZ – enter the ellipsoid's angle rotation parameters
   - Scale – enter the scale to adjust the ellipsoid by
   - Notes – type any desired notes

   The custom datum is added to the datums list.

NOTICE

These parameters (shifts, rotations, and scale) specify a coordinate transformation from the newly created reference datum to WGS84 using the following equation:

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

4. When finished defining or removing custom datums, click **Close** on the ***Custom Datums List***. The new datum(s) can then be selected from the *Datum* drop-down list on the Coordinate Systems panel.

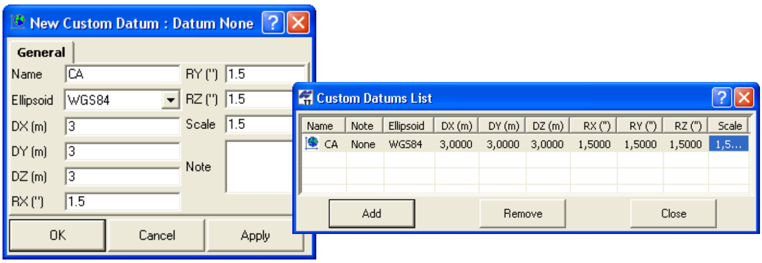


Figure 2-21. New Custom Datum

Set Grid to 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. The ground coordinates can be converted back to the grid projection.

Topcon Tools has two ways for setting Grid to Ground parameters:

The first way: Rotation of the ground system is performed relative to the origin of the Grid coordinate system. To do it, click the *Parameters* radio button (Figure 2-22) and take the following steps:

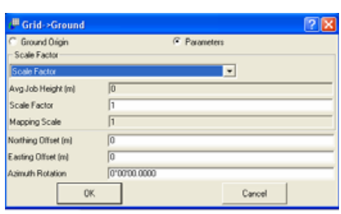
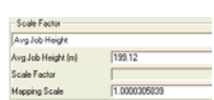
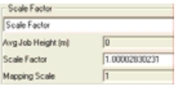


Figure 2-22. Creating Ground Projection Using Parameters Option

- Set the scale factor value using one of the following methods:
  1. select *Map Scale Factor* from the drop down list, enter an average height from all points in the job and enter the value of the Map Scale Factor. 

or

2. select *Scale Factor* from the drop down list in the *Grid->Ground* window and enter the value of the Scale Factor. This value can be taken from *Combined Grid to Ground Scale Factor* field of the *Points* tab. 

- Enter *Northing/ Easting offsets* from the origin of the Grid coordinate system
- Enter the *Azimuth Rotation* angle between the grid and ground coordinate systems. This angle defines the reference direction for ground azimuths.

The second way: Rotation of the Ground from Grid is performed relative to some point in the job. To do it, the user has to click the *Ground Origin* radio button (Figure 2-23) and take the following steps:

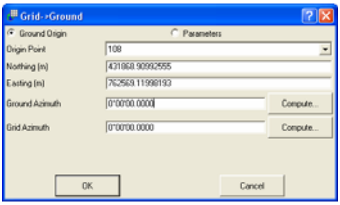


Figure 2-23. Creating Ground Projection Using Ground Origin Option

- Select the desired origin from the point list to set it as the origin. After selecting the point, the *Northing/ Easting* field of the *Grid->Ground* window displays coordinates of this point in the Grid coordinate system.
- To specify the ground coordinates of the origin point type in *Northing/ Easting* coordinates of the point in the Ground coordinate system.
- in the *Ground Azimuth* field, set the desired azimuth in the ground system.
- in the *Grid Azimuth* field, set the azimuth in the grid system.

To use the calculator for computing azimuth (instead of entering azimuth values) by the direction between two points of the job, then in the *Compute Azimuth* window press the *Compute* button in the corresponding azimuth field, select start and end points of the ray, to determine the direction, and enter a value to add to the azimuth:

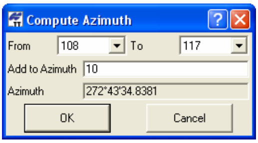


Figure 2-24. Compute Azimuth Window

Add a Geoid

If the Geoid list is empty...

1. Click the **Geoids List** button to import a geoid model to Topcon Tools. Click **Add** to open a geoid (Figure 2-25).

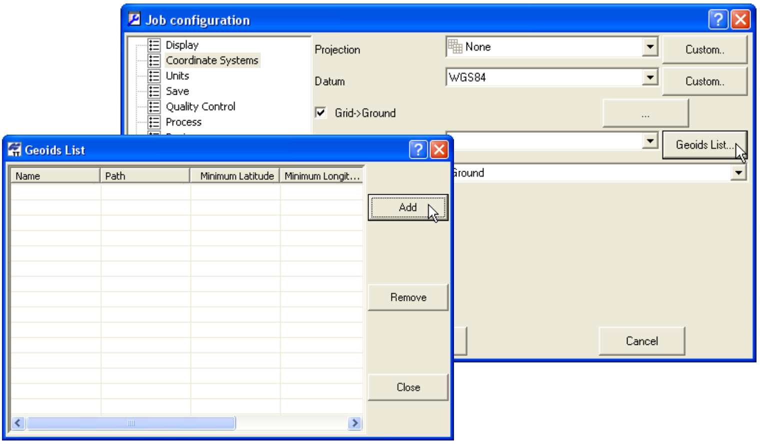


Figure 2-25. Add Geoids List

2. On the ***Open*** dialog box, navigate to the location of the geoids list and click **Open** to add the new geoid model to the Topcon Tools geoids list (Figure 2-26).

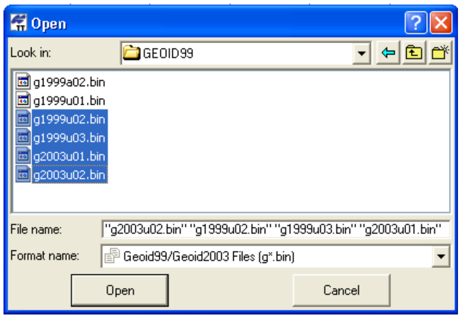


Figure 2-26. Open and Add Geoid List

3. Right-click on the ***Geoids List*** dialog box to display a pop-up menu, then click **Properties** to display the ***Properties*** dialog box (Figure 2-27).

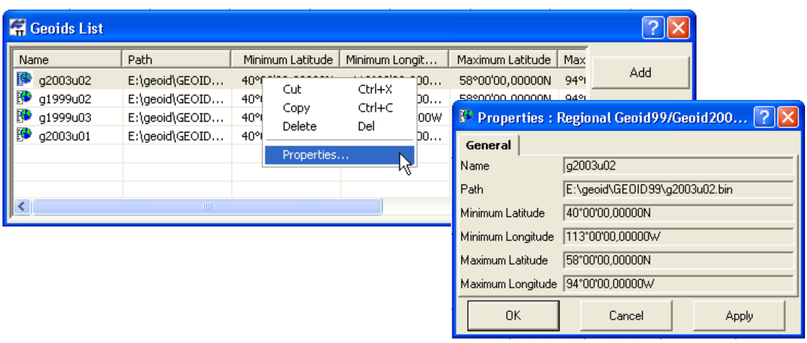


Figure 2-27. Geoids List and Properties Dialog Box

The Name and Path items on the ***Geoids List*** and ***Properties*** dialog boxes displays the name of the geoid and it's path on the local area network or computer.

4. To remove a geoid model from the Topcon Tools geoids list, select the file in the ***Geoids list*** dialog box and click **Remove**.

Units Selection

The Units item sets linear and angular units of measurement for the job (Figure 2-28).

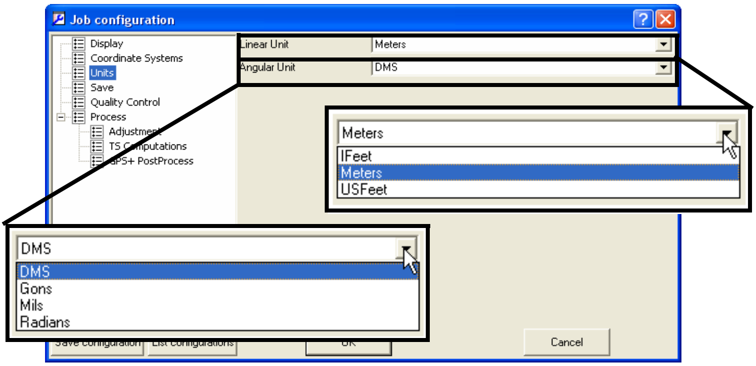


Figure 2-28. Job Configuration – Units

Save Options for Job

The Save item sets the folder in which to backup files, how to back up files imported from devices, and the backup interval for automatic saving (AutoSave) (Figure 2-29). The AutoSave feature is useful for securing data against loss and will save files in the "C:Documents and Setting\<username>\TopconTools\TopconToolsAutoSave" folder.

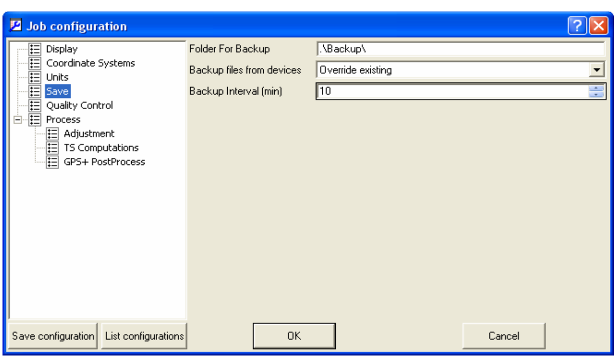


Figure 2-29. Job Configuration – Save

Quality Control Settings

The Quality Control item displays the following tabs in the right panel to help ensure job quality:

- The *Point Precisions* tab sets horizontal and vertical precisions for the coordinates of static and kinematic points (Figure 2-30). If horizontal (Std Dev Hz) and vertical (Std Dev u) residuals for a point are worse than the value in the settings in this tab, the point is highlighted in red in the *Points* tab, Map view, and Reports.

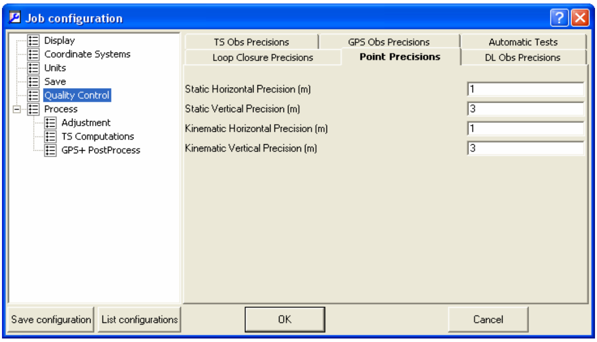


Figure 2-30. Job Configuration – Point Precisions

- The *TS Obs Precisions* tab sets precision for a distance and horizontal/vertical angle of TS observations (Figure 2-31 on page 2-21). If the values of the distance/horizontal/vertical residuals from a net adjustment—with Rejection Criterion-By Control—are worse than the values set in this tab, the observations are highlighted in red on the *TS Obs* tab, Map view, and Reports. These observations will not be used in the final adjustment of the net.

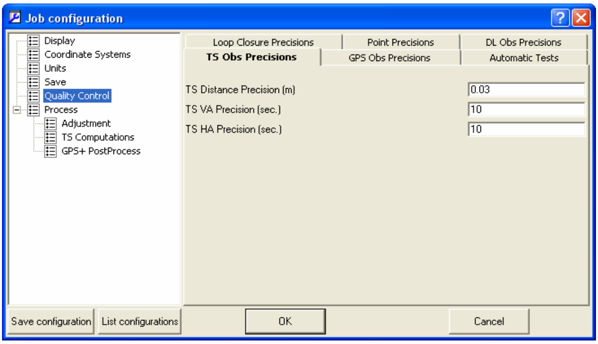


Figure 2-31. Job Configuration – TS Obs Precisions

- The *GPS Obs Precisions* tab sets horizontal/vertical precisions for RTK vectors and static/kinematic GPS post processing vectors (Figure 2-32 on page 2-21). If the values for horizontal $\sqrt{(Res(e))^2 + (Res(n))^2}$ and vertical residuals for RTK and GPS post-processed vectors resulting from a net adjustment—with Rejection Criterion-By Control—are worse than the values set in this tab, the observations are highlighted in red on the *GPS Obs* tab, Map view, and Reports. If the values of horizontal precision/ vertical precision for RTK and GPS post-processed vectors calculated in the process of net adjustment are worse than the values set in this tab, the observations are highlighted in red on the *GPS Obs* tab, Map view and Reports, and will not be used in the final adjustment of the net.

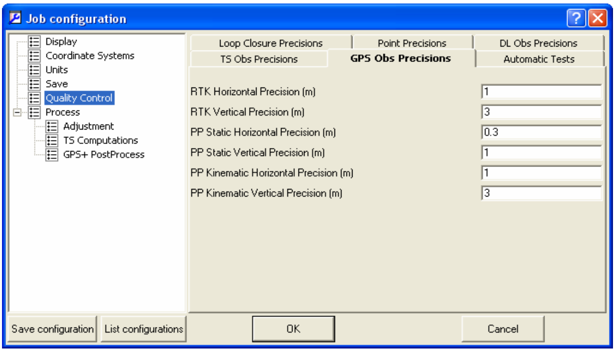


Figure 2-32. Job Configuration – GPS Obs Precisions

- The *DL Obs Precisions* tab sets precisions for digital level measurements (Figure 2-33). If the values of Ht Residual resulted from a net adjustment—with Rejection Criterion-By Control—are worse than the values set in this tab, the observations are highlighted in red on the *DL Obs* tab and Reports. These observations will no be used in the final adjustment of the net.

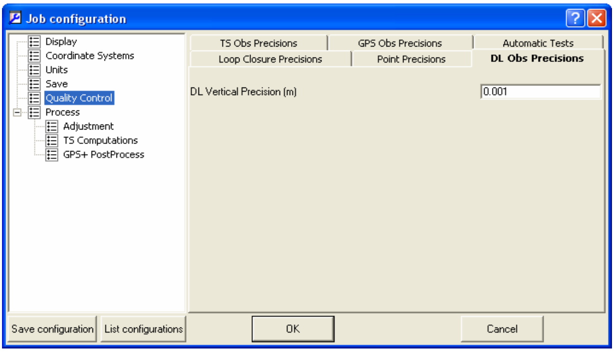


Figure 2-33. Job Configuration – DL Obs Tab

- The *Automatic Tests* tab sets which of the quality control tests to run instantly in the background and mark points and observations that fail the QC test in red (Figure 2-33 on page 2-22). Clearing any of the checkboxes will also clear red marks and textual descriptions on the QC tabs of the ***Property*** dialog boxes. When selecting a test, the test will first check existing data, then continue to run in the background. The following tests are available:
  - Warm Float Solution test, in case of Float solutions observations are highlighted in red on the Table and Map views, and in Reports.
  - RTK Precision test, in case of dissatisfaction the requirements of RTK Precision (see tab Precisions) during RTK. Observations are highlighted in red on the Table and Map views, and in Reports.
  - PP Static Precision test (when both receivers are stationery), in case of dissatisfaction the requirements of PP Static Precision (see tab Precisions). Observations are highlighted in red on the Table and Map views, and in Reports.

– PP Kinematic Precision test (when one of the receivers is stationery), in case of dissatisfaction the requirements of PP Kinematic Precision (see tab Precisions). Observations are highlighted in red on the Table and Map views, and in Reports.

– Point Standard Deviations test, during adjustment in case of dissatisfaction the precision criterion, which is determined depending on the point type, points are highlighted in red on the Table and Map views, and in Reports. Quality Control tab in Properties for these points contains message: Failed to match the desired precision

– Identical Points test. Test determines the points with a small distance between them. The minimum acceptable distance is determined depending on the point type, in case of dissatisfaction the precision criterion Points are highlighted in red on the Table and Map views, and in Reports. Quality Control tab in Properties for these points contains message: “This point is very close to point <point name>. They are probably identical”.

– Misnamed GPS Occupations test. For static measurements only. Test determines the occupations, which are more then 30 m away from the point and probably are misnamed. Such Points and Occupations are highlighted in red on the Table and Map views, and in Reports.

– Misnamed Autotopo Rovers test. For kinematic measurements only. Test determines the occupations, which are more then 30 m away from the point and probably are misnamed. Such Points and Occupations are highlighted in red on the Table and Map views, and in Reports.

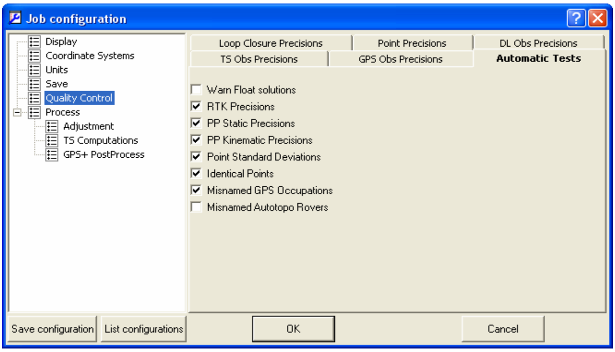


Figure 2-34. Job Configuration – Automatic Tests Tab

- The *Loop Closures* tab sets the horizontal and vertical tolerances for loop closures (Figure 2-35).

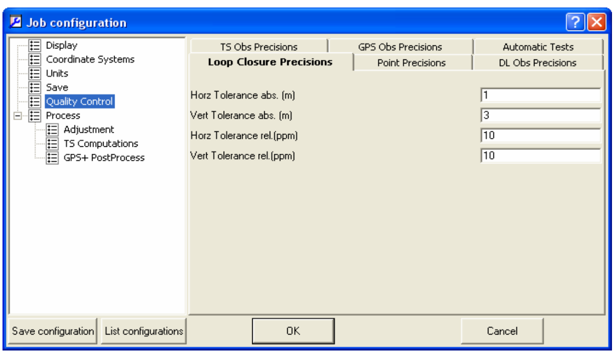


Figure 2-35. Job Configuration – Loop Closures Tab

Process Properties

The Process item displays the following tabs in the right panel (see also "Processing, Adjusting, & Localizing Points" on page 6-1):

- The *Adjustment* tab sets the confidence level for adjustment, the rejection criteria for quality control, and the tests to be performed before network adjustment (Figure 2-36). The default confidence level is 95% and the default rejection criterion is By Quality Control.

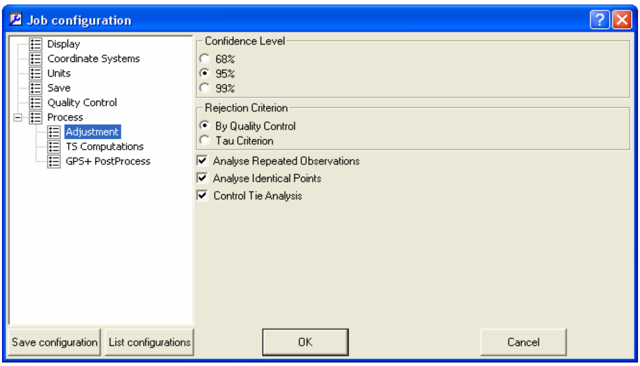


Figure 2-36. Job Configuration – Adjustment

- The *TS-Computations* tab sets the refraction coefficient to be applied to total station observations when adjusting (Figure 2-37). The default refraction coefficient is 0.14.

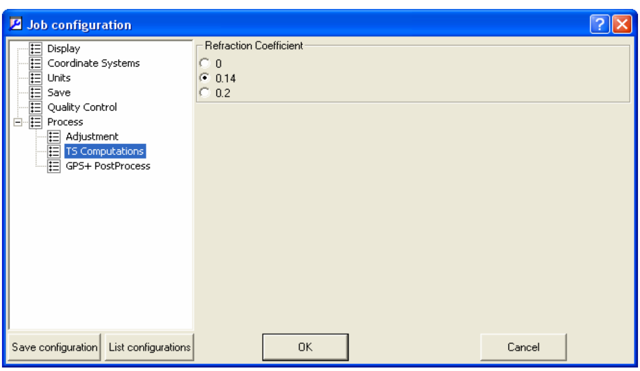


Figure 2-37. Job Configuration – TS-Computation

- The *GPS+ PostProcess* tab (Figure 2-38) sets the elevation mask, the navigation system, the minimum duration for station mode (Auto or Fixed Time), and enables/disables continuous kinematic.

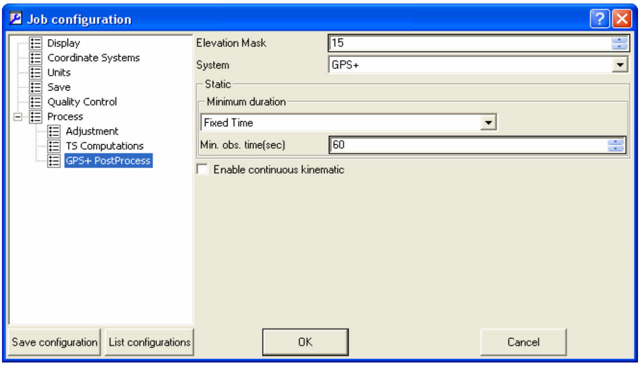


Figure 2-38. Job Configuration – GPS+ PostProcess

Job Information

The Job information menu selection displays basic information about the job's configuration and setup.

To access this information, click **Job ▸ Job info**. The ***Properties*** dialog box displays for the active job (Figure 2-39). Enter *Created by* and *Comments* information as needed. Click **OK** to save the information.

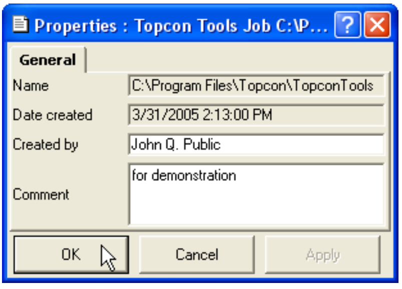


Figure 2-39. Job Properties

Importing Data

Before importing a file from the computer or a device, open a job in Topcon Tools. Newly imported data is selected in all views.

Importing From a File

Topcon Tools imports the following file formats:

• Coordinate files TOpSURV Coordinates (*.txt) CORS Coordinate files (*.txt) CR-5 Files (*.CR5) Custom Text Format files (*.*) FC-4 Points (*.xyz; *.fc4; *.pnt) FC-5 Points (*.xyz; *.fc5; *.pnt) GTS-210/310-10 Points (*.xyz; *.pnt) GTS-210/310-12 Points (*.xyz; *.pnt) GTS-7 Points (*.xyz; *.pnt) Name,E,N,Z,Code (*.csv) Name,Lat,Lon,Ht,Code (*.csv) Name,N,E,Z,Code (*.csv) NGS Datasheet file (*.htm; *.html) • DL Obs File (*.dl; *.txt; *.lev) • Field Orientation Data (*.foe; *.fos) • Field Scan Data (*.fsc) • GIS files Shape files (*.shp)	• Design Files DWG files (*.dwg) DXF files (*.dxf) LandXML files (*.xml) TN3 Surface files (*.tn3) • GPS Obs File Custom Text Format (*.*) Topcon Vectors (*.tvf) TDS RW5 GPS Obs (*.rw5; *.raw) Topcon XML GPS Obs (*.xml) • GPS+ Raw Data Files Compact RINEX fiels (*.??D; *.??G; *.??N) RINEX files (*.??O; *.??G; *.??N) SP3 & SPC3 files (*.sp3) TPD files (*.tpd) TPS / JPS files (*.tps; *.jps) • Localization Files (*.gc3) • TDS Raw Data Files (*.rw5; *.raw) • Topcon Tools Jobs (*.ttp) • Topcon XML Files (*.xml) • TopSURV PC Job Files (*.tlsv)

(continued below)

- TS Obs Files
  - Custom TS Raw Format (*.*)
  - FC-5 Raw (*.raw; *.dat; *.fc5)
  - GTS-210/310 Raw (*.raw; *.dat; *.gts; *.gt6)
  - GTS-6 No Station Raw (*.raw; *.dat;*.gts; *.gts6; *.gt6)
  - GTS-6 Raw (*.raw; *.dat; *.gts; *.gts6; *.gt6)
  - GTS-7 Raw (*.raw; *.gts; *.gts7; *.gt7)
  - GTS-7+ Raw (*.raw; *.dat; *.gts; *.gts7; *.gt7)
  - TDS RW5 TS Obs (*.rw5; *.raw)
  - Topcon XML TS Obs (*.xml)
- TS Obs Files
  - TDS TP5 (*.tp5; *.xlt; *.xst; *.xml)
  - Topcon SSS XS-Template (*.xtl)
  - Topcon XML X-Section Template (*.xml)
  - TopSURV XS Template (*.xst)
- Code Library
  - DBF Code Library file (*. dbf)
  - TDD Code Library file (*. tdd)
  - XML Code Library file (*. xml)
- Roads File
  - CLIP Road Files (*.PLT)
  - ISPOL Road Files (*.ALI)
  - TDS Road Files (*.RD5)
  - Topcon MC Road Files (*.RD3)
  - Topcon SSS Road Files (*.HAL)
  - TopSURV Road Files (*.THL)
  - LandXML Roads (*.xml)
  - Topcon XML Roads (*.xml)
  - VGP Roads (*.VGP)

When importing files, you can select multiple files of the same format: either press **Shift** and use the **Up** and **Down** arrow keys to select sequential files, or press **Ctrl** and click non-sequential files. Topcon Tools also supports the drag-and-drop technique for importing data into an open job.

1. Open Topcon Tools and the desired job.
2. Run Windows Explorer on the computer and navigate to the location of the desired file(s).
3. Click to highlight the folder or file(s) to import
4. Click and hold the selected data, then drag-and-drop the files into Topcon Tools (either Map or Tabular view) (Figure 3-1 on page 3-3).
   - When using this procedure with the left mouse button, Topcon Tools attempts to automatically detect the file type and format (of all selected files and/or all files in the selected folder).

click and drag to import files to job

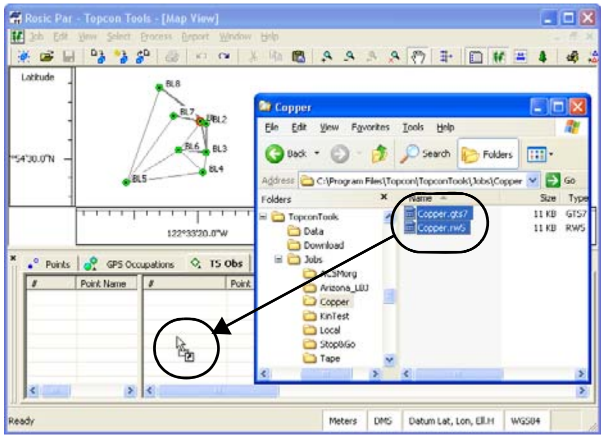


Figure 3-1. Import Data Into Existing Job Using Drag-and-drop

- When using this procedure with the right mouse button, the ***Drop options*** dialog box displays for increased import control (Figure 3-2). Click **OK** to continue.
  – Select the format type.
  – Enable *Recurse folders* to import data from all sub-folders within a selected folder.

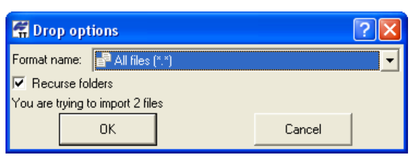


Figure 3-2. Drop Options for Drag-and-drop Importing

If no specific format is specified (using either the drag-and-drop technique or the Import file technique), Topcon Tools will try to determine the file format independently based on the imported file's extension and contents.

Note that this function is convenient but not 100% error-free. This method works fine for binary file formats like GPS Raw Data files, TopSURV files and most TS Raw Data files, but can sometimes produce incorrect data input for text files, especially comma-delimited coordinate files.

Importing Coordinate Files

Coordinate files are used to input and exchange points with known coordinates and codes. “Name,N,E,Z,Code”, “Name,E,N,Z,Code”, “Name,Lat,Lon,Ht,Code” are the most simple and commonly used coordinate files; these are comma-delimited text files with the fields listed. Any text editor can be used to create such files in order to input coordinates of known points into Topcon Tools. Points can also be exported from TopSURV, Topcon Link, most third-party controllers, and survey and GIS software packages.

For the “Name,Lat,Lon,Ht,Code” format, several formats can be used for typing latitude and longitude, including “[-]dd[d] mm sshhhh[NSEW]” and “[-]dd[d].mmsshhhh[NSEW]”, where ‘d’ stands for degrees, ‘m’ for minutes, ‘s’ for seconds, and ‘h’ for parts of a second; a minus sign in front of the latitude/longitude OR one of the N,S,E,W letters indicates north, south, east, west and are optional. This format uses 2 or 3 digits for degrees, 2 digits for minutes and seconds, and an arbitrary number of decimals for parts of second.

- If using delimited text files for storing coordinates, but require different formats, use ‘Custom Text Format’ to describe a custom text format (see “Importing and Creating Custom Format Files” on page 3-8 for details).
- “TopSURV Coordinates” are comma-delimited coordinate files that can be exported from TopSURV; they can contain attribute information along with coordinates and codes.
- “CR-5” files are coordinate files produced by TDS controller software.
- “FC-4 Points”, “FC-5 Points”, “GTS 210/310-10 Points”, “GTS 210/310-12 Points”, and “GTS-7 Points” are the formats in which Topcon total stations store coordinates; these formats can be used to input coordinates from Topcon total stations.
- “CORS Coordinate files” and “NGS Datasheet files” are coordinate files that can be taken from NGS and CORS websites.

1. To import a coordinate file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.

2. Select the format name as *Coordinate File*, or click the coordinate file plus button and select an individual file type.
3. Navigate to the location of the file and select the desired file.
4. Not every coordinate file contains information about coordinate units and the coordinate system. By default, the coordinate file will be treated as if it uses the job's linear unit and coordinate system after importing.

   Select the desired *Advanced* options to assign an additional options for each coordinate formats. In common cases, the *Advanced* option for coordinate files displays these fields:

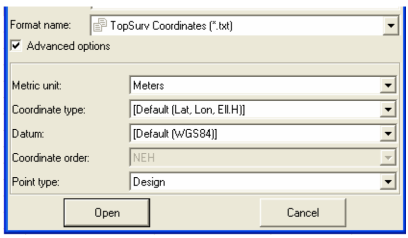
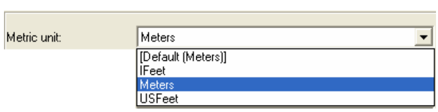
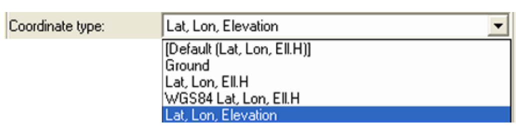
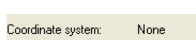


Figure 3-3. Advanced Option for TopSurv Coordinates File

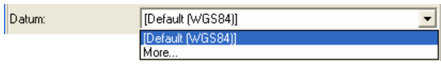
   Using the *Advanced* option, select the following parameters for the file being opened:

   - Metric unit: 

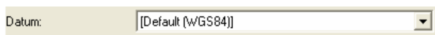
   - Coordinate type 

   - Depending on the selecting in the *Coordinate type*, the *Datum* field can display the following set:
     – If *Ground* is selected, the *Datum* field displays that no coordinate system is set: 

– If *Lat,Lon, Ell.H* or *Lat,Lon, Elevation* is selected, the *Datum* field displays the name of the datum set in the job, and allows selecting any datum from the drop-down list:

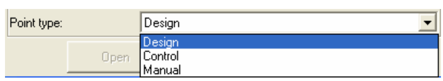


– If *WGS-84 Lat,Lon, Ell.H* is selected, *Datum* field displays the datum *WGS-84*

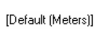


- Selection of the coordinate order can be available if only *Ground* is selected as the coordinate type

- A type for all points can be selected in the *Point type* field



NOTICE

The parameters set in the job will be marked as Default: 

If the user select the default settings, then the linear units and coordinates in the coordinate file will be assigned to the units and coordinate system set in the job configuration in the process of importing.

Other formats of the coordinate file, which Topcon Tools can import to the current job, have different fields in the *Advanced* option. For example, the *Advanced* option for the *GTS-210/310-10 Points*, *GTS-210/310-12 Points, Name,E,N,Z,Code, Name,N,E,Z,Code, GTS-7 Points, FC-4 Points, FC-5 Points* have the following fields: 

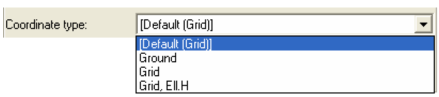
. For these formats, the user can set only types of points.

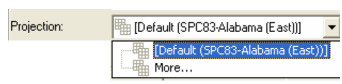
NOTICE

The Coordinate type is not available for selecting in the Advanced option 

when only the given coordinate system is available in the job

When all coordinate systems (*Ground, Grid, Datum*) are available in the job, the coordinate type list for the coordinate files (*GTS-210/310-10 Points*, *GTS-210/310-12 Points, Name,E,N,Z,Code, Name,N,E,Z,Code, GTS-7 Points, FC-4 Points, FC-5 Points*) displays the following list of coordinate system:



If *Grid* system is selected, the *Projection* field displays the name of the projection set in the job, and allows selecting any projection from the drop-down list: 

5. Clicking the **Open** button on the ***Import*** window imports the file to the job. The data is displayed in the *Points* tab.

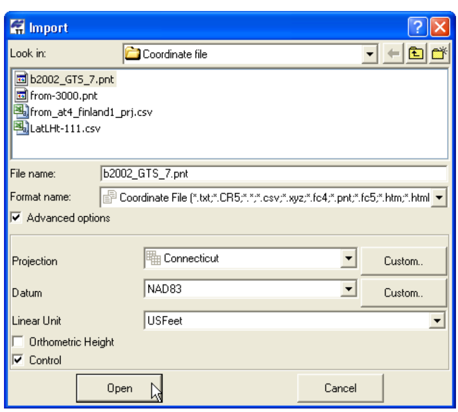


Figure 3-4. Import Coordinate Files

Importing and Creating Custom Format Files

Besides the commonly used file formats, Topcon Tools also supports user-defined ASCII file format.

1. To import a coordinate file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. In the *Format name* drop-down list, click the Coordinate File plus button and select Custom Text Format.
3. Navigate to the location of the file and select the desired file.
4. Select the desired *Advanced* options (Figure 3-5 on page 3-9):
   - Define the projection type, datum, and linear unit.
   - Enable *Orthometric Height* to mark the heights of all points from the imported file as orthometric; otherwise, the points are marked as ellipsoidal.
   - Enable *Control* to mark coordinates of all points from the imported file as fixed; otherwise, the coordinates are marked as none.

NOTICE NOTICE

Unless selected, heights will be orthometric (for grid/ground) or ellipsoidal (for longitude/latitude) and points imported as control.

5. Click **Open** (or **Save** if exporting) to set custom format properties.

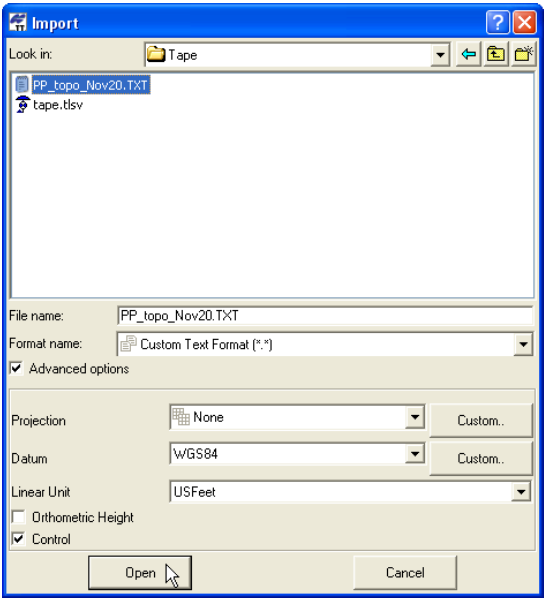


Figure 3-5. Import Custom Format File

6. On the ***Custom format properties*** dialog box, select the *Delimiters* and *Coordinate system* from the drop-down lists (Figure 3-6).

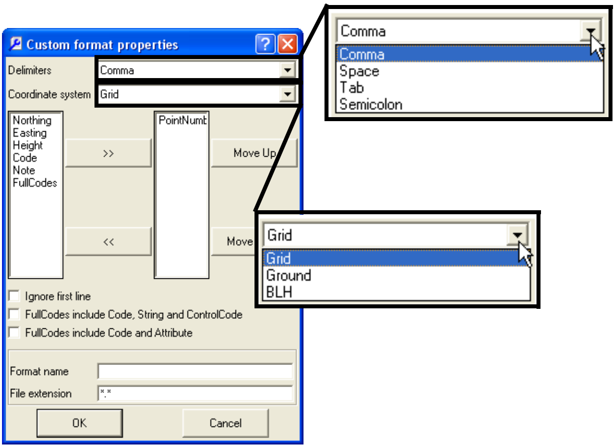


Figure 3-6. Select Delimiters and Coordinate System

7. Select the elements to include in the format from the left column and click the move right button (**>>**) to add it to the right column (Figure 3-7). Use the move left button (**<<**) to remove elements from the format.

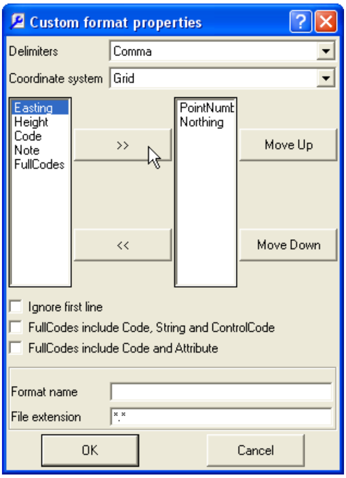


Figure 3-7. Add Elements to Custom File Type

8. To arrange included elements, select an element in the right column and use the **Move Up/Move Down** buttons.
9. Select *Ignore first line* to have Topcon Tools disregard the first line of the file.
10. Depending on the type of codes included in the custom format, select the desired option:
    - For fullcodes that contain codes, strings and control codes, use the string code shown in Figure 3-8.

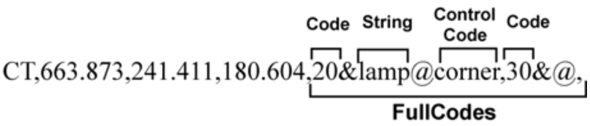


Figure 3-8. Example Coordinate File Format with Codes, String and Control Code

After importing this coordinate file to a job, the following information will be displayed (Figure 3-9 on page 3-11) at this point in the *CAD* tab.

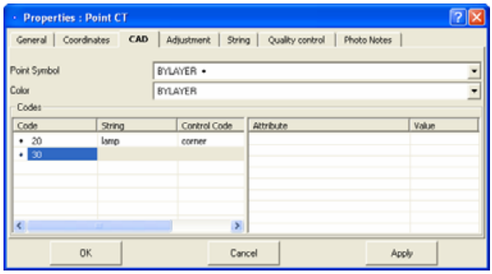


Figure 3-9. Point Properties – CAD tab

- Figure 3-10 shows fullcodes that contain codes and attributes.

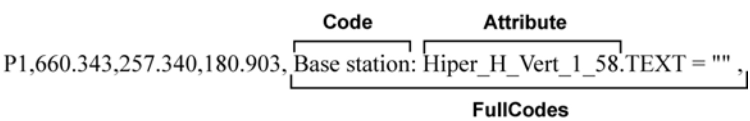


Figure 3-10. Coordinate File Format Including Code and Attribute

After importing this coordinate file to a job, the following information is displayed for this point in the *CAD* tab:

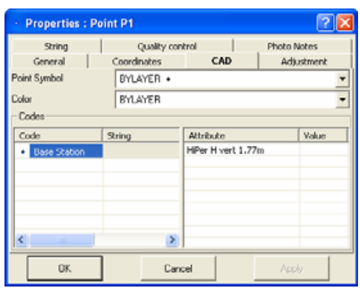


Figure 3-11. Point Properties - CAD tab

If a custom format has mixed fullcodes, one can click both check boxes:

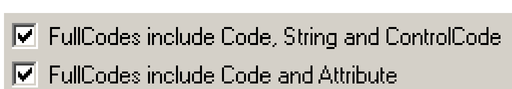


Figure 3-12. Mixed FullCodes

If the file format contains FullCodes, it should be the last in the list of the right panel in the Custom Format Properties window.

Do not set the space delimiter for files containing codes with attributes. For this file, use the comma, tab, semicolon delimiters.

11. Name the format and give it an extension to include it in the *Format name* list (Figure 3-13 on page 3-12).
    - If no name or extension is given, Topcon Tools will assign a random name and extension to the custom format to use until you exit.
    - Giving the custom format a name will save and list the new format in the Format name list for later use.

TIP

Before clicking OK, check the following: “PointsNumber” should always be in the right column; “FullCodes”, if included, should always be last in the right column; and if files contain codes with attributes, use the comma, tab, semicolon delimeters, not the space delimeter.

12. Click **OK** to import the selected file according to the indicated format properties.

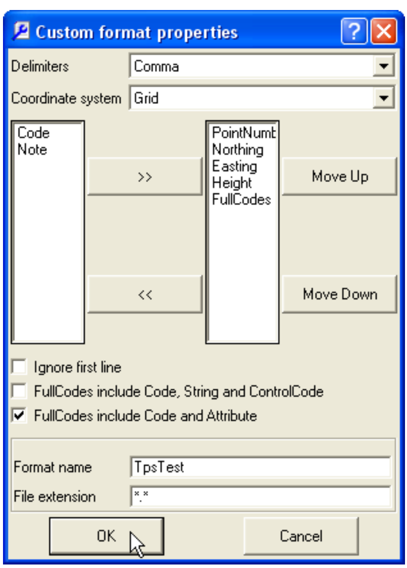


Figure 3-13. Enter Format Name and File Extension

Importing DL Obs Files

DL Obs Files are files used to store observations in Topcon's Digital Level.

1. To import a DL observations file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. Select the format name as *DL Obs File*.
3. Navigate to the location of the file and select the desired file.

   This file type has no advanced options.
4. Click **Open** to import the file (Figure 3-14).

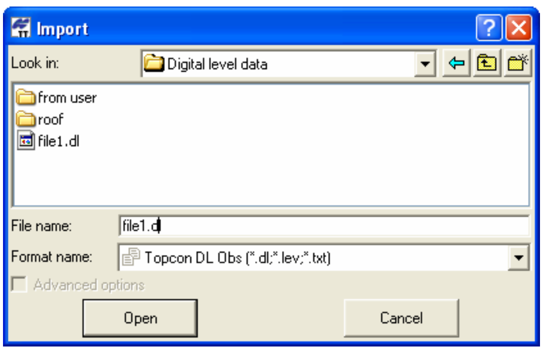


Figure 3-14. Import DL Obs File

Importing GIS Files

SHP files are popular formats used to transfer GIS data between software programs. SHP is a native format of ArcInfo™.

1. To import an SHP file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar
2. Select the format name as *GIS File->SHP(*.shp)*
3. Navigate to the location of the file and select the desired file

   Note that SHP file not contains information about linear units and projection type. By default, the SHP file will be treated as if it uses the job's linear unit and projection after importing.When importing a SHP file into a job, the linear units and coordinates in this file will be assigned to the units and coordinate system set in the job configuration.

4. Select the desired *Advanced* options to assign an additional options for SHP format (Figure 3-15):

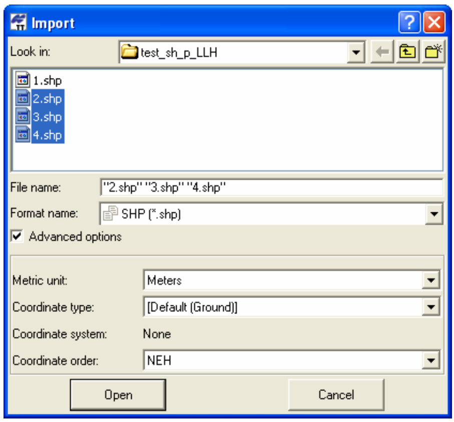
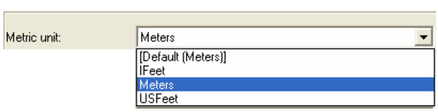


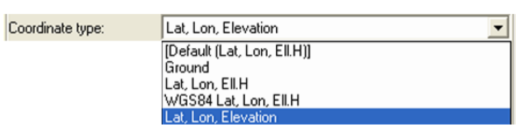
Figure 3-15. Import Shape File

Using the *Advanced* option, select the following parameters for the file being opened:

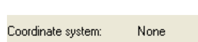
- Metric unit:



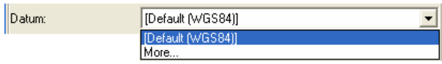
- Coordinate type



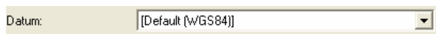
- Depending on the selecting in the *Coordinate type*, the *Datum* field can display the following set:
  – If *Ground* is selected, the *Datum* field displays that no coordinate system is set:



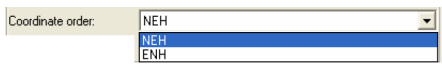
– If *Lat,Lon, Ell.H* or *Lat,Lon, Elevation* is selected, the *Datum* field displays the name of the datum set in the job, and allows selecting any datum from the drop-down list:



– If *WGS-84 Lat,Lon, Ell.H* is selected, *Datum* field displays the datum *WGS-84*



- Selection of the coordinate order can be available if only *Ground* is selected as the coordinate type



NOTICE

The parameters set in the job will be marked as Default.

If selecting default settings, the linear units and coordinates in the coordinate file will be assigned to the units and coordinate system set in the job configuration in the process of importing.

5. Clicking the **Open** button in the *Import* window imports the file to the job. The data is displayed in the *Points* tab.

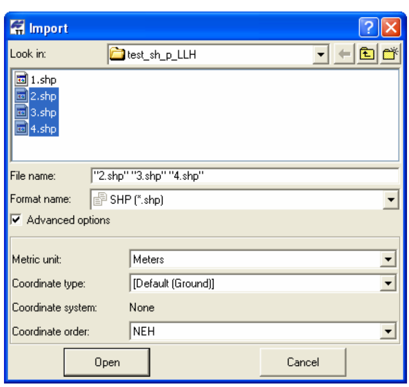


Figure 3-16. Import GIS File

Importing Design Files

Topcon Tools imports the following Design data files:

- DWG and DXF files
- LandXML files
- TN3 Surface

These formats can contain the information about points, linework and surfaces. LandXML files can contain the road information.

1. To import a Design file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar
2. Select the desired format name from the Design formats list.
3. Navigate to the location of the file and select the desired file

   Note that Design file not contains information about linear units and projection type. By default, the Design file will be treated as if it uses the job's linear unit and projection after importing.When importing a Design file into a job, the linear units and coordinates in this file will be assigned to the units and coordinate system set in the job configuration.
4. Select the desired *Advanced* options to assign an additional options for each Design formats (Figure 3-17):

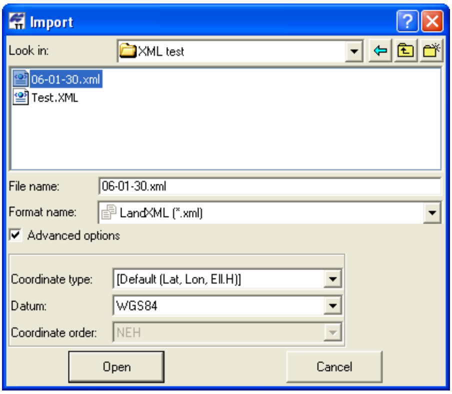
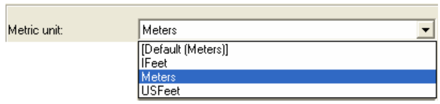


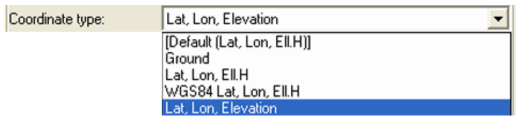
Figure 3-17. Import Land XML File

Using *Advanced* option the user can select the following parameters for the file being opened:

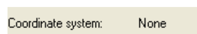
- Metric unit:



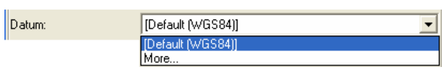
- Coordinate type



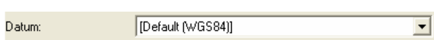
- Depending on the selecting in the *Coordinate type*, the *Datum* field can display the following set:
  - If *Ground* is selected, the *Datum* field displays that no coordinate system is set:



  - If *Lat,Lon, Ell.H* or *Lat,Lon, Elevation* is selected, the *Datum* field displays the name of the datum set in the job, and allows selecting any datum from the drop-down list:



  - If *WGS-84 Lat,Lon, Ell.H* is selected, *Datum* field displays the datum *WGS-84*



- Selection of the coordinate order can be available if only *Ground* is selected as the coordinate type

NOTICE

The parameters set in the job will be marked as Default.

If selecting default settings, the linear units and coordinates in the coordinate file will be assigned to the units and coordinate system set in the job configuration in the process of importing.

5. Clicking the **Open** button in the *Import* window imports the file to the job. The imported data is displayed in the *Points, Linework, Surfaces and Road* tabs (that depends on the type of data is contained in the file).

Importing GPS Obs Files

Topcon Tools imports the following GPS Obs files:

- Topcon Vectors
- Topcon XML GPS OBS
- TSD RW5 GPS Obs
- Custom Text Format

GPS vector files (*.tvf) is a simple comma delimited format from Topcon for transferring vector solutions between software packages.

1. To import a GPS Obs file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. Select the desired format name form the GPS Obs formats list.
3. Navigate to the location of the file and select the desired file.

   This data will be displayed in the *Points*, *GPS Occupations*, and *GPS Obs* tabs.
4. Click **Open** to import the file (Figure 3-18).

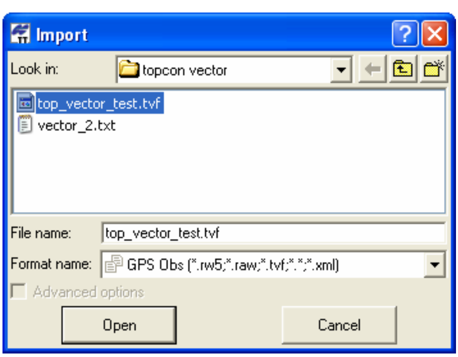


Figure 3-18. Import GPS Obs File

Importing and Creating Custom Vector Format Files

Topcon Tools also supports user-defined GPS vector file text format. Newly imported data is selected in all views.

1. To import a vector file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. In the *Format name* drop-down list, click the *GPS Vector File* plus button and select *Custom Vector Format*.
3. Navigate to the location of the file and select the desired file.
4. Select the desired *Advanced* options for the linear unit and vector type if known.
5. Click **Open** (or **Save** if exporting) to set custom format properties (Figure 3-19).

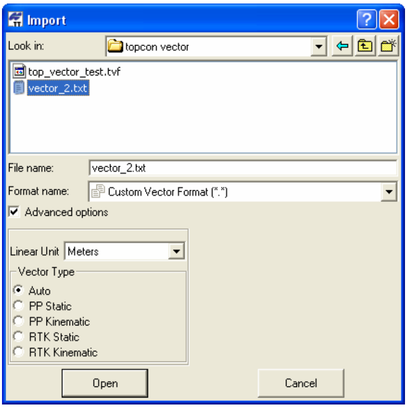


Figure 3-19. Import Custom Vector Format File

6. On the ***Custom vector format properties*** dialog box, select the *Delimiters* from the drop-down lists (Figure 3-6).

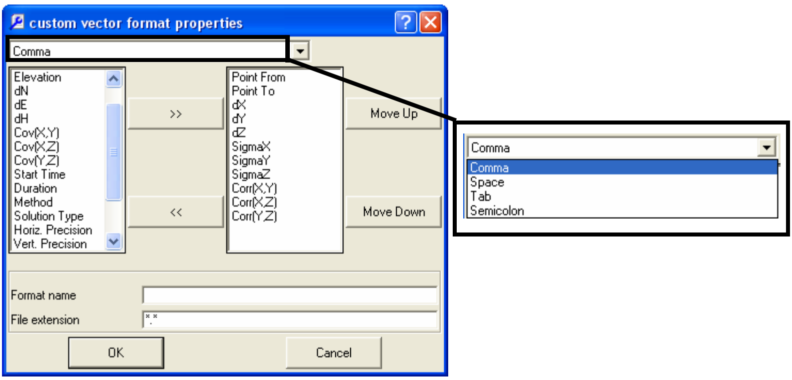


Figure 3-20. Select Delimiters

7. Select the elements to include in the format from the left column and click the move right button (**>>**) to add it to the right column (Figure 3-7). Use the move left button (**<<**) to remove elements from the format.

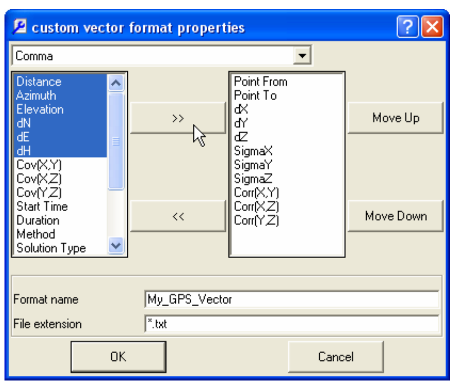


Figure 3-21. Add Elements to Custom Vector File Type

8. To arrange included elements, select an element in the right column and use the **Move Up/Move Down** buttons.
9. Name the format and give it an extension to include it in the *Format name* list (Figure 3-7).
   - If no name or extension is given, Topcon Tools will assign a random name and extension to the custom format to use until you exit the program.

  - Naming the custom vector format will save and list the new format in the *Format name* list for later use.

10. Click **OK** to import the selected file according to the indicated format properties.

Importing GPS+ Raw Data Files

Topcon Tools imports the following GPS+ raw data files:

- RINEX is the standard format for exchanging GPS Raw Data. For static observation session (occupation) 2 or 3 files are created; the first usually having an extension beginning with the letter ‘O’ and stores the observations; the second usually having extensions beginning with the letter ‘N’ or ‘G’, depending on GPS/GLONASS capability, and stores GPS and GLONASS navigational data (orbits) for those observations. If standard RINEX conventions for naming files are followed, and navigational files are present in the same folder from where you are importing observation files, Topcon Tools will automatically pick up the appropriate navigational files. However, if you use different naming conventions for these RINEX files, or navigational files are placed in a different folder, remember to import them as well. A lack of navigational data will inhibit the ability to process observations.
- Compact RINEX file (or Hatanaka compressed file) is the compression of RINEX observation files. This file type contains a “D” extension.
- SP3 files are the common format for storing precise orbits, and can be used to import precise orbits into a Topcon Tools job.
- 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.

1. To import a GPS raw data file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.

2. Select the format name as either a *GPS Raw Data File* or click the GPS raw data file plus button and select an individual file type.
3. Navigate to the location of the file and select the desired file.
4. Click **Open** to import the file.

In the example below, several files have been selected to import.

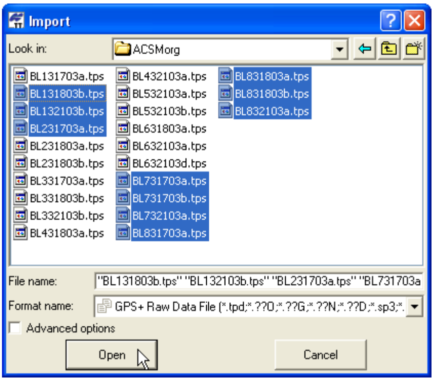


Figure 3-22. Import GPS Raw Data File

Importing Localization Files

The *.GC3 format is a Topcon proprietary format for exchanging coordinates and parameters for computing localization between TopSURV, Topcon Tools, and Topcon machine control software (Pocket-3D, 3D-Office, etc.).

1. To import a Localization on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. Select the format name as *Localization Files*.
3. Navigate to the location of the file and select the desired file.
4. Click **Open** to import the file (Figure 3-23 on page 3-23).

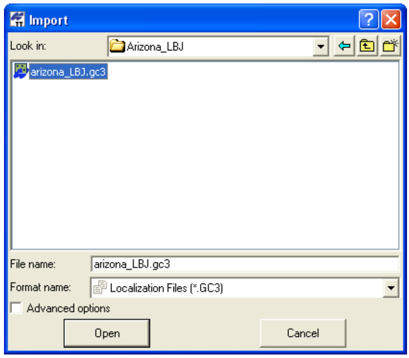


Figure 3-23. Import Localization File

Importing Topcon Tools Jobs

A Topcon Tools job can be imported into another job. For example, you can produce jobs on a daily basis, and then use the import function to combine those jobs into a single job.

1. To import a Topcon Tools job on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. Select the format name as *Topcon Tools Job*.
3. Navigate to the location of the file and select the desired file.
4. Click **Open** to import the file (Figure 3-24).

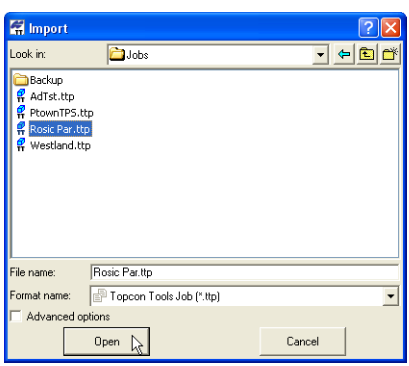


Figure 3-24. Import Topcon Tools Job

If the imported Topcon Tools job configuration is different from the current Topcon Tools job configuration, the ***Override Job Configuration*** dialog box displays. Select the configuration to override and click **OK** (Figure 3-25).

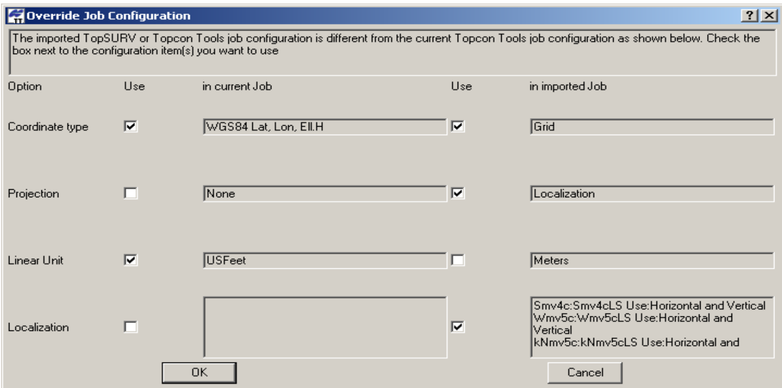


Figure 3-25. Configuration Override Notice – Example

Importing Topcon XML Files

Topcon XML Files are files in XML format that can be used to export coordinates, GPS observation, surfaces, roads, and x-section templates out of Topcon Tools; this format can also be used to exchange coordinates and total station observations between jobs.

1. To import a Topcon XML file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. Select the format name as *Topcon XML File*.
3. Navigate to the location of the file and select the desired file.
4. Select the desired *Advanced* options (Figure 3-26 on page 3-25): define the coordinate type, projection type, datum, and linear and angular units.

   Note that Topcon XML files do not contain information about units, projection type, and datum. By default, the Topcon XML file will be treated as if it uses the job's units, projection type, and datum after importing.

When importing a Topcon XML file into a job, the units and coordinates in this file will be converted to the units and coordinate system set in the job configuration.

5. Click **Open** to import the file.

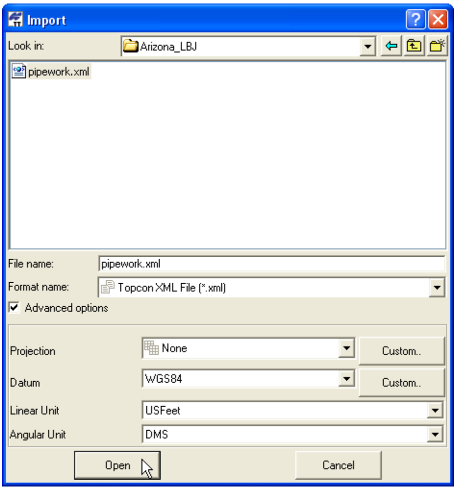


Figure 3-26. Import Topcon XML File

Importing TopSURV PC Jobs

TopSURV PC Database files are job files collected by TopSURV.

1. To import a TopSURV PC job on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. Select the format name as *TopSURV PC File*.
3. Navigate to the location of the file and select the desired file.
4. Click **Open** to import the file (Figure 3-27 on page 3-26).

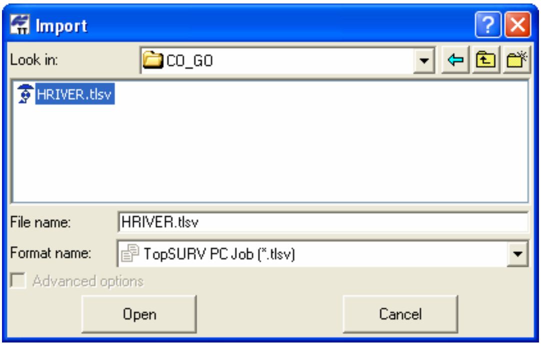


Figure 3-27. Import TopSURV PC Job

If the imported TopSURV job configuration is different from the current Topcon Tools job configuration, the ***Override Job Configuration*** dialog box displays. Select the configuration to override and click **OK** (Figure 3-28).

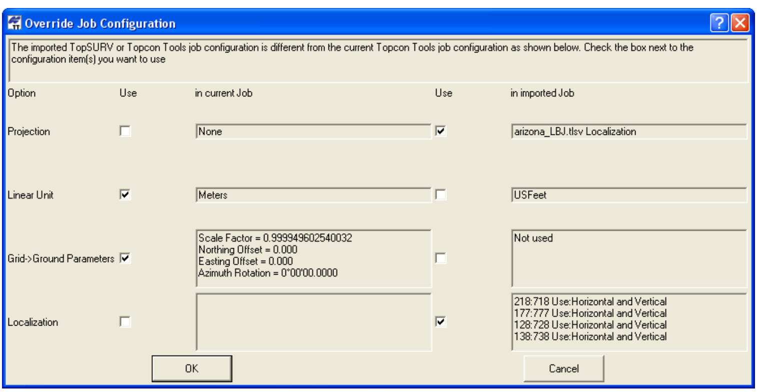


Figure 3-28. Configuration Override Notice – Example

NOTICE

The Topcon Tools job and TopSURV file must use the same geoid for calculating the orthometric heights for points; otherwise, the point heights will be incorrectly calculated when opening the file (a warning will display).

Importing TS Obs Files

TS Obs Files are files used to store observations in Topcon Total Stations.

1. To import a TS Obs file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. On the ***Import*** dialog box, select the format name as a *TS Obs File*, or click the TS raw data file plus button and select an individual file type.
3. Navigate to the location of the file and select the desired file.
4. Set the desired *Advanced* options (Figure 3-29 on page 3-27): define the projection type, grid->ground transformation parameters, coordinate order, and type of vertical angle if known.

   Note that TS Raw Data files do not contain information about coordinate order and projection type. By default, the TS Obs file will be treated as if it uses the job's coordinate order and projection type after imputing.

   When importing a TS Obs file into a desired job, the coordinates in this file will be converted to the coordinate system set in the job configuration. This data will be displayed in the *Points* and *TS Obs* tabs.
5. Click **Open** to import the file.

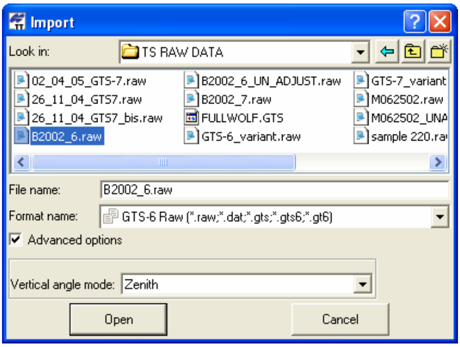


Figure 3-29. Import TS Obs File

In Total Stations, vertical angles can be measured using either from zenith (zenith mode) or from horizontal (level mode). After importing a TS Obs file to the job, the *TS Obs* tab displays the values of vertical angle in the following columns:

- Zenith – the vertical angle from Zenith.
- Horizontal Level – the vertical angle from Horizontal.

For the point, the sum of the Zenith Vertical Angles equals n*90.

TS Obs files do not allow saving information about vertical angle mode. However, this mode can be set when opening a TS Obs file: on the *Horizontal Level* field (Figure 3-30), set the mode enabled for the survey in the Total Station.

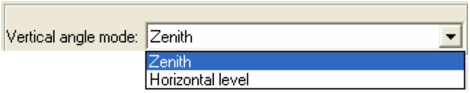


Figure 3-30. Vertical Angle Field When Importing a TS Obs File

Importing and Creating Custom Text Format Files

Topcon Tools also supports user-defined TSRaw file text format. Newly imported data is selected in all views.

1. To import a TSRaw file into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. In the *Format name* drop-down list, click the *TS Raw Data File* plus button and select *Custom TSRaw Format*.
3. Navigate to the location of the file and select the desired file.
4. Set the desired *Advanced* options (Figure 3-31 on page 3-29): define the projection type, coordinate order, and type of vertical angle if known.

   Note that TS Raw Data files do not contain information about coordinate order and projection type. By default, the TS Raw Data file will be treated as if it uses the job's coordinate order and projection type after imputing.

When importing a TS Raw Data file into a desired job, the coordinates in this file will be converted to the coordinate system set in the job configuration. This data will be displayed in the *Points* tab.

5. Click **Open** (or **Save** if exporting) to set custom format properties.

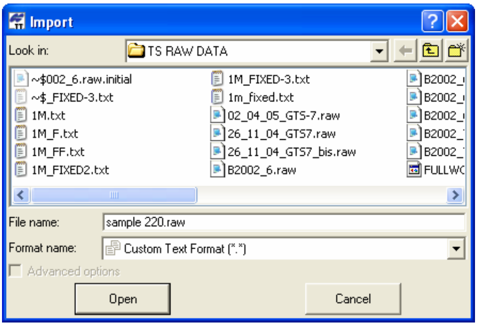


Figure 3-31. Import Custom TSRaw Format File

6. On the ***TSRaw custom format properties*** dialog box, select the *Delimiters* from the drop-down lists (Figure 3-32).

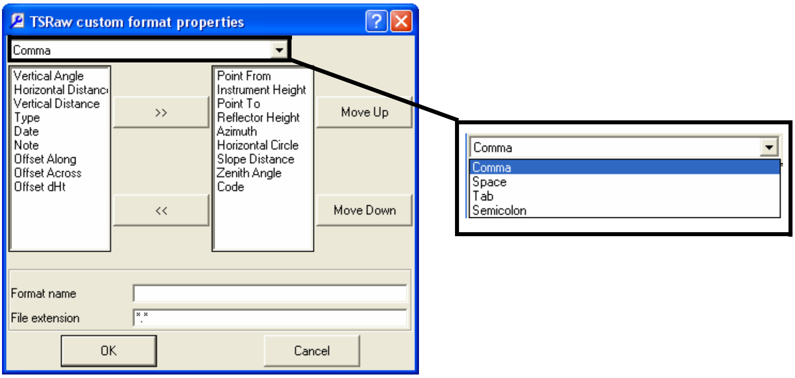


Figure 3-32. Select Delimiters

7. Select the elements to include in the format from the left column and click the move right button (>>) to add it to the right column (Figure 3-7 on page 3-10). Use the move left button (<<) to remove elements from the format.

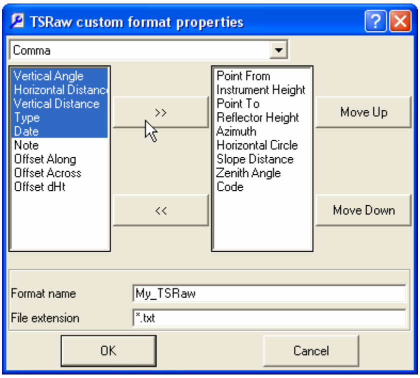


Figure 3-33. Add Elements to TSRaw Custom File Type

8. To arrange included elements, select an element in the right column and use the **Move Up/Move Down** buttons.
9. Name the format and give it an extension to include it in the *Format name* list (Figure 3-7).
   - If no name or extension is given, Topcon Tools will assign a random name and extension to the custom format to use until you exit the program.
   - Naming the TSRaw custom format will save and list the new format in the *Format name* list for later use.
10. Click **OK** to import the selected file according to the indicated format properties.

Importing Road Files

Road files are data files that contain road data. Topcon Tools imports road data saved in the following formats: TopSurv (*.THL), Topcon machine control software (3D-Office) (*.RD3), Standard Survey Software (*.HAL), TDS RD5 (*.RD5), CLIP (*.PLT), ISPOL (*.ALI), LandXML Roads (*.XML), and Topcon XML Roads (*.xml). The following X-section template formats can be imported into the current job: Standard Survey Software (*.rd), TopSurv (*.trd) and TDS (*.TP5). Newly imported data is selected in all views.

1. To import a road file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. On the ***Import*** dialog box, select the format name as a *Road File*, or click the *Road File* file plus button and select an individual file type.
3. Navigate to the location of the file and select the desired file.
4. Click **Open** to import the file (Figure 3-34).

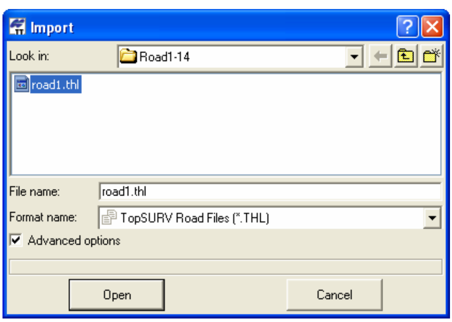


Figure 3-34. Import Road File

Importing X-Section Templates Files

Topcon Tools imports X-Section Templates data saved in the following formats: Topcon SSS (*.xtl), TopSurv (*.xst), Topcon XML X-Section Templates (*.xml) and TDS TP5(*.tp5).

1. To import a road file on a computer into Topcon Tools, with a job open, click **Job ▸ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. On the ***Import*** dialog box, select the format name as a *X-Section Template*, or click the *X-Section Template* file plus button and select an individual file type.
3. Navigate to the location of the file and select the desired file.
4. Click **Open** to import the file.

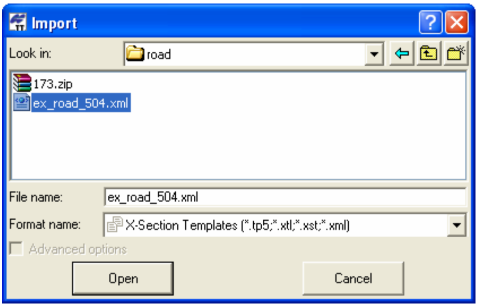


Figure 3-35. Import X-Section Template File

Importing From a Device

Topcon Tools imports data from a device to a computer for post-processing using either Windows® Explorer or Topcon Tools.

Since files from devices are imported directly into active jobs, make a backup copy of the imported file to ensure you don't lose original data. See "Save Options for Job" on page 2-19 for details.

Importing from a Device using Windows Explorer

Installing Topcon Tools creates additional device directories on the computer (Figure 3-36). The "Mobile Device" directory is created after installing Microsoft® ActiveSync® on the computer.

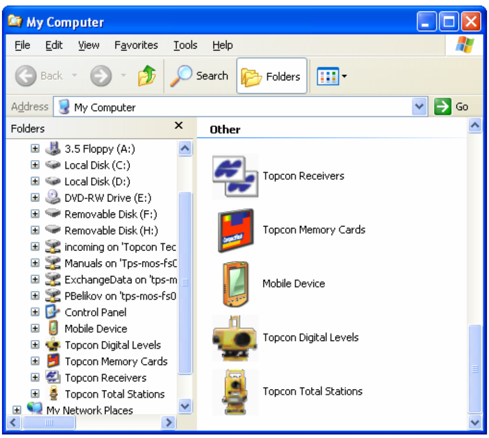


Figure 3-36. Topcon's Device Folders

1. To import data from a device using Windows Explorer, connect the computer and device then click the appropriate directory. Refer to the device's documentation for connection details.
2. For controllers, check that Microsoft ActiveSync is installed and has established a connection with the device.

3. Navigate to the directory that contains the Topcon device folders and click the appropriate device folder.
   - Once the desired device has been found, stop the search to continue below; otherwise, the search will continue until all connected devices of the selected type have been found.
   - To update the list connected devices of the selected type, click **Search for connected <device type>**.
   - For total stations and digital levels, add a new device as needed.
     1. Right-click **Add New <Station or Digital Level>** and click **Create <Station or Digital Level>** on the pop-up menu.
     2. Enter *Name*, *Notes*, the *Port* the device connects to, and the *Model*. Enter *Name*, the *Port* the device connects to, the *Baud Rate*, *Parity*, *Data Bits*, *Stop Bits*, and/or *Protocol* used for communication.
     3. Click **Ok** to add the device.
   - To view information about a detected device, right-click the device and click **Properties**.
4. Once the connected device is detected, click the device's directory to view collected files stored in the device.

   For total station and digital level files, follow the on-screen steps to prepare the TS for file downloads.
5. To download the file(s) from the device to the computer, create a folder on the computer then select the file(s) to download.
   - For receiver files, copy or drag-and-drop the selected file(s) to the folder.
   - During the copy process from controller to computer, *.tsv files are converted to computer-friendly *.tlsv files.
6. After copying device files to the computer, import them into a Topcon Tools job using the **Job ▸ Import from Device** function. See the following sections for details:
   - "Importing From a Receiver" on page 3-35
   - "Importing From a TPS Controller" on page 3-37

- "Importing From a Total Station" on page 3-38
- "Importing From a Digital Level" on page 3-40
- "Importing from a Memory Card" on page 3-42

Importing From a Receiver

NOTICE

NOTICE

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.topcongps.com/software/updates.html).

1. Refer to the Topcon receiver manual for the procedure to connect a receiver and computer.
   - Connect the receiver and computer using the RS232 or USB cable, and turn on the receiver.
   - If the receiver and computer are Bluetooth® enabled, connect using Bluetooth.
2. Start Topcon Tools and open a job, then click **Job ▸ Import from Device**.
3. Click **Topcon Receivers** in the ***Import from Device*** dialog box (Figure 3-37). Topcon Tools will search for Topcon receivers connected to the computer (COM or USB port). When finished, all receivers connected to the computer will display.

   To view information about a receiver, right-click the receiver and click **Properties** (Figure 3-37).

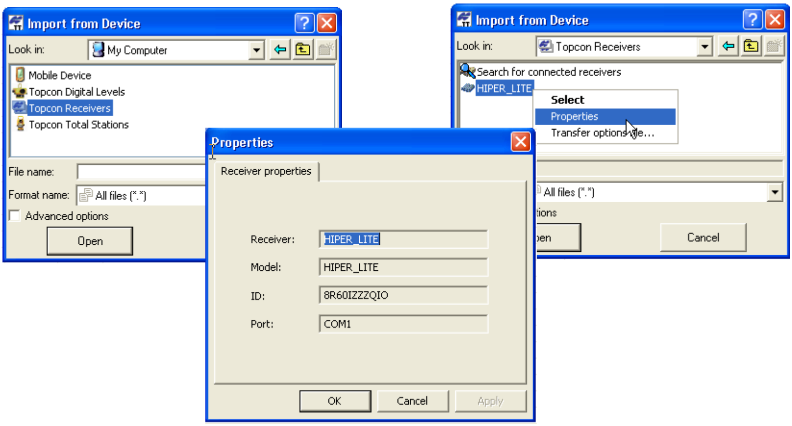


Figure 3-37. Connected Device(s) and Device Properties

4. To view the collected raw files stored in a receiver, click the desired receiver.
5. To import the file(s) from the receiver to the current job, highlight the file(s), set the corresponding file format in the *Format name* field and click **Open** (Figure 3-38).

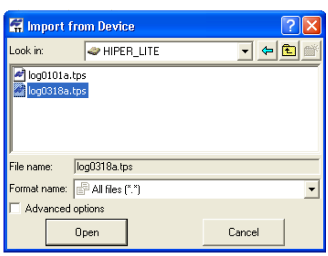


Figure 3-38. Select the Raw Data File to Import

The new point(s) at which GPS data was collected will display in the *Points* tab, *Map* view and *Cad* view after a successful import of the raw data file into the current Topcon Tools job. The *.tps file(s) will be saved in the folder defined in the *Folder For Backup* field during job configuration.

Importing From a TPS Controller

1. Follow the manufacturer's directions for connecting the computer and a controller.
2. With a job open, click **Job ▸ Import from Device**.
3. Once Microsoft ActiveSync establishes a connection with the controller, double-click **Mobile Device** in the ***Import from Device*** dialog box (Figure 3-39).

   To view information about a controller, right-click the controller and click **Properties**.

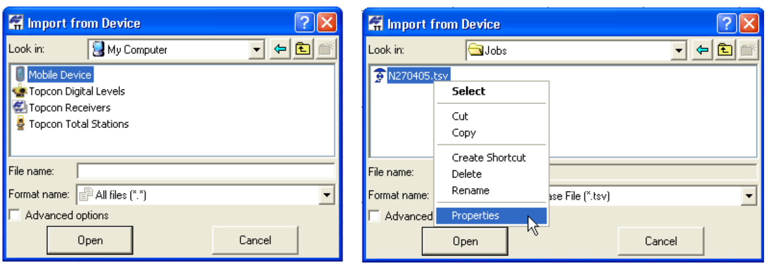


Figure 3-39. Connected Device(s) and Device Properties

4. To view the collected files stored in a controller, click the desired folder where *.tsv files are stored.
5. To import the file(s) from the controller to the current job and convert them to *.tlsv files, set the corresponding file format in the *Format name* field and click **Open** (Figure 3-40).

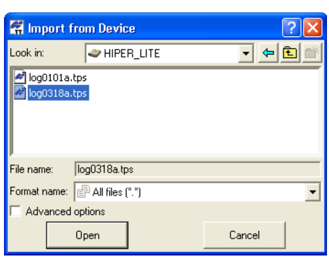


Figure 3-40. Select the TSV File to Convert and Import

The new point(s) and observations contained in the TopSURV file will display in the appropriate tabs, *Map* view and *Cad* view after a successful import of the file into the current Topcon Tools job. The file will be saved in the folder defined in the *Folder For Backup* field during job configuration.

Importing From a Total Station

When importing files from a robotic total station, the file transfer will be initiated from the TS after connecting to the computer. Refer to the total station's documentation for connecting the computer and device.

1. Start Topcon Tools and open a job, then click **Job ▸ Import from Device**.
2. Double-click **Topcon Total Stations** in the ***Import from Device*** dialog box.
3. To add a device, right-click **Add New Station** and click **Create Station** (Figure 3-41).

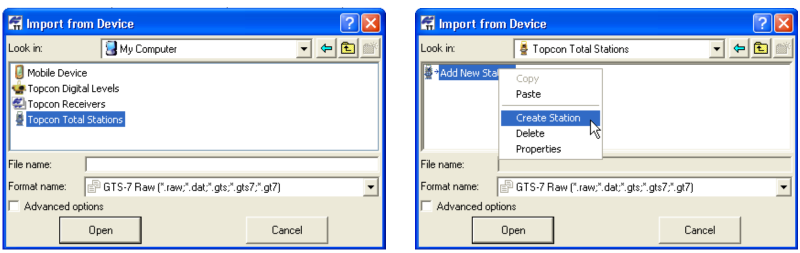


Figure 3-41. Creating a New Station

4. Enter *Name*, *Notes*, the *Port* the device connects to, and the *Model*. Enter the *Baud Rate*, *Parity*, *Data Bits*, *Stop Bits*, and/or *Protocol* used for communication (Figure 3-42). Click **OK**.

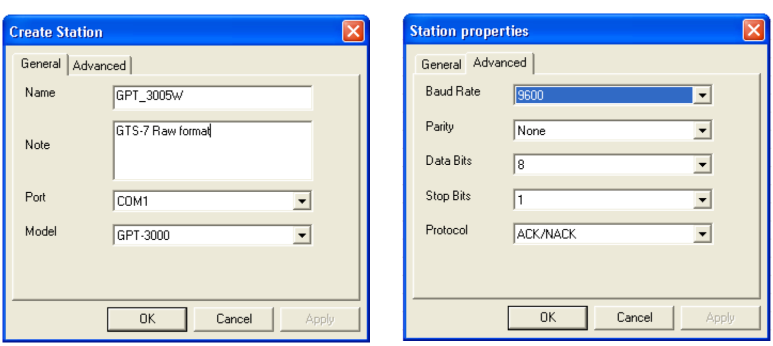


Figure 3-42. Total Station Properties

5. Double-click the total station icon to import a coordinates or measurement file from this total station to the current job.
6. On the ***Import from Device*** dialog box, enter the file name as "file.txt" and select the file type.

Figure 3-43. Import From Total Station

7. Follow the all the steps listed in the ***Download File From Total Station*** dialog box to prepare the Total Station (Figure 3-44).
8. Select the desired file in the Total Station for downloading to the computer.
9. Click **Start** in the ***Download File From Total Station*** dialog box. When ready to send data from the Total Station to the computer, press the **F3** key.

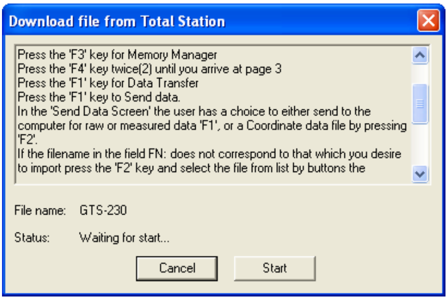


Figure 3-44. Total Station Instructions – Preparing for Import

The new point(s) contained in the total station's will display in the *Points* and *TS Obs* tabs, *Map* view and *Cad* view after a successful import of the file into the current Topcon Tools job. A "file.txt" file will be saved in the folder defined in the *Folder For Backup* field during job configuration.

Importing From a Digital Level

When importing files from a digital level, the file transfer will be initiated from the DL after connecting to the computer. Refer to the digital level's documentation for connecting the computer and device.

1. Start Topcon Tools and open a job, then click **Job ▸ Import from Device**.
2. Double-click **Topcon Digital Levels** in the ***Import from Device*** dialog box (Figure 3-37).
3. To add a device, right-click **Add New Station** and click **Create Station**.

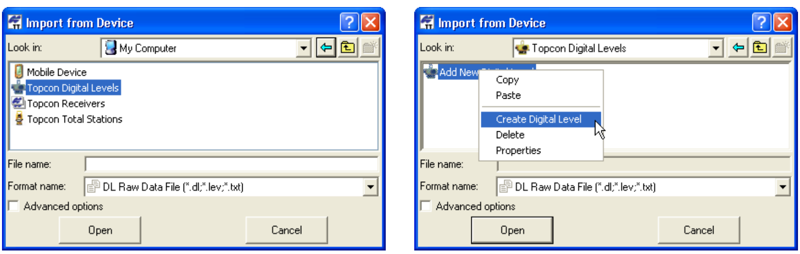


Figure 3-45. Create New DL

4. Enter *Name*, the *Port* the device connects to, the *Baud Rate*, and *Parity* used for communication (Figure 3-46). Click **OK**.

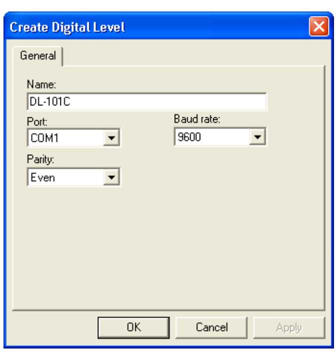


Figure 3-46. Digital Level Properties

5. Double-click the digital level icon (Figure 3-47 on page 3-41).

6. Enter the file name "file.dl" and select "DL Raw Data File" in the *Format name* field.

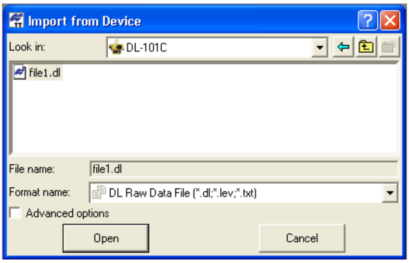


Figure 3-47. Import From Digital Level

7. Follow the on-screen steps to prepare the digital level.
8. Select the desired file in the Total Station to download to the computer (Figure 3-48).

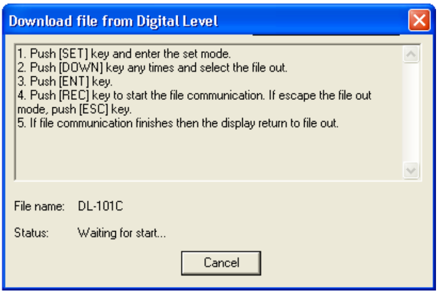


Figure 3-48. Digital Level Instructions – Preparing for Import

The new point(s) contained in the digital level's will display in the *Points* and *DL Obs* tabs after a successful import of the file into the current Topcon Tools job. A "file.dl" file will be saved in the folder defined in the *Folder For Backup* field during job configuration.

Importing from a Memory Card

To import data from Memory Card using Windows Explorer, take the following steps:

1. Insert the receiver's memory card (SD card), label side down, into the computer's SD card slot
2. Start Topcon Tools and open a job, then click **Job ▸ Import from Device**.
3. Click **Memory Card** in the ***Import from Device*** dialog box. If the SD card was formatted in receiver's file system, the disk, which designate the Topcon Memory Card, will be displayed as red (Figure 3-49).
4. To view the collected raw files stored in the Memory Card, click the disk. The list of *.tps files are displayed after checking of the file system of this CD card.

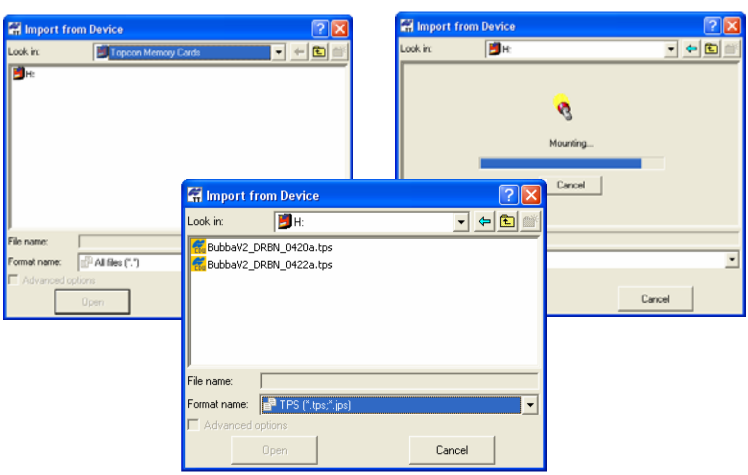


Figure 3-49. Import From Memory Card

5. To import the file(s) from the Memory Card to the current job, highlight the file(s), set the TPS file format in the *Format name* field and click **Open.**

6. If the SD card was formatted in any other system, the icon of the memory card will be displayed as gray. In the case, Topcon Tools does not read the file stored in the card. To format the Memory Card, double click to the icon and click **Yes**:

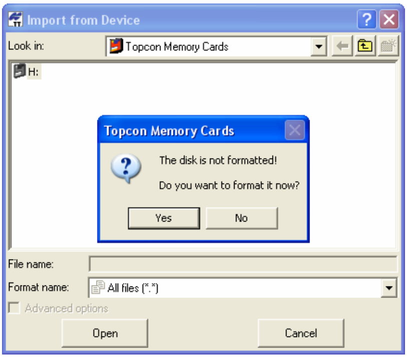


Figure 3-50. Unformatted Memory Card

Notes:

Viewing, Selecting, & Filtering Data

When opening a job in Topcon Tools, several data views are available for displaying information. From a map of points and vectors to a grid of occupations to tables of data, each view provides the information needed to edit and post-process data efficiently and effectively. Printing the different views provides a way to study the data offline.

The views in Topcon Tools are interactive, data selected in one view is selected in all open views. Selecting data provides access to other functions, such as data properties or data parameters. Data can also be filtered based on type, time, or codes.

The menu bar (commands) and toolbar provide access to the views and functions available in Topcon Tools; these can be customized for personalized access to viewing and selecting data.

Data Views

Topcon Tools provides several data views for editing, managing, and processing data.

- The Tabular view contains tabs with tables of information on the points, occupations, observations, linework, roads, cross section (X-sect) templates, surfaces, tape dimensions, images, stereopairs, and scan session used in the job.
- The Map view displays a graphical representation of the points and vectors used in the job.
- The Occupation view is a time-scale chart of the occupations used in the job.

- The Cad View displays linework, roads and surfaces in the different layers. Objects are displayed with the color/width/style of the corresponding layer. Selecting a corresponding attribute in the Layers screen or the Filter screen will show/hide objects in a given layer.
- The 3D View displays linework, surfaces and roads as a three-dimensional image. Surfaces and roads are displayed with the color of the surface layer. Lines are displayed with the applied color(s).
- The Codes view lists all codes and their attributes used in the job. This view is also used to add codes to the job.
- The Layers view lists all layers, and associated parameters, used in the job. This view is also used to add layers to the job.

The points, vectors, occupations, and observations displayed in the various views use symbols and colors to designate information. The *Legend* windows in the Map and Occupation views describe these designations.

Tabular View

By default, the Tabular view displays on the Main Screen. To view or hide the Tabular view, click **View** ▸ **Tabular View**, press **Ctrl+T**, or click the **Tabular View** button on the toolbar.

The Tabular view contains tabs representing the different types of information. The data in the job determines the tabs that display; the Points tab always displays.

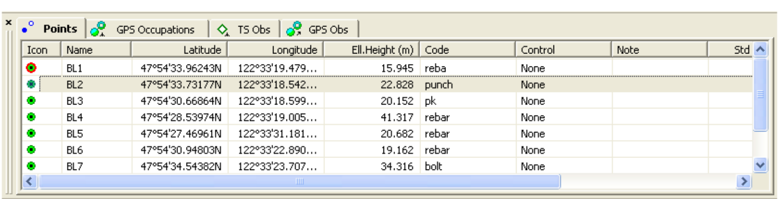
- Points – displays point name, coordinates, and other relevant point information.
- GPS Occupations – displays point names and antenna information, as well as occupation times, methods, file location, and receiver ID.
- TS Observations – displays from and to point names, instrument and reflector heights, measured values, adjustment residuals, and other relevant point information for total station observations.

- GPS Observations – displays point from and point to names, observation time, components of computed vector solution, and other information about solution, adjustment residuals and relevant information.
- Tape Dimensions – displays start and end point information for the periphery, point numbers for the tape measurements, measurement distances, and the date of the measurement.
- Linework – displays codes, layers, plotting styles, order, and from/to points for CAD information.
- Images – displays an image overlayed with point, linework, and surface information.
- Surfaces – displays name, number of points, number of triangles, minimum/maximum northing/easting/elevation, and other relevant information for all surfaces in the project.
- DL – displays point from and point to names, overall distance, balance distance, measurement date, order in job, measurement type, adjustment residuals, and other relevant information for digital level jobs and measurements.
- Roads – displays the horizontal and vertical projections of the center line, the line describing the surface of the road, and the line lying in the plane perpendicular to the center line.
- X-Section Templates – displays created or imported cross-section templates that can be used for creating a road in the current job.
- Stereopairs – displays stereopair in orientation and stereo view, as well as points, linework and surfaces on the stereopair.
- Scan Session – displays scan session, linework, surface, and images attached to the scan session.

Points Tab

Click the **Points** tab to view point information. The *Points* tab displays a table that can contain the following informational columns (Figure 4-1):

- Icon – displays a symbol associated with the point.
- Name – displays the name of the point.
- Point coordinates – displays the coordinates of the point, and depends on the coordinate type selected in the Job Configuration.
- Code – displays the primary code used for the point.
- Control – the coordinate fix of the point for adjustment.
- Note – displays user comments.
- Photo Notes – displays the number of a photo note per point.
- Layer – displays the layer in which the point resides.
- Standard Deviations – the standard deviations for the point, in selected units, after adjustment.
- String and Control Code – displays fields relevant for linework generation. These are taken into account when exporting data to GIS formats (DWG, DXF).
- Combined Scale Factor – the scale factor applied to convert grid distances to ground distances.
- Convergence – the angle between geodetic north and grid north.



Icon	Name	Latitude	Longitude	Ell.Height (m)	Code	Control	Note	Std
	BL1	47°54'33.96243N	122°33'19.479...	15.945	reba	None		
	BL2	47°54'33.73177N	122°33'18.542...	22.828	punch	None		
	BL3	47°54'30.66864N	122°33'18.599...	20.152	pk	None		
	BL4	47°54'28.53974N	122°33'19.005...	41.317	rebar	None		
	BL5	47°54'27.46961N	122°33'31.181...	20.682	rebar	None		
	BL6	47°54'30.94803N	122°33'22.890...	19.162	rebar	None		
	BL7	47°54'34.54382N	122°33'23.707...	34.316	bolt	None		

Figure 4-1. Points Tab

Click on a column's heading to sort *Point* tab information in alphabetical order (point names), descending/ascending order, or increasing/decreasing order (point coordinates).

To edit information in the Points table, see "Editing in the Tabular View" on page 5-1 (Standard deviations are uneditable).

GPS Occupations Tab

The *GPS Occupations* tab displays only when the job contains GPS data and the PP, RTK, or GIS module of Topcon Tools is activated.

Click the **GPS Occupations** tab to view GPS occupation information (Figure 4-2 on page 4-6).

The *GPS Occupations* tab displays a table that can contain the following informational 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 source information 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.
- Offset Azimuth – the azimuth of offset defines the direction from occupation other horizontal offsets (distance and cross) are given.
- Offset Dist – displays the occupation’s distance offset.
- Offset dHt – displays the occupation’s height offset.
- Offset Across – displays the occupation’s across offset.

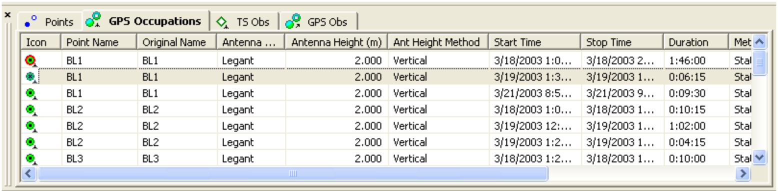


Figure 4-2. GPS Occupations Tab

Click on a column's heading to sort the *GPS Occupations* tab information in alphabetical order (point names, antenna type, receiver ID), descending/ascending order, or increasing/decreasing order (time, duration).

To edit information in the *GPS Occupation* tab (Start/Stop Time, Duration, Method, Source, and Receiver are uneditable), see "Editing in the Tabular View" on page 5-1.

TS Obs Tab

The *TS Obs* tab displays only when the job contains TS raw data and the TS module of Topcon Tools is activated.

Click the **TS Obs** tab to view Total Station observation information (Figure 4-3 on page 4-7).

The *TS Obs* tab displays a table containing two panels. The left panel displays all TS occupations, and the right panel displays all TS observations. The TS Obs tab can have the following informational columns:

- Icon – displays a symbol associated with the observation.
- # – point number
- Point Name – displays the name of the point.
- Instrument Height – the height of the instrument at that point.
- Instrument Type – the type of instrument used.
- Point From and Point To – the origin and direction of the observation.
- Reflector height – the height of the reflector.
- Azimuth – if entered, displays the azimuth of the observation.

- Measured values – depending on the parameters selected in the Options dialog box, the following measured values can display: Horizontal Circle, Zenith Angle, Vertical Angle, Slope Distance, Horizontal Distance, Vertical Distance.
- Date – displays the date of observation.
- Note – displays additional information for the observation, such as comments.
- Code – displays the primary code used for the point.
- Type – displays the type of observation (BS, SS, FS, BKB, or Resection).
- AutoReject – allows or disallows observations to be rejected by adjustment.
- Adjustment status – indicates whether or not the observation has been adjusted, auto-rejected, disabled, or not adjusted.
- Azimuth Residual – displays the adjustment residual for the azimuth of offset.
- Residuals – depending on the parameters selected in the Options dialog box, the following residuals can display for the observation: Horizontal Circle Residual, Zenith Angle Residual, Vertical Angle Residual, Slope Distance Residual, Horizontal Distance Residual, Vertical Distance Residual.

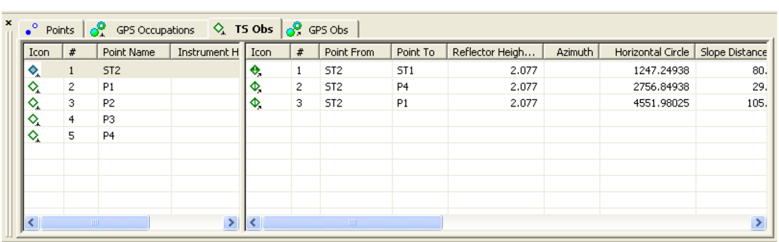


Figure 4-3. TS Obs Tab

Click on a column’s heading to sort TS Obs tab information in alphabetical order (point from, point to, etc.), descending/ascending order, or increasing/decreasing order.

To edit information in the *TS Obs* tab (Point From, all measured values, Date, Type, Adjustment Status, and Residuals are uneditable), see “Editing in the Tabular View” on page 5-1.

GPS Obs Tab

The *GPS Obs* tab displays only when the job contains GPS data and the PP, RTK, or GIS module of Topcon Tools is activated.

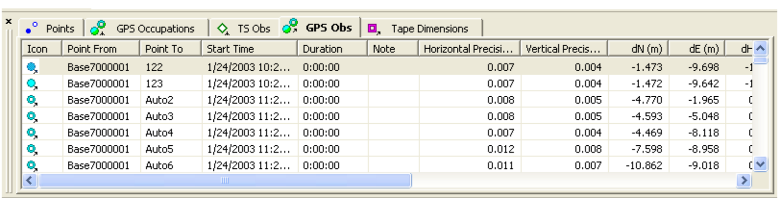
Click the **GPS Obs** tab to view GPS observation information (Figure 4-4 on page 4-9).

The *GPS Obs* tab displays a table that can contain the following GPS observations (vectors) informational columns:

- Icon – displays a symbol associated with the observation.
- Point From, Point To – the beginning and end points of the vector.
- Start Time – the first epoch time of common interval for the vector.
- Duration – the time duration of observation in a common time interval.
- Note – displays additional information for the vector, such as comments, epochs, etc.
- Horizontal Precisions, Vertical Precisions – displays horizontal and vertical precision estimates of the vector solution.
- GPS observations solution components – displays vector increments; north/east/up, x/y/z, azimuth/elevation/distance. NOTE: PP observation solutions include antenna heights and phase center, while RTK observation solutions do not.
- Method – displays the observation survey method.
- Solution type – displays the type of solution used for the vectors; either Fixed (all ambiguities have been fixed to integers) or Float (all estimated ambiguities are float numbers), or Fixed/Float, mmGPS for RTK solution with mmGPS.
- Orbit – if the observation is not yet processed, displays the type of orbit data (Broadcast, Precise, or None) available for processing this observations; if the observation is processed, displays the type of obit data used in the processing; not applicable to RTK observations.
- AutoReject – allows or disallows observations to be rejected by adjustment.

- Adjustment status – indicates whether or not the observation has been adjusted, auto-rejected, disabled, or not adjusted.
- Residuals – displays adjustment residuals for the vector, Res n/ Res e/Res u, Res x/Res y/Res z, Res Az/Res El/Res Dist.
- Epochs – displays the number of epochs over the common data time interval.
- GPS Satellites /GLONASS Satellites – displays the number of GPS/GLONASS satellites. For RTK observation, the common number of SV's observed by the base and rover in the last common epoch. For PP observation, the common number of SV's observed by the base and rover during the whole observation time.
- HDOP/VDOP – displays the horizontal/vertical position dilution of precision (HDOP and VDOP) in the last common epoch for RTK observation (taken from the TopSURV RTK job).

Note that for PP observations, solution components, precisions, and solution types display only after the observation has been postprocessed.



Icon	Point From	Point To	Start Time	Duration	Note	Horizontal Precisi...	Vertical Precis...	dN (m)	dE (m)	dH
	Base7000001	122	1/24/2003 10:2...	0:00:00		0.007	0.004	-1.473	-9.698	-1
	Base7000001	123	1/24/2003 10:2...	0:00:00		0.007	0.004	-1.472	-9.642	-1
	Base7000001	Auto2	1/24/2003 11:2...	0:00:00		0.008	0.005	-4.770	-1.965	0
	Base7000001	Auto3	1/24/2003 11:2...	0:00:00		0.008	0.005	-4.593	-5.048	0
	Base7000001	Auto4	1/24/2003 11:2...	0:00:00		0.007	0.004	-4.469	-8.118	0
	Base7000001	Auto5	1/24/2003 11:2...	0:00:00		0.012	0.008	-7.598	-8.958	0
	Base7000001	Auto6	1/24/2003 11:2...	0:00:00		0.011	0.007	-10.862	-9.018	0

Figure 4-4. GPS Obs Tab

Click on a column's heading to sort *GPS Obs* tab information in alphabetical order (point from, point to, method, solution type), descending/ascending order, or increasing/decreasing order (time, duration).

To edit information in the *GPS Obs* tab (Point From, Point To—except for RTK autotopo observations, Start Time, Durations, Precisions, GPS observations, Method, Solution Type, Orbit, Adjustment Status, and Residuals are uneditable), see "Editing in the Tabular View" on page 5-1.

Tape Dimensions Tab

The *Tape Dimensions* tab displays only when the job contains tape dimension measurements and the TS module of Topcon Tools is activated. Figure 4-5 shows an example tape dimensions job.

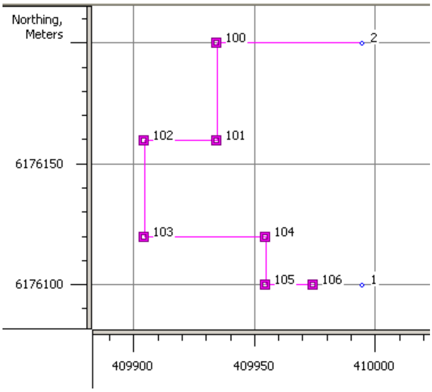


Figure 4-5. Example Tape Dimensions Job

Click the **Tape Dimensions** tab to view tape dimension information (Figure 4-6 on page 4-11).

The Tape Dimensions tab displays a table containing two panels. The left panel displays start and end points, and the right panel all measurements. The Tape Dimensions tab can have the following informational columns:

- Icon – displays any image associated with the tape dimension.
- Start Point – the beginning of the tape measurement at a known point.
- End Point – the end of the tape measurement at a known point.
- # – point number.
- Point To – the end of the vector.
- Distance – the measured distance, where each distance is orthogonal (at a 90° angle) from the previous distance; a negative distance is 90° left, a positive distance is 90° right.
- Date – displays the date of tape measurement.
- Note – displays any user comments.

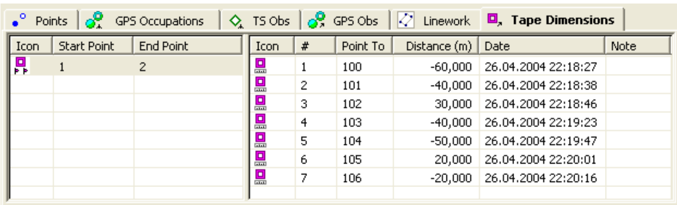


Figure 4-6. Tape Dimensions Tab

Click on a column's heading to sort Tape Dimensions tab information in alphabetical order (note), descending/ascending order (start point, end point, #, point to), or increasing/decreasing order (distance, date).

To edit information in the *Tape Dimensions* tab (Date is uneditable), see "Editing in the Tabular View" on page 5-1.

Linework Tab

The *Linework* tab displays only when the job contains line (polyline) data.

Click the **Linework** tab to view CAD information contained in the open job (Figure 4-7 on page 4-12).

The Linework tab displays a table containing two panels. The left panel displays all lines (codes, layers, and plotting styles) in the job, and the right panel displays all line segments for the selected line. The Linework tab can have the following informational columns:

- Icon – displays the symbol associated with the line or line segment.
- Layer – displays the layer in which the selected line resides.
- Code/String – displays the primary code an string used for the line or line segment.
- Color/Line Style/Line Width – displays the plotting styles of the selected line.
- Type – displays the type of the selected line, line or area. If selecting an Area, a line containing more than one segment will be automatically closed.
- Length – displays the total horizontal length of the line in the current coordinate system.

- Order – displays the order of the point (vertex of the segment) in the selected line.
- Point – displays the name of the line’s vertex.
- Control Code – displays the control code of the point.
  - Arc Start: the starting point of the arc
  - Arc End: the ending point of the arc
  - Rectangle: if selected for the last point from three points, Topcon Tools will calculate the coordinates of the fourth point and link all four points as a quadrangle
  - Close: the last point in a closed line

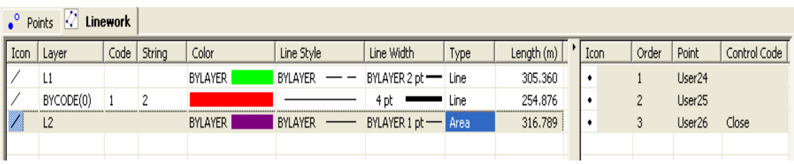


Figure 4-7. Linework Tab

Click on a column’s heading to sort Linework tab information in descending/ascending order (code), or increasing/decreasing order (order, to, from).

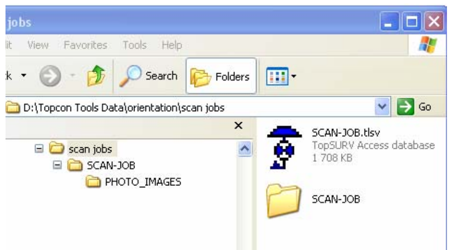
To edit information in the *Linework* tab (Date is uneditable), see “Editing in the Tabular View” on page 5-1.

Images Tab

The *Images* tab displays only when the job contains data associated with captured images, such as photo notes for a point or data obtained with the GPT-7000i total station, and the TS or Imaging module of Topcon Tools is activated.

NOTICE

*If you copy a TopSURV PC job manually to the current Topcon Tools job, be sure that the image sub-folder and *.tlsv file are located in the same folder:*



Click the **Images** tab to view image information (Figure 4-6).

The Images tab displays the following two panels:

- The left panel displays thumbnail images for all images in the file. Image identification in the panel begins with lowest image title (either alphabetically or numerically) and increases incrementally.
- The right panel displays the selected image with measured points, linework and surface inside the picture area. The symbols of the points and lines correspond to the settings selected in the *Layers* combo box in the Toolbar.

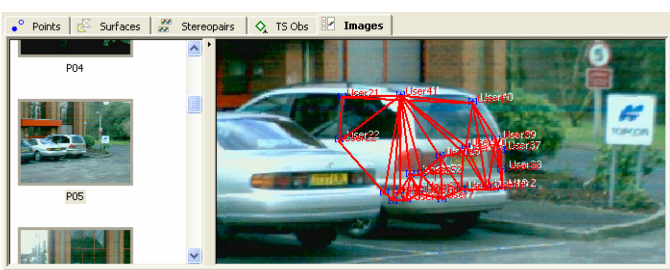


Figure 4-8. Images Tab

To edit options for the right panel of the *Images* tab, see “Editing in the Tabular View” on page 5-1.

Stereopairs Tab

The *Stereopairs* tab appears only if the job contains stereopairs and *Image* module of Topcon Tools is enabled via *Access Codes*. Stereopairs can be imported from Total Station (GPT- 7000i) or be created from the single images in the *Images* tab. The *Stereopairs* tab allows one to display stereopairs in the orientation view and in the stereo view.

In the *Orientation View* each image of the stereopair is displayed as the original image that is taken with some angle to the baseline connecting survey points.

In the *Stereo View* each image of the stereopair is normalized. Transformation of the image to some plane parallel to the baseline is performed using the data of external orientation (coordinates of the stations from which photography was made, vertical and horizontal photography angles). In this case, every image is aligned along the Y axis. It means that in the stereo view any point defined in the left and right images will have the same Y-coordinate in the coordinate system of the monitor.

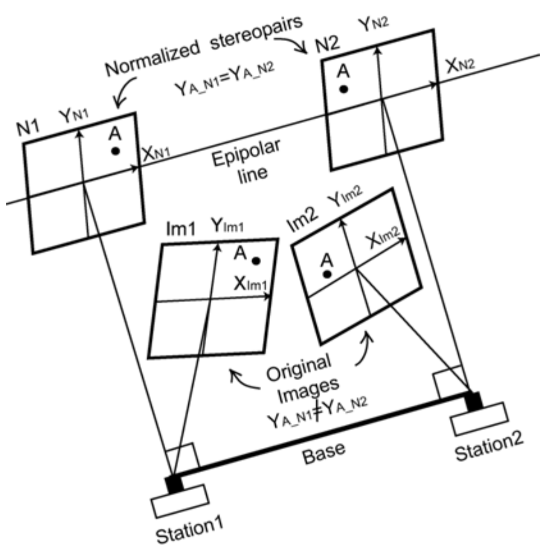


Figure 4-9. Transformation of Stereopairs in the Stereo View

To display a stereopair, the user has to set *Ground / Grid* coordinates in the Status bar. Click the *Stereopairs* tab to view stereopair information.

The *Stereopairs* tab displays the following two panels:

- The left panel displays the thumbnail for all stereopairs in the file.
- The right panel displays the stereo or orientation view for the highlighted stereopair. The *Stereo View* displays images in the normalized form, the *Orientation View* displays original images. The right panel is divided by splitters into four parts. The upper two parts (smaller by default and editable) display the thumbnails for the left and right images. The lower two parts display the enlarged area selected on left and right images respectively. In the upper part, the red view box will show which parts are currently visible in the lower part. The user can move the red view box for the left / right image. Only the lower windows allow zooming the images using either the toolbar buttons (Zoom In, Zoom Out, Restore All and Pan) or mouse wheel. In the *Orientation View* the user can zoom left/right image independently. In the *Stereo View* the scale changing of the left/right image automatically changes the scale of the other image. Pan mode is independent for each image of the stereopair only in the horizontal plane. The lower windows can display all points, lines and surfaces of the current job inside of the image area. The symbols of the points correspond to the settings selected in the *Layers* combo box in the Toolbar. Image measurements are displayed blue ([+]) if point coordinates can be computed, red ([+]) otherwise.

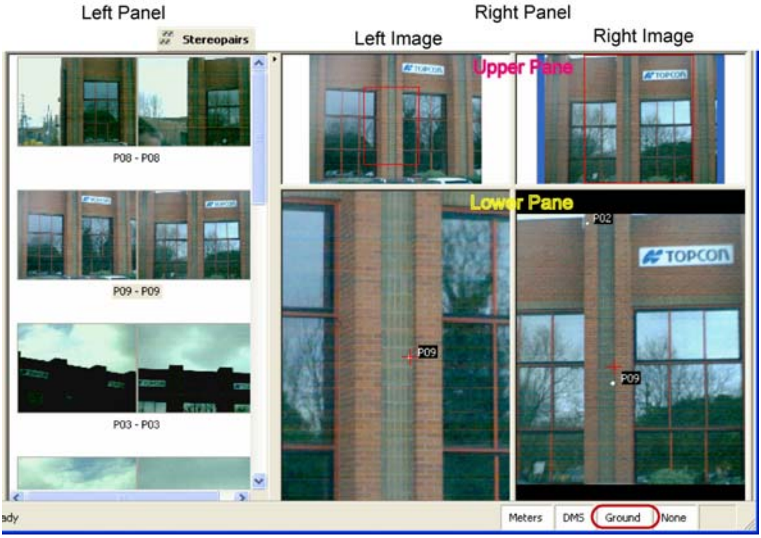


Figure 4-10. Stereopairs View in the Orientation View Option

To edit options for the left/right panel of the *Stereopairs* tab, see Chapter 10

Figure 4-11. Stereopairs View in the Stereo View Option

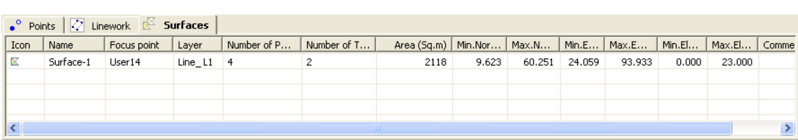
Surfaces Tab

The *Surfaces* tab displays only when the job contains a digital terra model and the Design module of Topcon Tools is activated.

Click the **Surfaces** tab to view digital terra model information (Figure 4-6).

The *Surfaces* tab displays a table that can contain the following informational columns:

- Icon – displays any image associated with the surface.
- Name – the name of the surface.
- Focus point – displays a focus point. If the column is empty, the triangulation is complete with respect to ground plane. If set to some existing point, the triangulation will be done with respect to that point, that is as if viewing the surface from that point.
- Layer – the name of the layer in which the surface resides.
- Number of Points – displays the quantity of points in the surface, including the coordinates and intersection points of lines forming this model.
- Number of Triangles – displays the quantity of triangles created in the surface.
- Area – displays the sum of areas of the triangle projections on the horizontal plane (if the triangulation is done with respect to the ground plane) and the vertical plane (if the triangulation is done with respect to a vertical plane from a focus point for the given surface).
- Minimum/Maximum Northing/Easting/Elevation – displays minimum and maximum values corresponding to points coordinates included in the surface.
- Comment – displays any additional information about the surface.


Points | Linework | Surfaces

Icon	Name	Focus point	Layer	Number of P...	Number of T...	Area (Sq.m)	Min.Nor...	Max.N...	Min.E...	Max.E...	Min.El...	Max.El...	Comme
	Surface-1	User14	Line_L1	4	2	2118	9.623	60.251	24.059	93.933	0.000	23.000	

Figure 4-12. Surfaces Tab

Click on a column's heading to sort *Surfaces* tab information in descending/ascending order (name), or increasing/decreasing order (number of points, number of triangles, minimum/maximum northing/easting/elevation).

To edit the name column in the *Surfaces* tab, see "Editing in the Tabular View" on page 5-1.

DL Obs Tab

The *DL Obs* tab displays only if the job contains data collected on Topcon's Digital Level and the TS, PP, or RTK module of Topcon Tools is activated. Figure 4-13 shows an example of digital level data.

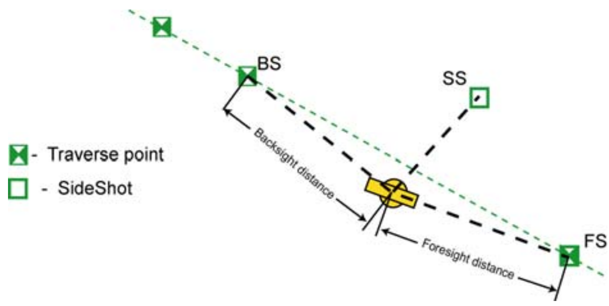


Figure 4-13. Example of Level Measurements

Click the **DL Obs** tab to view digital level information (Figure 4-6 on page 4-11).

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.

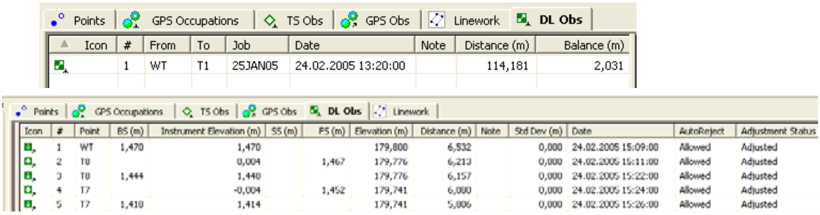
The left panel of the *DL Obs* tab has the following columns:

- Icon – the symbol of leveling job
- # – the number of leveling job
- From – the start leveling point of the job
- To – the finish leveling point of the job
- Job – 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 of the DL Obs tab has the following columns. Note that adjustment status and HT residuals display only after the level measurements has been adjusted.

- Icon – displays any image associated with traverse points.
- # – the number of measurement.
- Point – the name of the traverse point.
- BS – the measurement for backsight point.
- FS – the measurement for foresight point.
- Distance – measured distance.
- Vertical Offset (DL) – displays the vertical offset from the horizontal plane for traverse and sideshot points.
- Elevation – the orthometric heights of the point (or the height of the point is calculated from a point with known height).
- Date – the date and time of level measurement.
- AutoReject – allows or disallows level measurements to be rejected in adjustment.
- Adjustment status – indicates whether or not the level measurements has been adjusted, auto-rejected, disabled, or not adjusted.
- HT residual – adjustment residuals for the level measurements.
- Note – any comment for the level measurement
- Std Dev – standard deviation for the level measurement. This value is created in the Digital Level.
- Job – the name of the leveling job.
- Source – the full path name of the raw data file that the given level measurement corresponds to.



Icon	#	From	To	Job	Date	Note	Distance (m)	Balance (m)
	1	WT	T1	25JAN05	24.02.2005 13:20:00		114,181	2,031

Icon	#	Point	BS (m)	Instrument Elevation (m)	SS (m)	FS (m)	Elevation (m)	Distance (m)	Note	Std Dev (m)	Date	AutoReject	Adjustment Status
	1	WT	1,470	1,470			179,800	6,532		0,000	24.02.2005 15:09:00	Allowed	Adjusted
	2	T8		0,004		1,467	179,776	6,213		0,000	24.02.2005 15:11:00	Allowed	Adjusted
	3	T8	1,444	1,440			179,776	6,157		0,000	24.02.2005 15:22:00	Allowed	Adjusted
	4	T7		-0,004		1,452	179,741	6,000		0,000	24.02.2005 15:24:00	Allowed	Adjusted
	5	T7	1,418	1,414			179,741	5,006		0,000	24.02.2005 15:26:00	Allowed	Adjusted

Figure 4-14. DL Obs Tab

Click on a column's heading to sort *DL Obs* tab information in alphabetical order (note), descending/ascending order (#, point), or increasing/decreasing order (distance, balance, elevation).

To edit information in the *DL Obs* tab (Point, Instrument Elevation, Note, Autoreject), see "Editing in the Tabular View" on page 5-1.

Roads Tab

The *Roads* tab displays only if the job contains road data and the corresponding Design module in Topcon Tools is activated.

Click the *Roads* tab to view the information about existing roads in the current job (Figure 4-15).

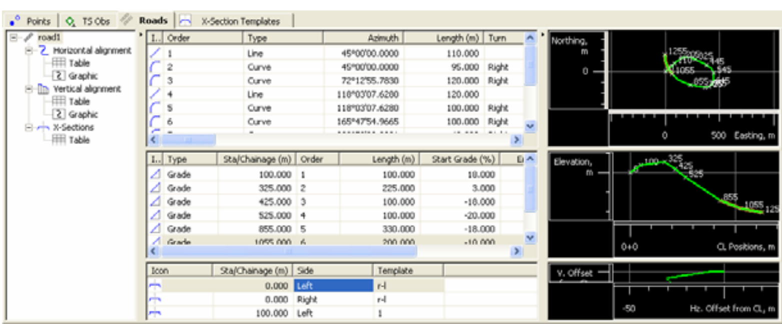


Figure 4-15. Roads Tab

The left panel of the *Roads* tab displays the names of the roads, the middle panel displays horizontal/vertical alignments and x-section of the selected road in a table, the right panel displays a 2D graphic of the selected alignment/x-section.

The *Horizontal alignment* table shows the list of horizontal alignment elements, the horizontal alignment plot and the starting station of each element. The horizontal elements table can contain the following informational columns:

- Icon – displays an image associated with the elements:
  -  : Line
  -  : Spiral
  -  : Curve
  -  : Intersection
- 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 (see “Feature Azimuth Setting” on page 9-20).
- 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. The “Right” value stands for clockwise direction; the “Left” value stands for counter-clockwise direction.
- Start Radius/End Radius – the radius of the curve or spiral.
- Nothing /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” or “False”. True is set if the azimuth for this element is the end azimuth for the previous element; False is set 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 (see “Adding an Intersection” on page 9-25).
- Start Deg Chord/End Deg Curve – the angle in degrees used to compute the radius of curve whose chord is 100 units long.

The *Vertical alignment* table shows a list of the vertical alignment elements, the vertical alignment plot and the starting station of each element. The vertical elements table can contain the following informational columns:

- Icon – displays an image associated with the elements:
  -  : Grade
  -  : Parabola
  -  : Parabola Long Section
  -  : Circular Arc
  -  : Circular Long Section
- 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 set positive; if the grade is falling, the value should be set 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.
- Radius – displays the radius of the element. For the circular arc, the radius of the element; for the circular arc long section, user-enter radius of the circular arc.

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

- 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).

To edit the road in the *Roads* tab, see Chapter 9.

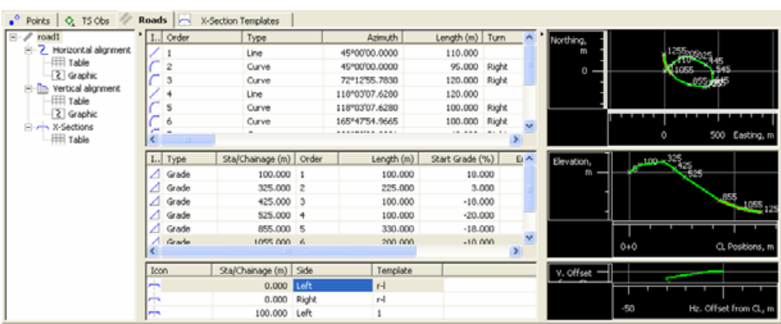


Figure 4-16. Roads Tab

X-Section Templates Tab

The *X-Section Templates* tab displays only if the job contains road data and the Design module of Topcon Tools is activated.

Click the *X-Section Templates* tab to view the information about existing templates in the current job (Figure 4-17).

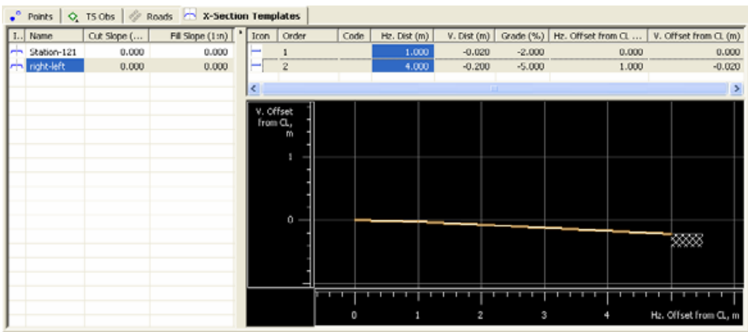


Figure 4-17. X-Section Template Tab

The left panel of the *X-Section Templates* tab displays the name of the template(s) and values of the cut and fill slopes in percent. The right panel displays the segment(s) of the selected template in table and graphic mode.

The right panel of the *X-Section Templates* tab has the following default columns for segments used in the selected template:

- Icon – the symbol of the segment.
- Order – the order of the template 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 this parameter is selected, the Grade will be automatically calculated.
- Grade% – the ratio of Hz. Dist and V.Dist multiplied by 100%. If this parameter is selected, 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 previous the segment(s) and is not editable.
- V. offset from CL (m) – vertical offset from the horizontal plane for the start point of the segment. Calculated using the corresponding values of previous the segment(s) and is not editable.

Map View

If the Map view displayed when the job was closed, it will display when the job is opened. To view or hide the Map view, click **View ▸ Map View**, press **Ctrl+M**, or click the **Map View** button on the toolbar.

The Map view is a graphical latitude/longitude or northing/easting plot of points, observations and background map (Figure 4-18).

- Bolded lines indicate repeated observations; mixed lines of color indicate observations have different statuses.
- Use the right-click pop-up menu or a scroll wheel on a mouse to zoom in and out.
- Press down on a scroll wheel or select Pan mode from the right-click pop-up menu to dynamically "grab" and move the view.

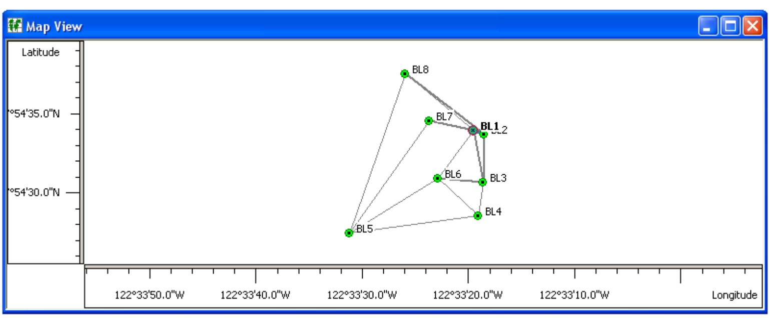


Figure 4-18. Map View

To edit in the Map view, right-click a point or vector and click **Properties** on the pop-up menu. See "Editing Data Properties" on page 5-52 for details on editing in the ***Properties*** dialog box.

Occupation View

If the Occupation view displayed when the job was closed, it will display when the job is opened. To view or hide the Occupation view, click **View ▸ Occupation View** or click the **Occupation View** button on the toolbar.

The Occupation view is a graphical view of points and their GPS time plot (Figure 4-19). The Occupation view option allows the user to view occupations in the many different ways, e.g.

- occupations by points
- occupations by receivers
- occupation (satellite bars) by points
- occupation (satellite bars) by receivers

After the Occupation view is selected, an 'Occupations by points' graph will appear on the screen, for example:

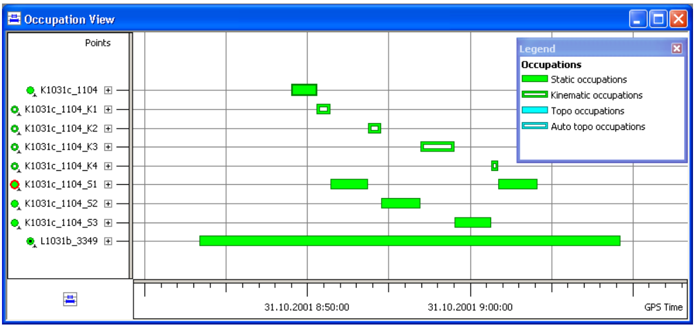


Figure 4-19. Occupation View by Points

Use the right-click pop-up menu or a scroll wheel on a mouse to zoom in and out.

- Press down on a scroll wheel or select Pan mode from the right-click pop-up menu to dynamically "grab" and move the view.
- Click the **+/-** expand button to view occupation times and epochs for individual satellites.

To view individual satellite epochs for the occupations, click the node for point. If the node is expanded, the satellite availability bars will be displayed for each occupation.

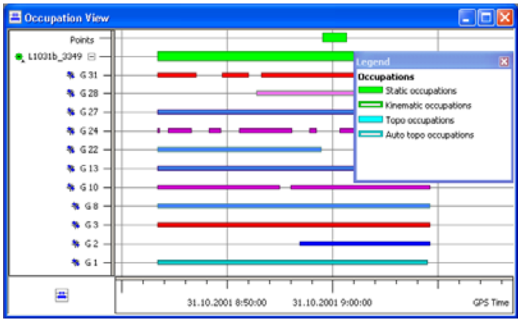


Figure 4-20. Available Satellites for the Occupations

Occupation View allows cutting a part of the satellite's observations from a point's occupations. To cut the satellite's observations, select the desired satellites and time interval and right click any selected area, then click *Disable* on the pop-up menu.

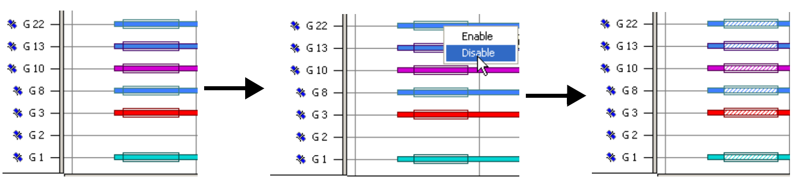


Figure 4-21. Cutting the Satellite's Observations

Topcon Tools's engine does not use the cutting intervals when computing the corresponding baselines or trajectories.

If the user selects the 'Occupations by receivers' from *Occupation View* tab of the *Occupation View Options* dialog box, the vertical axis of the occupation view graph will show the receivers' serial numbers, for example:

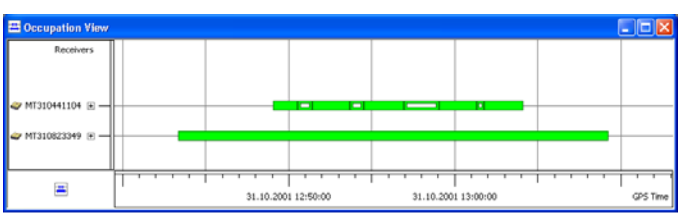


Figure 4-22. Occupations View by the Receivers

To set the horizontal axis of the occupation view in the local Time zone, click **Job ▸ Job Configuration** and in the Display panel, click the Time tab. Set a desired time offset (Figure 4-23).

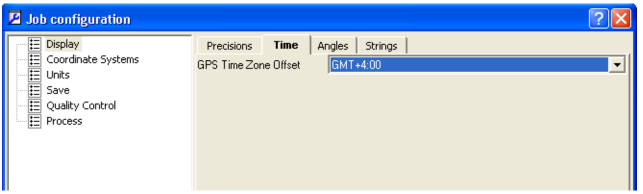


Figure 4-23. Setting GPS Time Zone Offset

See "Editing Data Properties" on page 5-52 for details on editing in the *Properties* dialog box.

CAD View

If the CAD view displayed when the job was closed, it will display when the job is opened. To view or hide the CAD view, click **View ▸ CAD View**.

The CAD view is a graphical view of linework, roads, and surfaces with the associated points (Figure 4-24 on page 4-29). Unless filtered, the following information displays:

- Points and their symbols display on the CAD view. If the point does not have a symbol, its survey symbol will be used.
- Lines display using the code's/layer's color, style, and width.
- If a line contains valid /AS, /AE, /R, /C control codes, it will display as arc, rectangle or closed, respectively.
- If a code includes a polygon entity type, it will display as closed and filled (if a fill color has been set).
- Right-click a thumbnail in the left pane of the image tab to view a larger version of that image in a secondary CAD view. In this view, coordinates are defined as HA and VA from the measurement direction. Only points and lines that fit into the image will display.
- Surfaces and roads are displayed in the color applied to the corresponding layer(s).

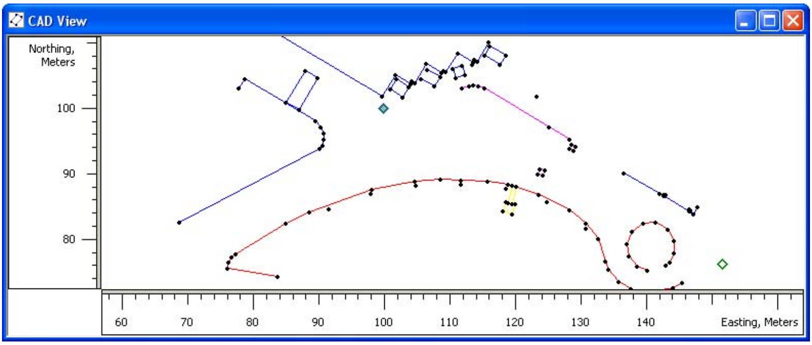


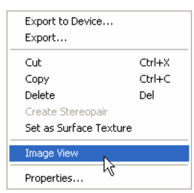
Figure 4-24. CAD View with Linework

To edit in the CAD view, right-click a point or line and click **Properties** on the pop-up menu. See “Editing Data Properties” on page 5-52 for details on editing in the ***Properties*** dialog box.

CAD View for Images

If the associated data has images, such as data from a GPT7000i or photo note for a point, a special CAD view will display a larger size of the selected image (Figure 4-25 on page 4-30).

To view the image CAD view, right-click an image in the left panel of the *Images* tab and click Image View:



- The points and lines associated with that image are indicated on the image and selected in other views and tabs.
- Select a point or line and use the right-click pop-up menu to quickly edit or view point and/or line properties, as well as append/insert points to a line.
- Use the zoom button to change the magnification of the image.

Figure 4-25. Image View

To change the view options, right-click outside the image and click **Options** on the pop-up menu.

3D View

The 3D view displays surfaces, roads, and linework using a three-dimensional representation of the data (Figure 4-26 on page 4-31). Surfaces and roads are displayed in the color in the color used for that layer; lines are displayed in the color set for that line. If the 3D view displayed when the job was closed, it will display when the job is opened.

To view or hide the 3D view, click **View ▸ 3D View**.

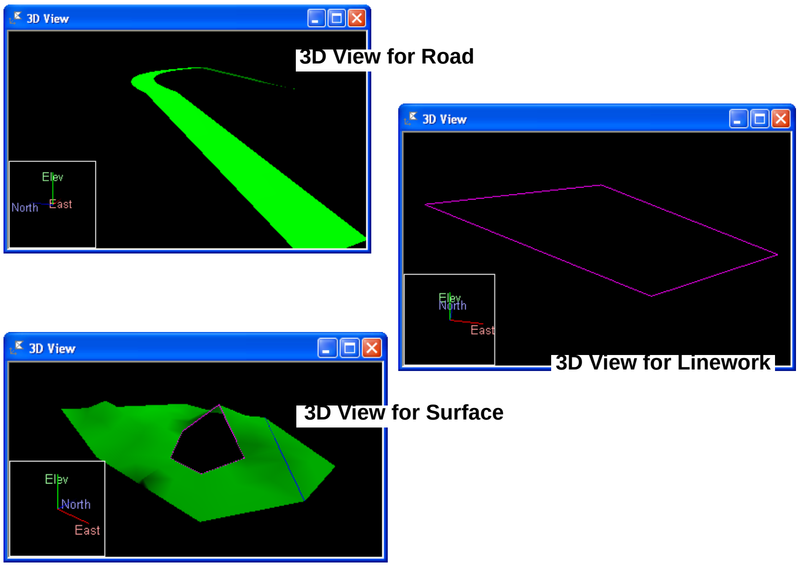


Figure 4-26. 3D View for Different Objects

Use the wheel of the mouse to pan (press and move the mouse) or zoom (scroll up/down). Right-click and hold on the 3D image to rotate the view. Use the mouse as described and hold the Ctrl key to change the virtual position of the light source (Figure 4-27).

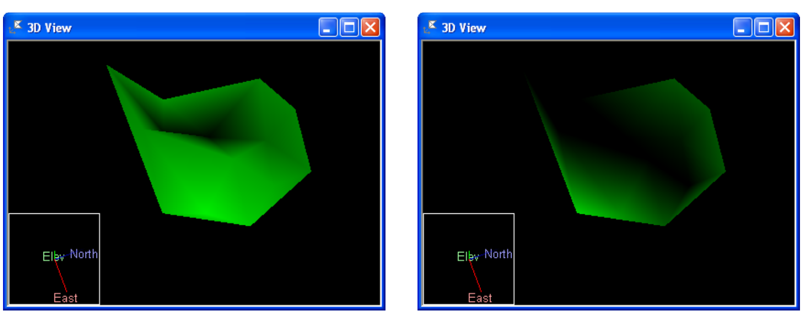
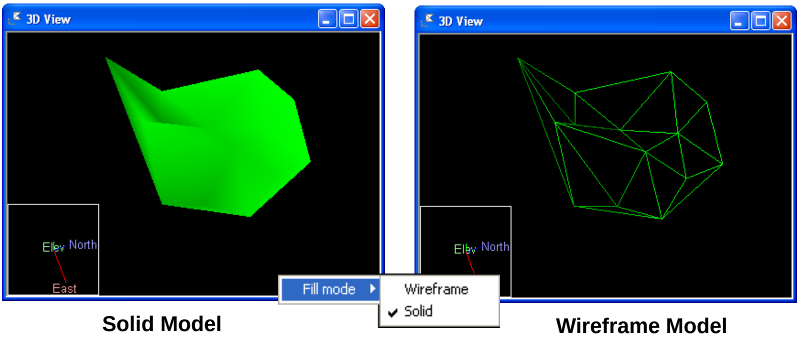


Figure 4-27. Changing the Virtual Light Source

The 3D image can be viewed as a solid model or a wireframe model. To select the desired model, right-click outside the image and click the model type on the pop-up menu (Figure 4-28).



Solid Model **Wireframe Model**

Figure 4-28. 3D Image Model Types

Topcon Tools allows one to cover a surface with a texture and to set a the corresponding image as texture. To do it, take the following steps:

- Create a surface on the image or on the stereopairs
- Click **View ▸ 3D View**.
- Click the *Image* tab. Right click on the corresponding image in the left panel and select “*Set as Surface Texture*” from pop-up menu:

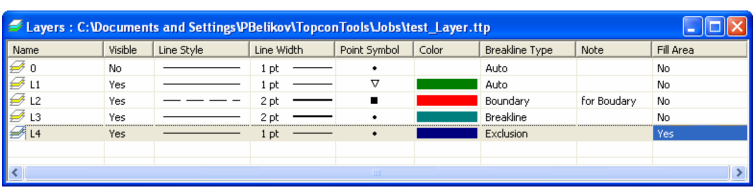
Figure 4-29. Surface is Covered With Image

Layers View

If the Layers view displayed when the job was closed, it will display when the job is opened. To view or hide the Layers view, click **View ▸ Layers**.

The Layers view lists all layers and their plotting style used in the job (Figure 4-30 on page 4-33):

- Name – the name of the layer.
- Visible – shows (select Yes) or hides (select No) the layer on the *Cad View* and *3D View*.
- Line Style/Line Width/Line Color/Point Symbol – displays the plotting style (attributes) of the layer.
- Note – displays user comments.
- Fill Area – display whether or not (Yes or Not) the areas of this layer are filled.
- Breakline types – displays the type of the layer. If Breakline type is set in Auto, triangulation will be automatically determined by the boundary, exclusions, and breaklines. If Breakline type is set to Breakline, Boundary or Exclusion, the line will be treated exactly this way in the triangulation.


Layers : C:\Documents and Settings\PBelikov\TopconTools\Jobs\test_Layer.ttp

Name	Visible	Line Style	Line Width	Point Symbol	Color	Breakline Type	Note	Fill Area
0	No		1 pt	•		Auto		No
L1	Yes		1 pt	▽		Auto		No
L2	Yes		2 pt	■		Boundary	for Boudary	No
L3	Yes		2 pt	•		Breakline		No
L4	Yes		1 pt	•		Exclusion		Yes

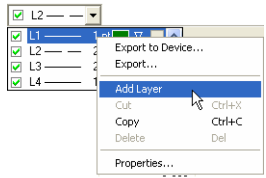
Figure 4-30. Layers View

To edit data in the Layers view, see “Editing Linework” on page 5-15 for details.

Layers are frequently used to group information by function, assigning line types, colors, and other attributes to distinguish this information from other data. By default, every Topcon Tools job includes a layer named 0 (zero). Layer 0 cannot be deleted or renamed; however, the attributes for this layer can be edited. New layers can be added to the job or imported from other files.

To create a new layer in the current job, do one of the following:

- click **Edit ▸ Add ▸ Layers**. Or in the *Layers* view, click **Add Layers** on the pop-up menu.
- open the list in the Layer combo box, right click in the list and select “Add Layer” from pop-up menu:



1. Enter the following general information for the layer in the *General* tab (Figure 4-31):
   - Name – the name of the layer.
   - Visible – select Yes to show the layer on the CAD and 3D views; select No to hide the layer.
   - Note – enter desired comments.
   - Breakline type-select desired type (*Auto*, *Breakline, Boundary or Exclusion*) for line is included to the surface.
2. Select the following plotting information for the layer in the *Plotting Styles* tab (Figure 4-31):
   - Line Style – select the type of line to display for line information in the layer.
   - Line Width – select a width for lines in the layer.
   - Color – select a color for all data (point and line) in the layer.
   - Point Symbol – select a symbol to represent all points in the layer.
3. Select Yes to fill the areas of this layer (Figure 4-31).

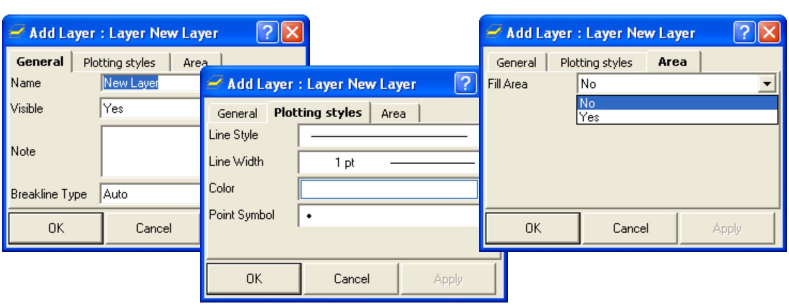


Figure 4-31. Enter and Select Layer’s Properties

The user can set any created layer as an active layer. To set an active layer for the job, open the Layer combo box in the Toolbar and select the layer. In this case, any point, linework, surface and road created will have the same plotting style as defined by the active layer:

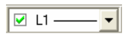


Figure 4-32. Combo Box Displays Active Layer

Setting the Layer for New Codes

When creating a new code, the user can select a layer. In this case, the plotting style for this code will be taken from the layer parameters.

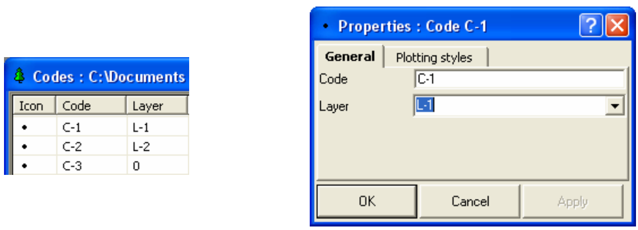


Figure 4-33. Codes and Layers

To edit the plotting style for any code with or without the layer, use the *Plotting styles* tab of the code's ***Properties*** dialog box.

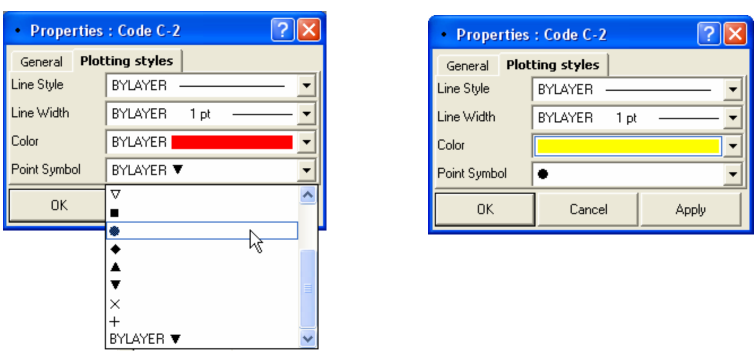


Figure 4-34. Editing Plotting Styles (Point Symbol) for Code

If no layer is selected for the code, the code will be automatically assigned to Layer 0. This layer (Layer 0) will be applied for all codes in Topcon Tools job and for imported files without layer support.

Setting the Layer for a New/Existing Point

To set the layer for a new point, select the layer using the *General* tab in the ***Add Point*** dialog box (Figure 4-35). The attributes (color and point style) for the selected layer will be assigned to this point. The user can set new layer for the selected points. To do it, select the desired points, right-click and select Properties. Set the layer for all selected points.

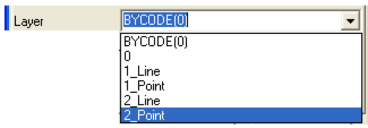


Figure 4-35. Setting Layer for Points

To apply codes (instead of layers) for a point, select the desired code in the *Code* field and set "BYCODE" in the *Layer* field. The attributes (color and point style) for the layer will be assigned to this point. Figure 4-36 shows an example of a point with code "101" in the *Cad View*. For this point, the layer was set to "BYCODE (For Points)" and this code uses the layer "For Points".

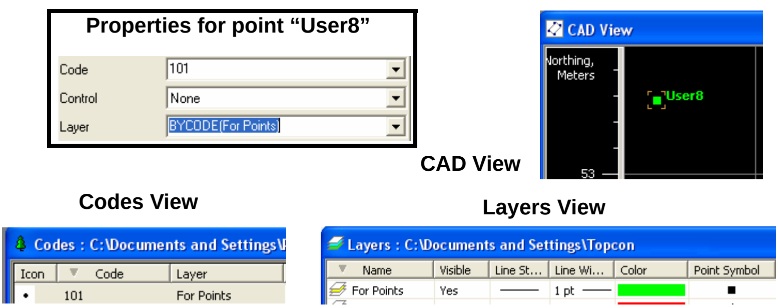


Figure 4-36. Setting Code for Point and Viewing Point

- If the point has multiple codes, setting Layer to "BYCODE" forces it to belong to multiple layers.
- If the point has no code, setting Layer to "BYCODE" forces the point to belong to layer 0 (zero).

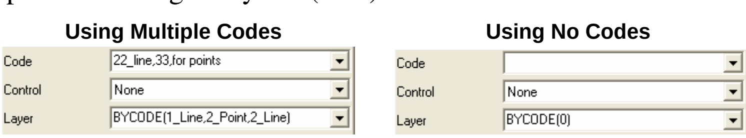


Figure 4-37. Layer Determination when Applying Codes

Setting the Layer for New/Existing Linework

To set the layer for new linework, select any layer from the list of existing layers in the Toolbar (Layer combo box). The plotting styles of the new line will be assigned by the active layer (Figure 4-38).

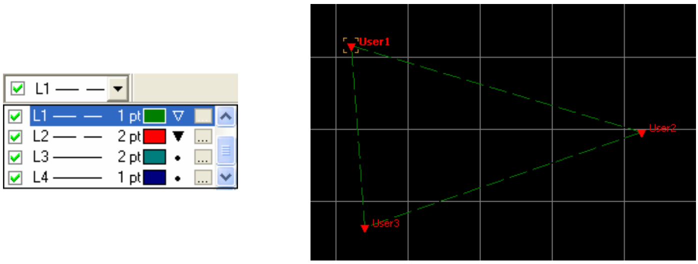
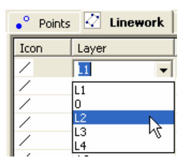


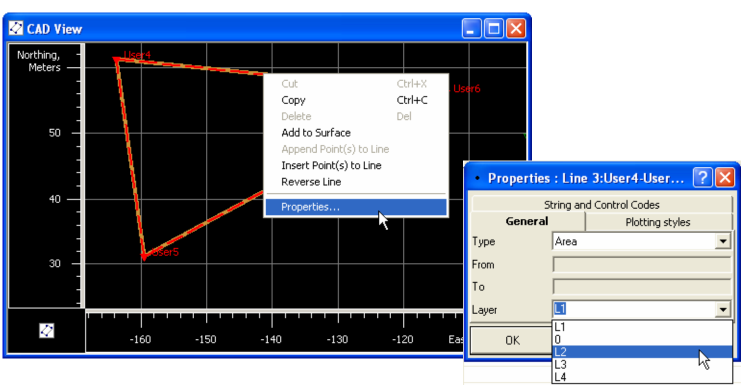
Figure 4-38. Setting the Layer for Linework

To change the layer for existing linework, do one the following:

- double-click in Layer column and select a different layer from the drop-down list in the left panel of the *Linework* tab:



- right click on the line (or selected line) in the CAD View and select the Properties from pop-up menu. Select a different layer from the drop-down list in the Properties window:



Setting the Layer for a New/Existing Surface

To set the layer for a new/existing surface, select a layer using the ***Add Surface*** (or ***Properties***) dialog box. The plotting styles for the selected layer will be assigned to the surface (Figure 4-39).

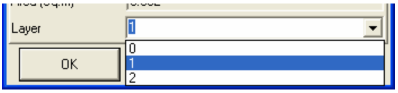


Figure 4-39. Setting the Layer for a Surface

To change the layer for an existing surface, in the *Surfaces* tab, double-click in Layer column and select a different layer from the drop-down list (Figure 4-40).

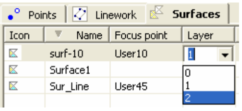


Figure 4-40. Selecting a Layer for an Existing Surface

Setting the Layer for a New/Existing Road

To set the layer for a new/existing road, select a layer using the ***Add Road*** (or ***Properties***) dialog box. The plotting styles for the selected layer will be assigned to the road (Figure 4-41).

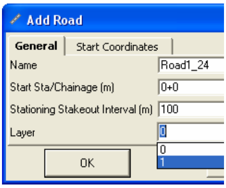


Figure 4-41. Setting the Layer for a Road

Codes View

If the Codes view displayed when the job was closed, it will display when the job is opened. To view or hide the Codes view, click **View ▸ Codes** or click the **Codes List** button on the toolbar.

The Codes view lists all codes and their attributes used in the job (Figure 4-42).

- For Codes, the left panel lists:
  - – Icon: the image associated with the code
  - – Code: the name of the code
  - – Layer: the name of the layer that uses the code
- For Attributes, the right panel lists:
  - – Icon: the image associated with the attribute
  - – Name: the name of the attribute
  - – Default Value: a value acquired by default when assigning a code to a point
  - – Type: the type of entity the code points to (Integer, Real Number, Text, Menu)

To edit in the Codes view, see "Editing Codes in the Codes View" on page 5-35 for details.

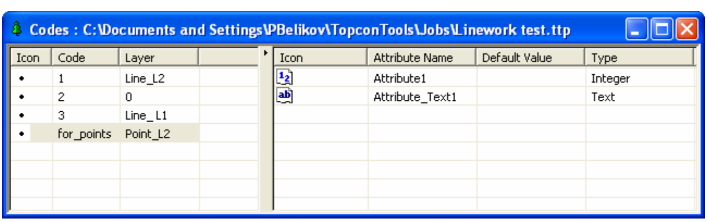


Figure 4-42. Codes View

Setting View Options

The view options have parameters for displaying data in different formats, for arranging columns in the Tabular view, or for customizing the display of information. Only the Map, Occupation, and Tabular views have the option selections.

Map View Options

View options for the Map view include displaying a coordinate grid and symbol legend, and selecting labels to display for points.

1. Click **View ▸ Map View Options** or right-click on an empty portion of the Map view and click **Options** on the pop-up menu.
2. On the *Show* tab, enable the desired settings (Figure 4-43 on page 4-41). Click **Apply** to save the settings and make further changes.
    - Show grid – makes the Map view a coordinate map
    - Show legend – displays a window describing the symbols used on the Tabular and Map views
    - Show ellipses – turn on and off the 3-D graphic accuracy indicators for the adjusted points and processed baselines. The plane errors are represented as ellipses with the semi-axes equal to Std e and Std n for the vector/point. The vertical error is represented as a segment with the length equal to Std u for the vector/point.
    - Background Map File – displays the path of the selected map file used as a background in Map and CAD views. Supported map files include DWG (*.dwg), DXF (*.dxf), GEOTIFF (*.tif), MrSID (*.sid), and World files (*.tfw, *.jgw, *.gfw, *.bpw).
3. On the *Labels* tab, enable the desired settings (Figure 4-43 on page 4-41). Click **Apply** to save the settings.
    - 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

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

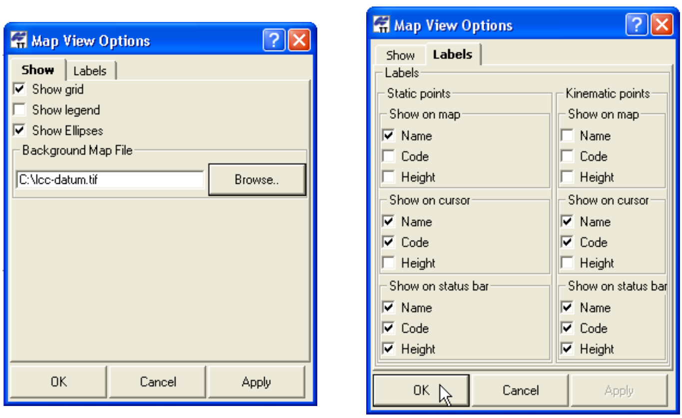


Figure 4-43. Map View Show and Label Options

Occupation View Options

View options for the Occupation view include displaying a time scale and symbol legend, and selecting the source of the occupation to display.

1. Click **View ▸ Occupation View Options** or right-click on an empty portion of the Occupation view and click **Options** on the pop-up menu.
2. On the *Show* tab, enable the desired settings (Figure 4-44 on page 4-42). Click **Apply** to save the settings and make further changes.
   - Show grid – displays a GPS time scale grid on the Occupation view
   - Show legend – displays a window describing the symbols used on the Occupation view

Figure 4-44. Occupation View Show Options

3. On the *Occupation View* tab, select the desired view option (Figure 4-45). Click **Apply** to save the settings.
   - Show occupations by receivers – select to display occupations based on the receiver used
   - Show occupations by points – select to display occupations based on the points recorded

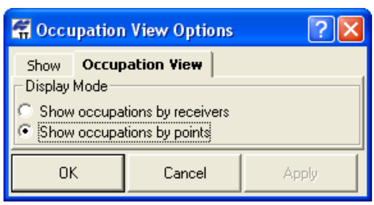


Figure 4-45. Occupation View Options

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

CAD View Options

View options for the 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.
2. On the *Show* tab, enable the desired settings (Figure 4-46 on page 4-43). Click **Apply** to save the settings and make further changes.
   - Show grid – makes the CAD view a coordinate map
   - Background Map File – displays the path of the selected map file used as a background in Map and CAD views.

Supported map files include DWG (*.dwg), DXF (*.dxf), GEOTIFF (*.tif), MrSID (*.sid), and World files (*.tfw, *.jgw, *.gfw, *.bpw).

   1. Click **Browse** and navigate to and select the desired file.
   2. Click **Open**, then click **Apply**.

3. On the *Labels* tab, enable the desired settings (Figure 4-46).
   - 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
4. Click **OK** to save the settings and close the dialog box.

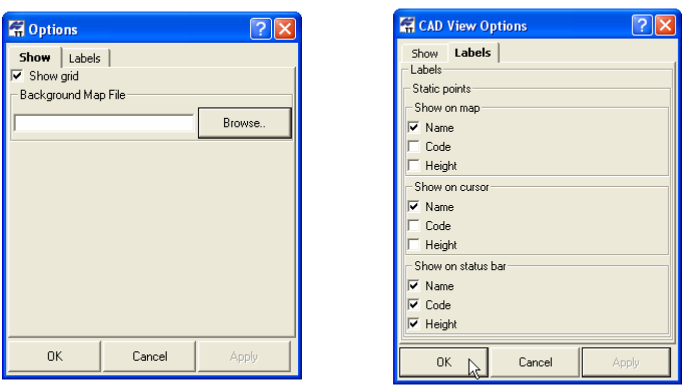


Figure 4-46. CAD View Show and Labels Options

Tab Options in the Tabular View

Each of the tabs in the Tabular view have ***Options*** dialog boxes for displaying various information columns, as well as arranging these columns to suit. The *Images* tab is the only exception: it has no options dialog box.

1. Click **View ▸ Tabular View Options** or right-click on an empty portion of the desired tabular view and click **Options** on the pop-up menu.
2. Select and arrange the desired columns (Figure 4-47).
   - Use the **>>** and **<<** buttons to move the selected column between fields.
   - Use the **Move Up** and **Move Down** buttons to move the selected column up or down in order in the *Selected columns* field.
3. Click **OK** to apply the changes to the table.

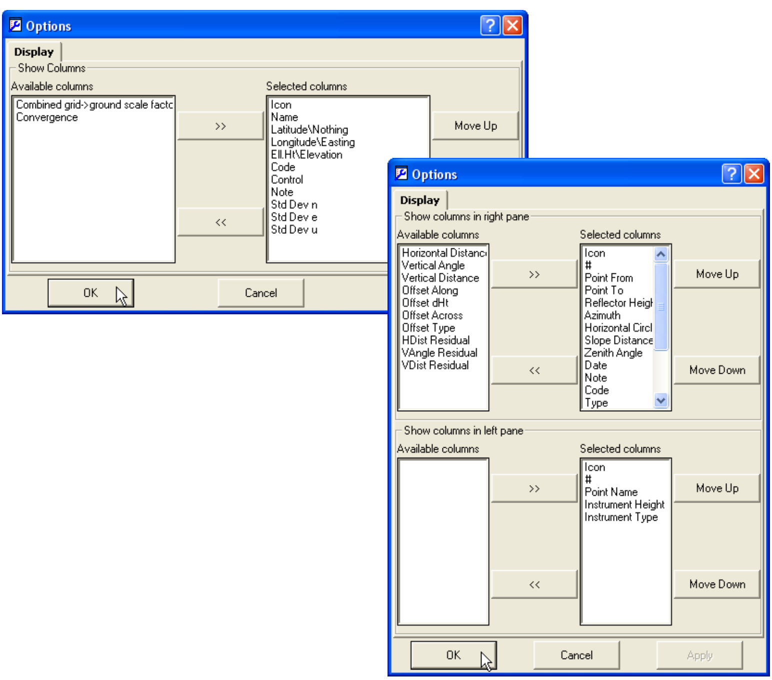


Figure 4-47. Example Tab Options for Points and TS Obs

Image Options

The options for the *Image* tab include labels for displaying the points and options for displaying the images.

1. Right-click on an empty portion of the *Image* tab and click *Options* on the pop-up menu.

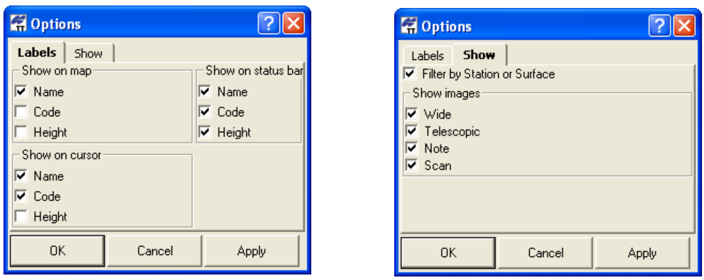


Figure 4-48. Image tab -> Labels and Show Options

2. On the *Labels* tab, enable the desired settings (Figure 4-48). Click *Apply* 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
3. On the *Show* tab, enable the desired settings (Figure 4-48). Click *Apply* to save the settings and make further changes.
   - *Filter by Station or Surface*- allows applying the filter. If the filter is applied only points, taken from the Station is displayed. Filter by Surface selects points, contained by created Scan Surface.
   - *Show images* - check corresponding check boxes for displaying the images of certain types:
     – Wide -images obtained by the Topcon Total Station (GPT 7000i) in Wide mode.
     – Telescopic- images obtained by the Topcon Total Station (GPT 7000i) in Telescopic mode.

– Note - any photo notes in the job. Photo notes (jpg images) can be attached to points in Topcon Tools. There can be multiple images per point.

– Scan - any images, attached to the Scan Session

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

Stereopairs Options

The options for the *Stereopairs* tab include labels for displaying the points. Right-click on an empty portion of the *Stereopairs* tab and click *Options* on the pop-up menu:

On the *Labels* tab, enable the desired settings (Figure 4-49). Click *Apply* 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

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

Figure 4-49. Stereopairs Option

Selecting Data

Data can be selected in Topcon Tools either visually using a computer mouse, or by selected parameters using the Select menu. Data selection provides a way to view or edit information on certain points or vectors. Also, you can select desired data to process or export rather than processing or exporting all data. Data selected in one view is selected in all views.

The ***Select*** dialog boxes support wildcards (* and ?) for selecting data that have similar elements. For example, to select all point with point names starting with "TS", type "TS*" in the *Name* field of the ***Select Points*** dialog box. Leave all other fields with their default settings and click **OK**. All points beginning with "TS" will be selected in all open views. You can also combine criteria to select only that data that match all selected fields.

Selecting Data in Map, Occupation, and CAD Views

To select data in the Map view, Occupation view, or CAD view:

- Click on the desired point, vector, occupation, epoch, or line. To select several points, vectors, occupations, epochs or lines, hold the **Shift** key while clicking the desired data. Use the **Ctrl** key to select/deselect elements.
- Click and drag a box around the desired point(s), vector(s), occupation(s), or line(s). Dragging from right to left selects all elements that touch the box; dragging from left to right selects only those elements completely within the box. Hold the **Shift** key to select groups of non-adjacent elements using this method. Use the **Ctrl** key to select/deselect elements.
- When dragging a square to select certain epochs, any epoch with starting times within the selection square will be selected; or, the entire epoch will be selected if the selection square falls within the start and end time of the epoch.

See "Editing Data Properties" on page 5-52 for details on editing selected data.

Selecting Data in Tabular and Codes Views

To select data in the Tabular view or Codes view:

- Click on the desired data.
- To select a range of data, hold the **Shift** key while clicking the desired data. Use the **Ctrl** key to select/deselect non-adjacent elements.

In the Tabular and Codes views, some data cells also contain drop-down lists, a field in which to type new or updated information, or spin boxes. The editable fields differ with each tab and panel, and not all cells can be edited.

- To access the drop-down lists, edit fields, and spin boxes in cells, select a cell and press **F2** or click-pause-click. Click outside the cell or press **Enter**.
- To make the same change in the same column across several rows, hold down the **Shift** key to select adjacent cells or hold down the **Ctrl** key to select separated cells. Press **F2** or click once on one of the highlighted cells and make the desired change. Only highlighted cells will be updated. Click outside the cell or press **Enter**.

Press **Esc** to cancel a change.

See “Editing in the Tabular View” on page 5-1 and “Editing Codes in the Codes View” on page 5-35 for more details.

Selecting Points

To select points using user-defined rules, click **Select ▸ Select Points** or press **Ctrl+Shift+P**.

On the ***Select Points*** dialog box, enter the following information and click **OK** (Figure 4-50 on page 4-49).

- Name / Note / Code – enter a name/note/code, or part of a name/note/code and a wildcard, to select all points with the indicated elements.

- Std Dev Horizontal / Std Dev Vertical – select Less than, Greater than, or Don't use. If using a deviation, enter in meters.
- Point type – select the type of point from the spin list to select all points of that type. To select unconnected points (without observations), select "Unconnected".
- Enable for adjustment – select Enabled, Disabled, or Don't use to select points based on this parameter.
- Clear current selection – all currently selected items will be deselected. If not enabled, currently selected points will remain selected.

Click **Set default** to apply the defaults shown in Figure 4-50.

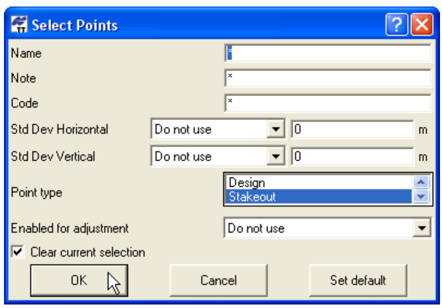


Figure 4-50. Select Points

Selecting TS Occupations

To select TS occupations using user-defined rules, click **Select ▸ Select TS Occupations** or press **Ctrl+Shift+T**.

On the ***Select TS Occupations*** dialog box, enter the following information and click **OK** (Figure 4-51 on page 4-50).

- Point name / Source – enter a name/source, or part of a name/source and a wildcard, to select all TS occupations with the indicated element.
- Instrument height – select Less than, Greater than, Equal to, or Don't use. If using an instrument height, enter the height in meters.

- Related point – if enabled, the points for the TS occupation(s) selected by criteria will also be selected.
- Related obs – if enabled, the observations for the TS occupation(s) selected by criteria will also be selected.
- Clear current selection – all currently selected items will be deselected. If not enabled, currently selected occupations will remain selected.

Click **Set default** to apply the defaults shown in Figure 4-51.

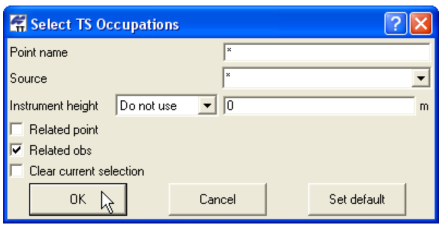


Figure 4-51. Select TS Occupations

Selecting GPS Occupations

To select GPS occupations using user-defined rules, click **Select ▸ Select GPS Occupations** or press **Ctrl+Shift+G**.

On the ***Select GPS Occupations*** dialog box, enter the following information and click **OK** (Figure 4-52 on page 4-51).

- Point name / Original name / Point code / Source – enter a name/code/source, or part of a name/code/source and a wildcard, to select all GPS occupations with the indicated element.
- Method – select the type of method from the spin list to select all GPS occupation that use the selected method.
- Antenna height – select Less than, Greater than, Equal to, or Don’t use. If using an antenna height, enter in meters.
- Start time / End time – select Less than, Greater than, or Don’t use. If using a start time/end time, enter the date and time of the start/end of the occupation measurement.

- Durations – select Less than, Greater than, or Don’t use. If using duration, enter the number of days, hours, minutes, and seconds the duration lasted for the occupation measurement.
- Related point – if enabled, the points for the GPS occupation(s) selected by criteria will also be selected.
- Related obs – if enabled, the observations for the GPS occupation(s) selected by criteria will also be selected.
- Clear current selection – all currently selected items will be deselected. If not enabled, currently selected occupations will remain selected.

Click **Set default** to apply the defaults shown in Figure 4-52.

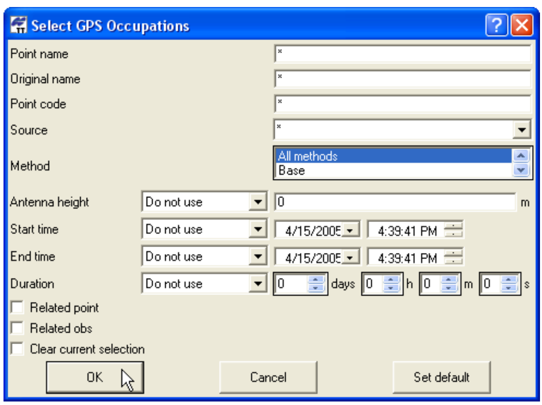


Figure 4-52. Select GPS Occupations

Selecting TS Observations

To select TS observations using user-defined rules, click **Select ▸ Select TS Obs** or press **Shift+Ctrl+M**.

On the ***Select TS Obs*** dialog box, enter the following information and click **OK** (Figure 4-53 on page 4-52).

- From point / To point – enter a from/to point name, or part of a from/to point name and a wildcard, to select all TS observations with that from/to point.
- Enabled – select Enabled, Disabled, or Don’t use to select points based on this parameter for adjustment.

- Hz residual / V residual – select Less than, Greater than, or Don't use. If using a residual, enter in meters.
- Reflector height – select Less than, Greater than, or Don't use. If using a reflector height, enter in meters.
- Hz angle / V angle / Z angle – select Less than, Greater than, or Don't use. If using an angle, enter in degrees.
- Hz dist / V dist / Slope dist – select Less than, Greater than, or Don't use. If using a distance, enter in meters.
- Related point – if enabled, the points for the TS observation(s) selected by criteria will also be selected.
- Clear current selection – all currently selected items will be deselected. If not enabled, currently selected observations will remain selected.

Click **Set default** to apply the defaults shown in Figure 4-53.

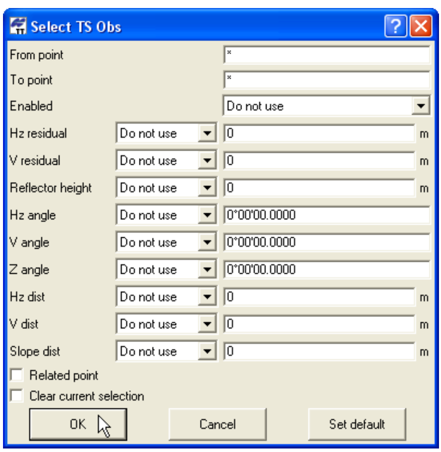


Figure 4-53. Select TS Observations

Selecting GPS Observations

To select GPS observations using user-defined rules, click **Select ▸ Select GPS Obs** or press **Shift+Ctrl+O**.

On the ***Select GPS Obs*** dialog box, enter the following information and click **OK** (Figure 4-54 on page 4-54).

- From point / To point – enter a from/to point name, or part of a from/to point name and a wildcard, to select all TS observations with that from/to point.
- Type – select the type of method from the spin list to select all GPS observation that use the selected method.
- Start time – select Less than, Greater then, or Don't use. If using a start time, enter the date and time of the start of the observation measurement.
- Duration – select Less than, Greater then, or Don't use. If using a duration, enter the number of days, hours, minutes, and seconds the duration lasted to select observations with this duration measurement.
- Solution type – select the type of observation solution from the spin list to select observations of this solution.
- Hz precision / V precision – select Less than, Greater than, or Don't use. If using a precision, enter in meters.
- Hz residual / V residual – select Less than, Greater than, or Don't use. If using a residual, enter in meters.
- Length – select Less than, Greater than, or Don't use. If using a length, enter in meters.
- Enabled – select Enabled, Disabled, or Don't use to select points based on this parameter for adjustment.
- Clear current selection – all currently selected items will be deselected. If not enabled, currently selected observations will remain selected.

Click **Set default** to apply the defaults shown in Figure 4-54 on page 4-54.

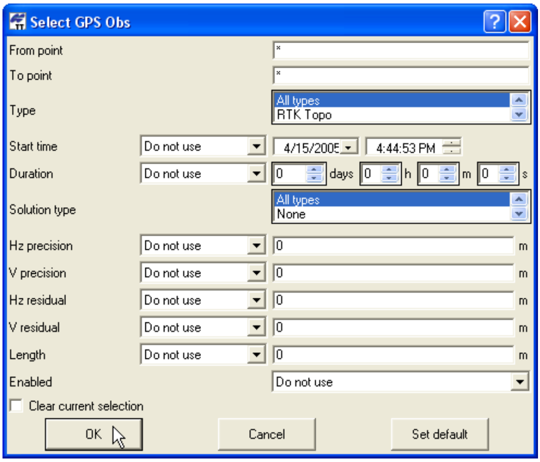


Figure 4-54. Select GPS Observations

Inverting Selections

To quickly select unselected occupations or observations, and to deselect the selected occupations or observations, use the Invert Selection tool in Topcon Tools.

To invert a selection, click **Select ▸ Invert Selection** or press **Ctrl+Shift+I**.

The selected occupations or observations become deselected, and the unselected occupations or observations become selected (Figure 4-55).

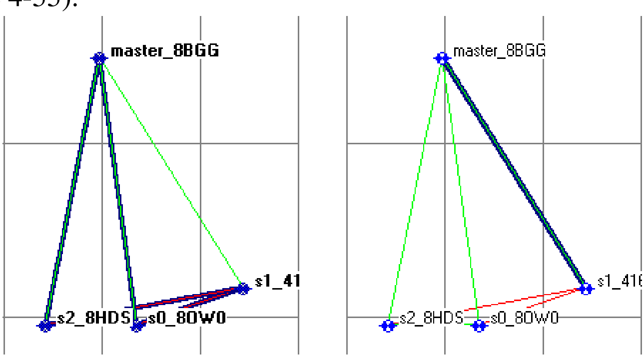


Figure 4-55. Before and After Inverting a Selection

Filtering Data

Filters provide a way to hide or display points, occupations, and observations based on type, time, and/or code using the selections in the ***Filters*** dialog box (Figure 4-56). Hidden points, occupations, and observations will be excluded from processing, adjustment, exporting, and reports.

Figure 4-56. Filters

TIP

When using multiple filters (type, time, and/or code), the selected filters are combined with logical OR.

Topcon Tools displays the filter status in the Status Bar (see “Status Bar” on page 1-19).

Filtering By Type

1. To hide/display data based on type, click **View ▸ Filters** or click the **Filter** button on the Toolbar.
2. On the *By Type* tab, click the desired check marks to filter data and data types (Figure 4-57 on page 4-56).
   - data types marked in red are hidden; data types marked in green are displayed

- points belonging to different data types simultaneously (for example, both a GPS and TS point, or also a GPS control point, etc.) are hidden only if all data types the point belongs to are hidden

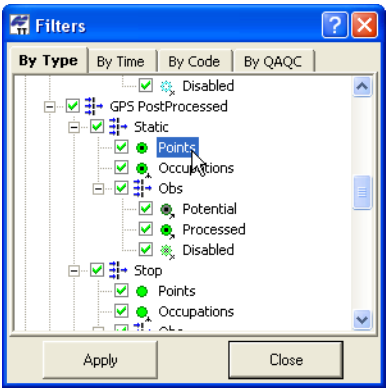


Figure 4-57. Select By Type Filter

3. Click **Apply** to save the filter settings. Click **Close** when finished applying the desired filters.

Filtering By Time

1. To hide data observed at particular time intervals, click **View** ▸ **Filters** or click the **Filter** button on the Toolbar.
2. On the *By Time* tab, select the *From* and *To* time filters for *interval 1* and *interval 2* to apply to the job (Figure 4-58 on page 4-57).

   NOTE: Only occupations and observations that lie within the selected time intervals will be hidden. A point is hidden if it is an observed point, as well as all observations on this point that lie within the selected time intervals.
3. Click **Reset** to reset the time intervals.
4. Click **Apply** to save the filter settings. Click **Close** when finished applying the desired filters.

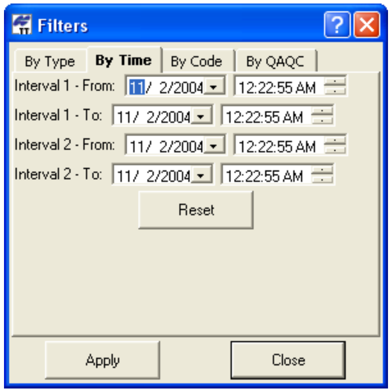


Figure 4-58. Select By Time Filter

Filtering By Code

1. To set a code filter, click **View ▸ Filters** or click the **Filter** button on the Toolbar.
2. On the *By Code* tab, type the name of the code/feature to filter data by (Figure 4-59 on page 4-58).

TIP

Use a wildcard (* or ?) to apply filters using any part of a code. Use commas to separate several codes.

3. Click **Apply** to save the filter settings. Click **Close** when finished applying the desired filters.

Figure 4-59. Select By Feature Filter

Filtering By Quality Control

1. To set a quality control filter, click **View ▸ Filters** or click the **Filter** button on the Toolbar.
2. On the *By QAQC* (Quality Analysis Quality Control) tab, click the desired check marks to filter data and data types (Figure 4-57).

   Data types marked in red are hidden; data types marked in green are displayed.
3. Click **Apply** to save the filter settings. Click **Close** when finished applying the desired filters.

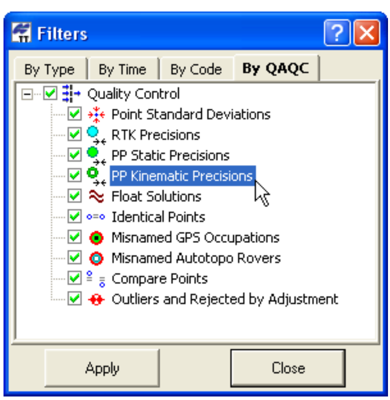


Figure 4-60. Select Quality Control Filter

Viewing Properties of Data

Each data type has a ***Properties*** dialog box associated with it that displays information particular to the selected data. When selecting several items of the same data type, all items are represented on one dialog box. When selecting several items of different data types, each different item is represented in its data type dialog box.

To view the ***Properties*** dialog box for selected single or multiple data in the Tabular, Map, Occupation, or CAD view (Figure 4-61):

- select a point/observation/occupation/line and click **Edit ▸ Properties**
- right-click a point/observation/occupation/line on the graphical or tabular view and click **Properties**

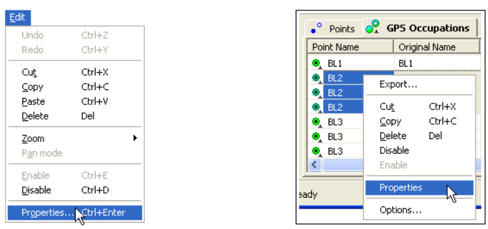


Figure 4-61. Display Properties Dialog Box

The ***Properties*** dialog box varies slightly depending on the number of items selected and the type of data selected.

- For points properties, the *Name* field and *CAD* tab are not available when viewing the properties of multiple points.
- For GPS occupation properties, the occupation type (PP or RTK) determines the available fields.
- For GPS observation properties, the observation type (static or kinematic) determines the available fields.
- For line properties, if selecting multiple lines, only the General tab displays.
- For the TS Obs tab, Tape Dimensions tab and Linework tab, the panel in which data is selected determines the properties that display.

For details on the ***Properties*** dialog boxes, see “Editing Data Properties” on page 5-52.

Notes:

Editing Data

Topcon Tools provides numerous editing features for changing, consolidating, and updating data in preparation for post processing and adjusting.

Editing in the Tabular View

Many fields (table cells) in the Tabular view can be directly edited using spin boxes, drop-down lists, and text entry fields.

To edit information in individual table cells, click-pause-click a cell, click an already highlighted cell, or highlight a cell(s) and press **F2** to display data to select or edit.

To enter equal values across several rows, press **Shift** while selecting the desired rows. Click one of the selections, edit the information and press **Enter** (Figure 5-1). Press **Esc** to cancel edits.

- For spin boxes, click the up/down arrows to spin to the desired selection, or type the information.
- For drop-down lists, click the desired selection. If needed, click **More** to display more selections.
- For text entry fields, type the new information, deleting old information as needed.

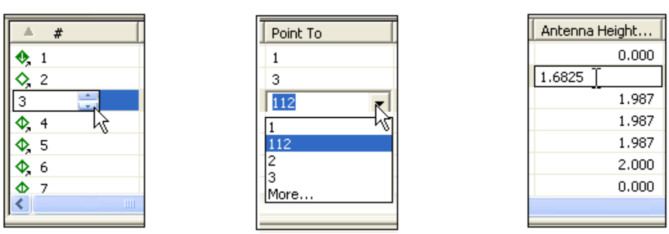


Figure 5-1. Fields for Editing Data

Table 5-1 lists editable and static fields for tabs in the Tabular view.

Table 5-1. Tabular View Editable Fields

	Editable Fields	Static Fields
Point Tab	Name Coordinates Code Control Note String Control Code Layer	Icon Standard deviations String[a] Control Code[b] Combined scale factor Convergence Photo Notes
GPS Occupations Tab	Point Name Original Name Antenna Type Antenna Height Antenna Height Method Note Offset Distance Offset Height Offset Across	Icon Interval Start Time Stop Time Duration Method Source Receiver
TS Obs Tab, Left Panel	# Point Name Instrument Height Instrument Type	Icon
TS Obs Tab, Right Panel	# Point To Reflector Height Azimuth Note Code AutoReject Offsets	Icon Point From Horizontal Circle Slope Distance Zenith Angle Vertical Angle Horizontal Distance Vertical Distance Date Type Adjustment Status Residuals

Table 5-1. Tabular View Editable Fields (Continued)

	Editable Fields	Static Fields
GPS Obs Tab	Note AutoReject Point To (RTK autotopo observations only)	Icon Point From / Point To Start Time Duration Precisions Solutions Method Solution Type Orbit Adjustment Status Residuals HDOP / VDOP GPS / GLONASS Satellites Epoch
Tape Dimensions Tab	Start Point End Point # Point To Distance Note	Icon Date
DL Obs Tab, Left Panel	# Note Name of DL job	Icon From / To Date Distance Balance
DL Obs Tab, Right Panel	Point Note Auto Reject Vertical Offset	# Elevation Instrument Elevation Icon BS / SS / FS Distance Standard Deviations Date Adjustment Status Height Residual Job Source

Table 5-1. Tabular View Editable Fields (Continued)

	Editable Fields	Static Fields
Linework Tab, Left Panel	Layer Color Line Style Length Line Width	Icon Type Code String
Linework Tab, Right Panel	Order	Icon Point Control Code 2 Control Code
Images Tab	n/a	n/a
Surfaces Tab	Name Comments Layer Focus point	Icon Number of Points Number of Triangles Min/Max Northing Min/Max Easting Min/Max Elevation Need Update Auto Update
Stereopairs Tab	n/a	n/a
Scan Session Tab, Left Panel	Name	Icon Instrument Point
Roads Tab, Left Panel	List of roads	n/a
Roads Tab, Right Panel Horizontal alignment for Line	Order Azimuth Length Tangential to prev	Icon Type End Sta/Chainage End Northing End Easting End Azimuth

Table 5-1. Tabular View Editable Fields (Continued)

	Editable Fields	Static Fields
Roads Tab, Right Panel Horizontal alignment for Curve	Order Azimuth Length Turn Tangential to prev Start Radius Delta Chord Tangent Mid Ord External Start Deg Chord Start Deg Curve	Icon Type End Radius End Sta/Chainage End Northing End Easting End Azimuth End Deg Chord End Deg Curve
Roads Tab, Right Panel Horizontal alignment for Spiral	Order Azimuth Length Turn Start Radius End Radius Tangential to prev Spiral Dir Spiral Const Start Deg Chord Start Deg Curve End Deg Chord End Deg Curve	Icon Type End Sta/Chainage End Northing End Easting End Azimuth
Roads Tab, Right Panel Horizontal alignment for Intersection	Order Start Radius Northing Easting Spiral 1 Len Spiral 2 Len Intersection Pt Spiral Const 1 Spiral Const 2 Start Deg Curve	Icon Type Length Azimuth Tangential to prev End Sta/Chainage End Radius End Northing End Easting End Azimuth

Table 5-1. Tabular View Editable Fields (Continued)

	Editable Fields	Static Fields
Roads Tab, Right Panel Vertical alignment for Grade	Order Length Start Grade	Icon Type End Sta/Chainage End Grade Elevation Radius
Roads Tab, Right Panel Vertical alignment for Parabola	Order Length Start Grade / End Grade	Icon Type End Sta/Chainage Elevation Radius
Roads Tab, Right Panel Vertical alignment for Parabola Long Section	Length End Sta/Chainage Elevation	Icon Type Order Start Grade / End Grade Radius
Roads Tab, Right Panel Vertical alignment for Circular Arc	Order Radius Start Grade / End Grade	Icon Type Order Start Grade / End Grade
Roads Tab, Right Panel Vertical alignment for Circular Arc Long Section	Length End Sta/Chainage Elevation Radius	Icon Type Order Start Grade / End Grade
Roads Tab, Right Panel X-Section	End Sta/Chainage Side Template	Icon
X-Section Templates Tab, Left Panel	Name Cut Slope (1:n) Fill Slope (1:n)	Icon
X-Section Templates Tab, Right Panel	Order Code Hz. Dist / V.Dist Grade	Icon Hz. Offset from CL Vz. Offset from CL

a. For Control Code, the Code column must contain data to be editable.
b. For String, the Code column must contain data to be editable.

Editing Antenna Parameters

Antenna parameters are one of the most commonly edited data fields. See Table 5-1 on page 5-2 for a list of editable cells.

The *Custom Antenna* list allows you to add user-defined antenna types to the antennas list.

Option 1: Edit in the Tabular View

1. In the column of the property you want to change, select the desired occupation.

   To select GPS occupations with certain parameters, use the ***Select GPS Occupations*** dialog box (see “Selecting GPS Occupations” on page 4-50 for details).
2. Click a highlighted cell (or press **F2**) and edit the desired information (Figure 5-2).
   - For *Antenna Type*, select a different antenna from the drop-down list.
   - For *Antenna Height*, type a new height for the antenna.
   - For *Antenna Height Method*, select the method from the drop-down list.

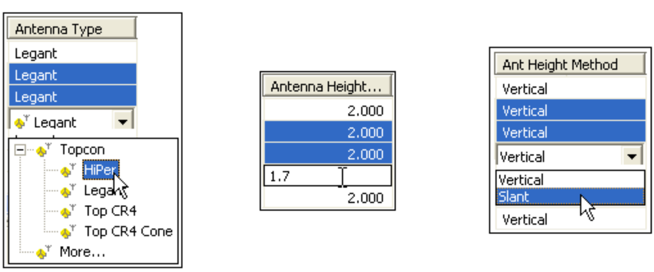


Figure 5-2. Editable Antenna Cells in Tabular View

3. After editing information in the column, click outside the cell or press **Enter** to save the new information.
4. Repeat steps 2 and 3 for each column until done (Figure 5-3 on page 5-8).

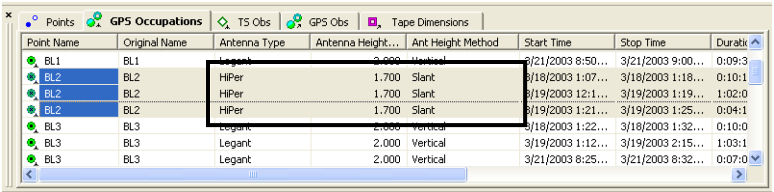


Figure 5-3. Edited Antenna Parameters

Option 2: Edit in the Properties Dialog Box

1. Select the desired occupations.

   To select GPS occupations with certain parameters, use the ***Select GPS Occupations*** dialog box (see "Selecting GPS Occupations" on page 4-50 for details).

2. Right-click the selected occupations and click **Properties** on the pop-up menu, or click **Edit ▸ Properties** (Figure 5-4).

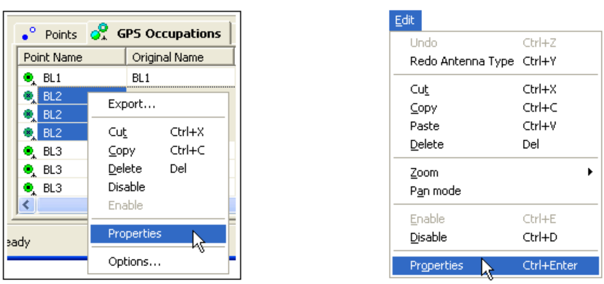


Figure 5-4. Ways to Open the Properties Dialog Box

3. On the *Antenna* tab and change the *Antenna Type*, *Antenna Height*, and *Ant Height Method* as needed (Figure 5-5 on page 5-9).

4. Click **OK** to save the edited information, which can be viewed on the *GPS Occupations* tab (Figure 5-3).

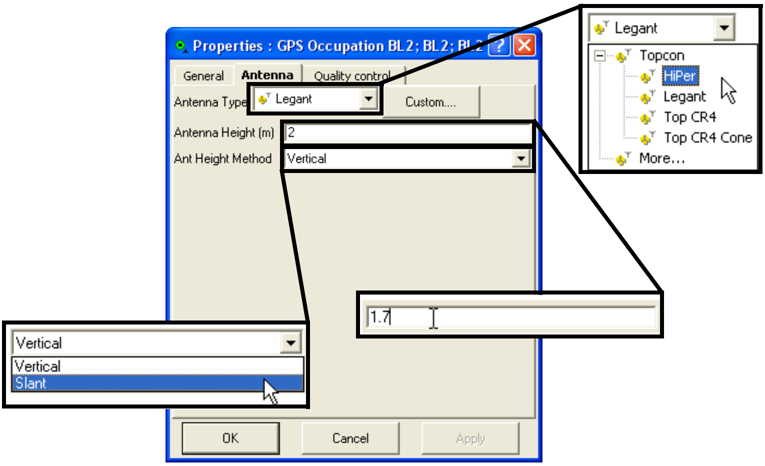


Figure 5-5. Enter New Parameters

Editing Antenna Offsets

1. To edit offsets, right-click anywhere within the table and click **Options** on the pop-up menu (Figure 5-6).
2. On the ***Options*** dialog box, move the offset selections to the *Selected columns* area (Figure 5-6). Click **OK**.

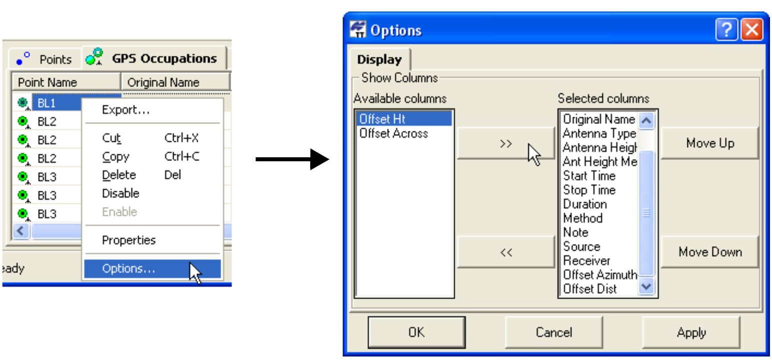


Figure 5-6. View Options

3. Right-click on the *GPS Occupations* table and click **Properties** on the pop-up menu. Click the **Offsets** tab to edit antenna offsets for the selected occupation (Figure 5-7 on page 5-10).

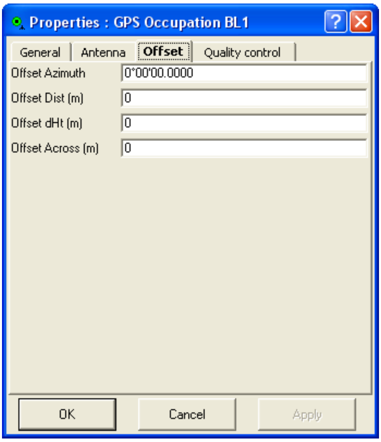


Figure 5-7. GPS Occupations Properties – Offset Tab

4. Click **Apply** to set the information, or **OK** to set the information and close the dialog box.

Adding Antennas Using the Custom Antenna List

Each antenna type has unique phase center parameters obtained through calibration and are stored in an ANTENNA.XML file. These parameters are not viewable or editable. However, the ***Custom Antennas List*** adds user-defined antenna types to the antennas list, as well as displays, edits, and removes antennas from the antenna list.

1. To add a new antenna type to the antenna list or edit a current antenna type, right-click a GPS occupation and click **Properties** on the pop-up menu (Figure 5-8).

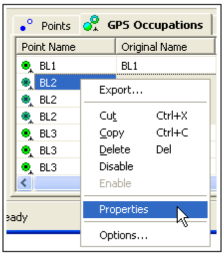


Figure 5-8. Open Properties

2. On the *Antenna* tab, click **Custom** (Figure 5-9) to display the ***Custom Antenna List***.

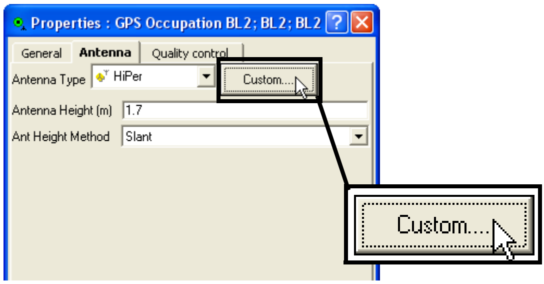


Figure 5-9. Custom Antennas List

3. Click **Add** (Figure 5-10). To remove an antenna, click on the antenna's row and click **Remove**.

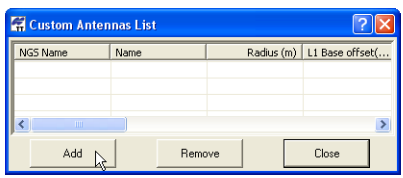


Figure 5-10. New Custom Antenna

4. On the *General* tab, edit the *NGS Name*, *Name*, *Manufacturer*, and *Note* fields (Figure 5-11). Then click **Apply** to save the information.
5. Click the **Parameters** tab and enter the *Radius*, *offsets*, and *Measured Height Method* for the antenna (Figure 5-11).

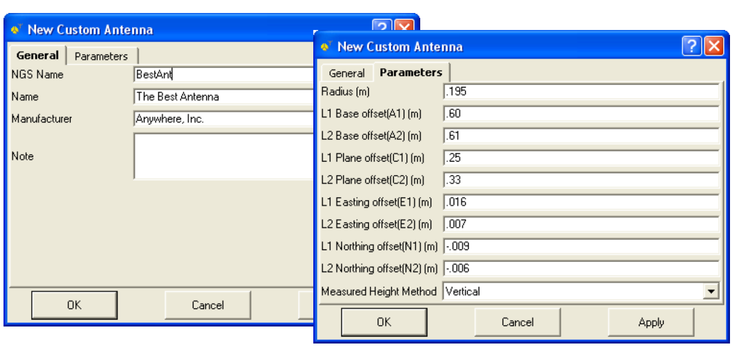


Figure 5-11. New Custom Antennas – General and Parameters Tabs

6. Click the PCV tab and enter information on the antenna phase center variation.

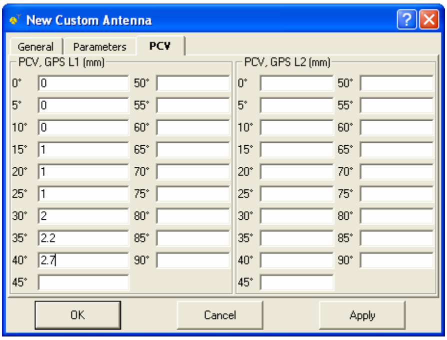


Figure 5-12. New Custom Antenna – Phase Center Variation Tab

7. Click **OK** on the ***Properties*** dialog box.

Editing Points

Common edits for points include name changes, merging points, updating Rover point names, and manually adding a point. Editing a point in one view (Tabular, Map) or dialog box (Properties) will apply the same change to all views, tabs, and dialog boxes. See Table 5-1 on page 5-2 for a list of editable cells.

Option 1: Edit in the Tabular View

Point names can be edited on the *Points*, *GPS Occupations*, and *TS Obs* tabs. However, there are significant differences when editing point names on the different tabs:

- When editing point names in the *Points* tab, only the name is edited and the new name will be reflected in all views.
- When editing the point name in any of the observation or occupation tabs, a different point is assigned to that occupation.
- When changing the point name for occupations or observations, a copy of the existing point (but with a new name) is created, but if

there are no more occupations on the original point, it will be removed.

1. Click a highlighted (or press **F2**) point name cell (Figure 5-13).

   To select data with certain parameters, use the appropriate dialog box (see “Selecting Data” on page 4-47 for details).

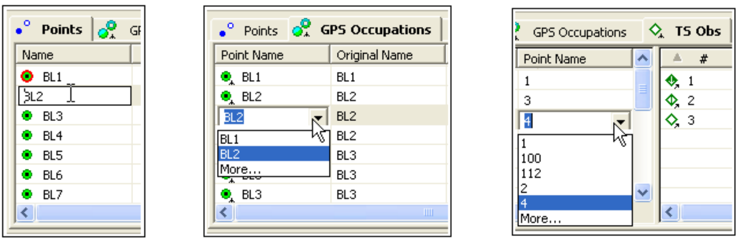


Figure 5-13. Select Point Name to Edit

2. Select or type the new point name. Click outside the cell or press **Enter** to save the new information (Figure 5-14).

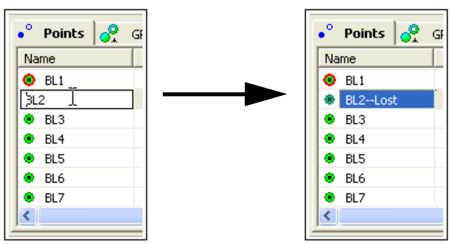


Figure 5-14. Edit Point Name

Option 2: Edit in the Properties Dialog Box

Point names can be edited on the Points, GPS Occupations, and TS Occupations ***Properties*** dialog boxes.

1. Right-click a point or GPS/TS occupation and click **Properties** on the pop-up menu. Or select the data and click **Edit ▸ Properties**.

   To select data with certain parameters, use the appropriate dialog box (see “Selecting Data” on page 4-47 for details).

2. On the ***Properties*** dialog box and the *General* tab, edit the point name and click **OK** to save the information (Figure 5-15).

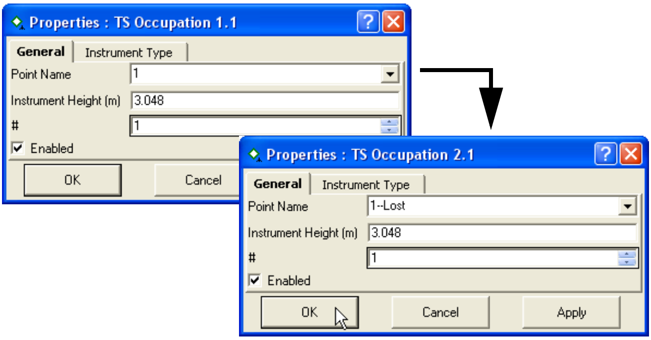


Figure 5-15. Edit Point Name

Merging Points

Merging two points will cause the adjustment, processing, and quality tests, etc. functions to treat the two points as one physical point, with certain consequences.

1. In the *Points* tab, select one of two points to merge.
2. Press **F2** and type the name of the second point in the text entry field.
3. Press **Enter** to merge the two points.

Editing Rover Point Names for GPS Observations

Often, the surveying software used during RTK surveys will start the numbering of autotopo points using a default number scheme. When importing two different jobs with autotopo observations that use the default number scheme, physically different autotopo points may have the same name.

Because Topcon Tools does not allow different points within 30m of each other to have the same name, the points may be merged upon import. To solve this, manually edit the "Point to" names in the *GPS Obs* tab. The "Auto-resolve point name collisions during import" feature will solve this for points more than 30m by adding the suffix "DUP" to the imported point.

1. In the *GPS Obs* tab, select the "Point to" name to edit.
2. Press **F2** and type a new name for the observation.
3. Press **Enter**.
4. Repeat these steps for each applicable observation.

Editing Linework

Topcon Tools allows the user to edit a linework using the Cad View and *Linework* tab. To edit the linework of the current job, click **View ▸ Cad View** and select *Linework* tab. The user can do the following:

- add a new point
- delete an existing point
- create a new line and append points to the line
- change the code and string of the line
- insert points to the line
- plot arcs
- plot rectangles
- plot closed objects
- delete any line

Adding a New Point

This process adds a point in the CAD, Map View, and Points tab.

1. To add a point do one of the following:
   - Click **Edit ▸ Add ▸ Point**. Using the cursor, click at the needed place in CAD View.
   - Press *Alt* and click at the needed place in CAD View.
2. On the *Add Point* dialog box (Figure 5-16 on page 5-16) the user can correct the point name (by default "User n" where n-number), the coordinates in the coordinate system set for the current job, enter a code, string, control codes, note and set a control. Click **OK**.

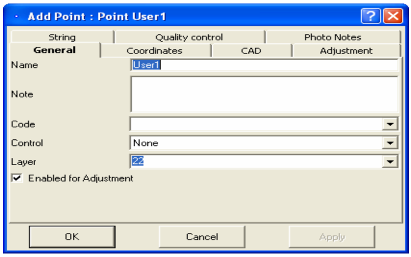


Figure 5-16. Add Point Dialog Box

To set an active layer for the job, open the Layer combo box in the Toolbar and select the layer. In this case, any point, created will have the same plotting style as defined by the active layer (Figure 5-17).

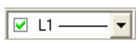


Figure 5-17. Active Layer for Point

To set the layer for a point, select the layer using the *General* tab in the ***Add Point*** dialog box (Figure 5-17). The attributes (color and point style) for the selected layer will be assigned to this point.

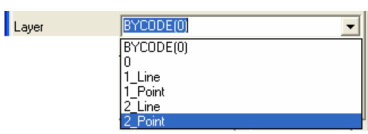


Figure 5-18. Select Layer for Point

To apply codes (instead of layers) for a point, select the desired code in the *Code* field and set “BYCODE” in the *Layer* field. The attributes (color and point style) for the layer will be assigned to this point. Figure 5-19 on page 5-17 shows an example of a point with code “101” in the *Cad View*. For this point, the layer was set to “BYCODE (For Points)” and this code uses the layer “For Points”.

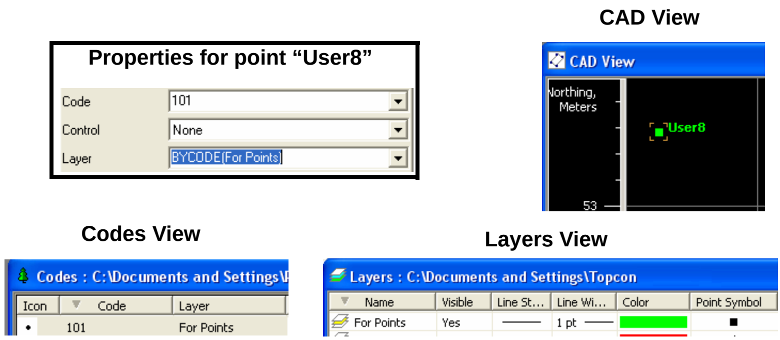


Figure 5-19. Setting Code for Point and Viewing Point

- If the point has multiple codes, setting Layer to "BYCODE" forces it to belong to multiple layers.
- If the point has no code, setting Layer to "BYCODE" forces the point to belong to Layer 0 (zero).

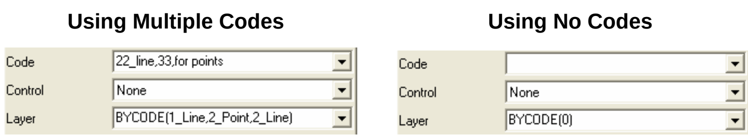


Figure 5-20. Layer Determination when Applying Codes

The Map View, the CAD View, and the *Points* tab displays the created point(s) (Figure 5-21).

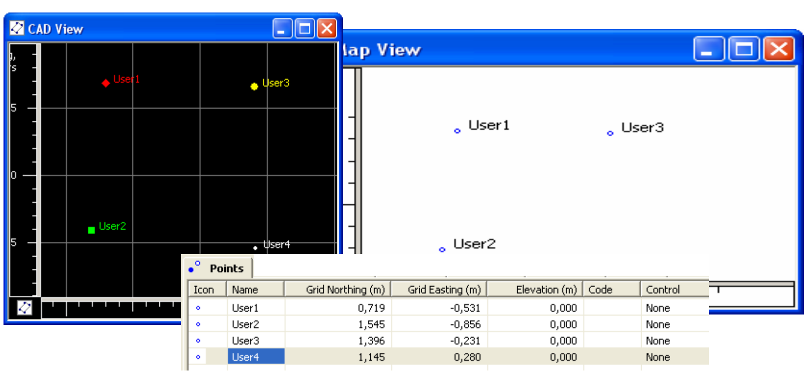


Figure 5-21. Created Points in CAD View, Map View and Points Tab

3. To deactivate the *adding point* mode, click **Edit ▸ Add ▸ Point.**

Deleting a Point

To delete a point from the current job, right-click the desired point in the CAD View/Map View/Points tab and click **Delete**.

Adding a Line

When creating a new line, the user has to select the desired layer. To set the layer for a new linework, select any layer from the list of existing layers in the Toolbar (Layer combo box). The plotting styles of the new line will be assigned by the active layer.

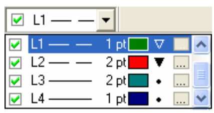


Figure 5-22. Setting Layer for Line

There are three following ways to plot a line:

- between two existing points. To plot a line, click **Edit ▸ Add ▸ Line** (or click the button *Add Line* in the Toolbar), click the '*append point*' cursor on the first point, then click on the second point. The line will be created between these points.

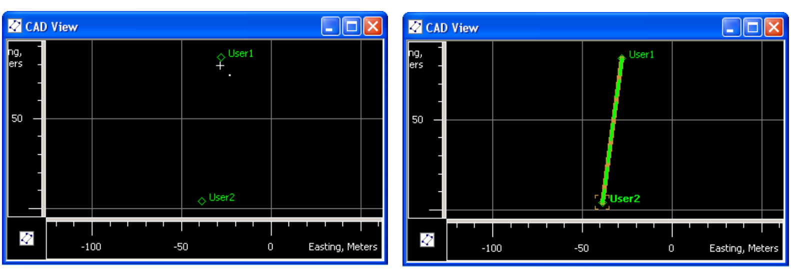


Figure 5-23. Plot A Line Between Two Existing Points

In this case, the right panel of the *Linework* tab displays the name of vertex line:

Icon	Order	Point
•	1	User1
•	2	User2

- between selecting points. Topcon Tools allows connecting the selected points into the line. To do it, click the button *Add Line* in the Toolbar and select the desired points in the CAD View or

Points tab. Then the line will be created, that connects the points in the order of point numbers/names.

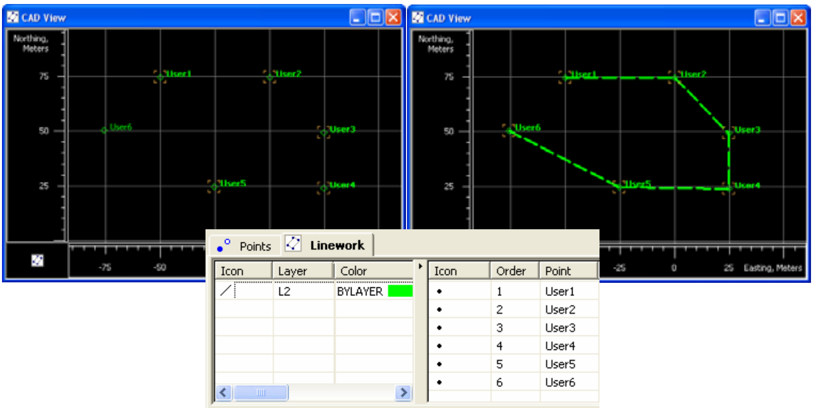


Figure 5-24. Connecting of Selected Points to Line

- without points. To do it, click the button *Add Line* in the Toolbar and click any area within the CAD view. Repeat this step as needed (Figure 5-25). Vertex of the line will be appended to the line. These vertexes have no name, and the *Points* tab does not display coordinates for it. The right panel of the *Linework* tab displays only icon and order for the vertexes (Figure 5-25).

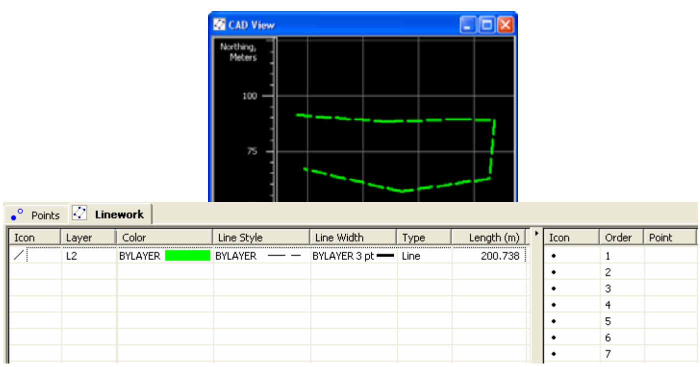


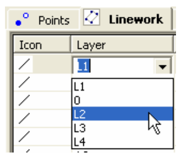
Figure 5-25. Plotting Line in the Cad View

Edit a Created Line

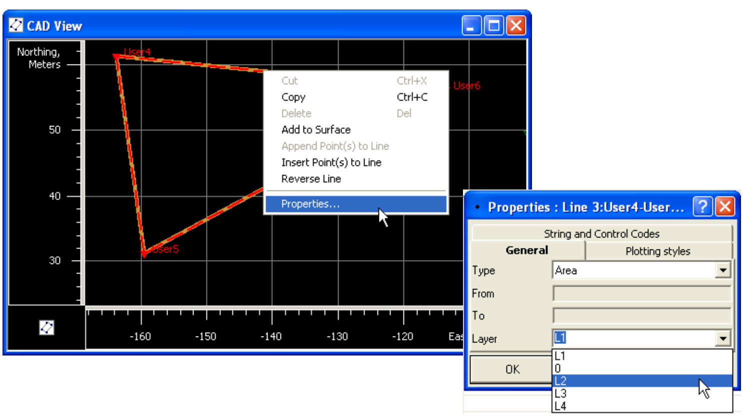
If the line is created in Topcon Tools, only the corresponding layer defines the plotting style for the line. To edit the line parameters, edit either the layer parameters or set other layer.

To change the layer for existing linework, do one the following:

- double-click in Layer column and select a different layer from the drop-down list in the left panel of the *Linework* tab.

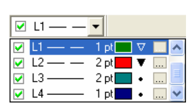


- right click on the line (or selected lines) in the CAD View and select the *Properties* from pop-up menu. Select a different layer from the drop-down list in the Properties window.



To change the layer parameters, do one the following:

- double-click in Layer combo box in the Toolbar, select the desired layer from the drop-down and click .



- Click **View ▸ Layers** and right-click the desired layer and click **Properties** on the pop-up menu.

Edit the layer's properties on the *General* and *Plotting styles* and *Area* tabs of the *Properties* window for the layer (Figure 5-26).

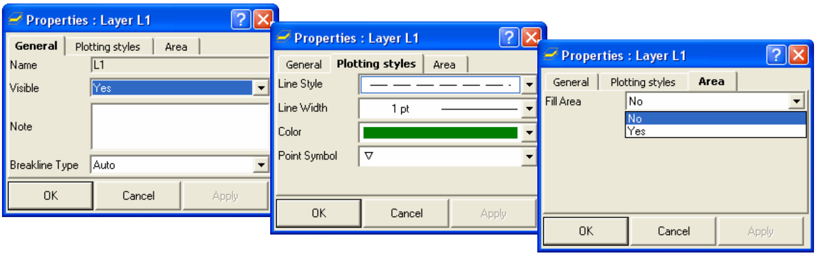


Figure 5-26. Editing Layer Parameters

If the line is imported from a TopSURV PC job, the code and the string define the plotting style for the line. To edit line parameters, edit code parameters. Right-click on the line (or selected lines) in the CAD View and select *Properties* from pop-up menu. Select a different code or a layer from the *Layer* drop-down list in the.

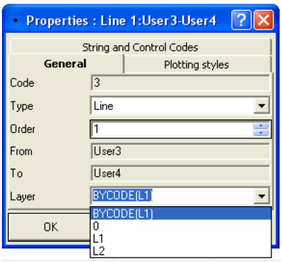


Figure 5-27. Edit Line Properties

The *Linework* tab displays all lines of the current job. To edit the plotting style of an existing line, select a line and click the desired parameter to edit. Select the new parameter and press *Enter* or click outside the cell to apply the change. The Icon column is static and cannot be edited.

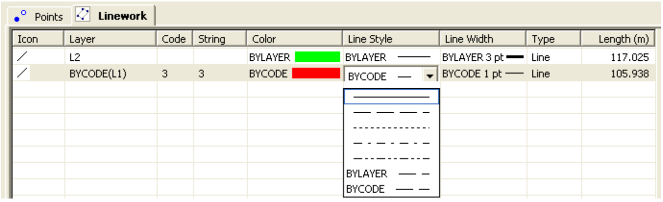


Figure 5-28. Editing Line Parameters in the Left panel of Linework Tab

Appending Points to a Line

The append points function adds points to the selected line. This function is activated after selecting of a existed line in CAD View.

Option 1: Selecting the Line, then Selecting the Point(s)

1. Select the desired line or create a new line.
2. Click **Edit ▸ Add ▸ Append Points to Line**. The pointer will change after *append points* mode has become active.
3. Click a point on the CAD view to append it to the line. The point will display in the right panel of the *Linework* tab (Figure 5-29) for the line selected in the left panel.

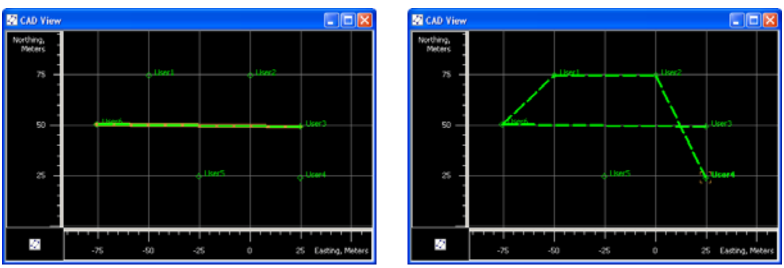


Figure 5-29. Appends Points to Line

4. Click another point to append to the line. The vertexes of the line will display in the right panel of the *Linework* tab (Figure 5-29). Repeat step 4 to append more points to the line. To create a closed figure append the finish point to the last segment and the start point of the first segment to the line.
5. When finished, click **Edit ▸ Add ▸ Append Points to Line** to deactivate the ‘append point’ mode. Save the job.

Option 2: Selecting the Point, then Selecting the Line

1. Right-click the desired point in the Cad View and click **Append Points to Line** on the pop-up menu (Figure 5-30).

   The pointer will change to indicate that 'append points' mode has been activated.

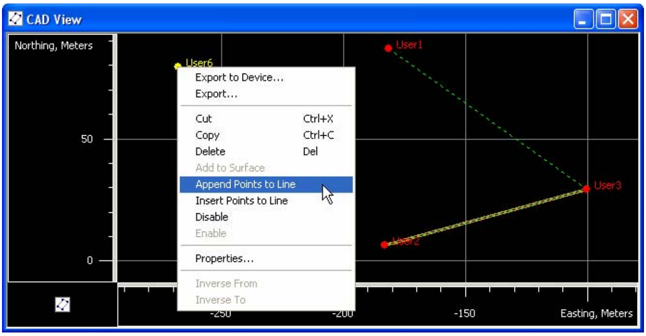


Figure 5-30. Appending Points Using the Pop-up Menu

2. Click any line on the CAD view to automatically append the selected point to (Figure 5-31). The *Linework* tab display a new vertex of the line

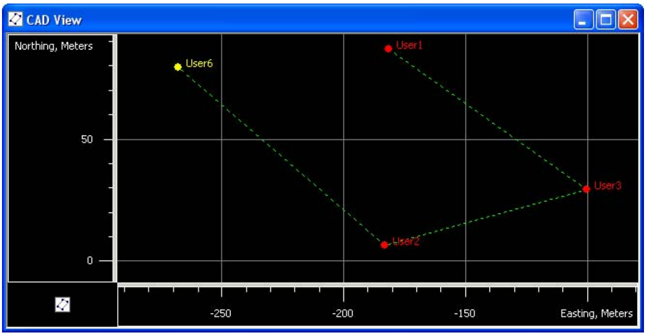


Figure 5-31. Example: Appending Points to the Line

Inserting Points to a Line

Inserting points to a line will add a point to the selected segment. When inserting a point to a segment, Topcon Tools creates a new point, deletes the selected segment between the start point and end point, and creates two new segments (from the start point to the new point and from the new point to the end point). To insert points to a line, select the desired segment in the Cad View or in the right panel of the *Linework* tab and enable *insert points to line* mode. The cursor will change after the *insert points to line* mode has become active. Two options are available for inserting points to a line.

Option 1: Selecting the Line, then Inserting (Creating) the Point

1. Select the desired line segment in the Cad View or the corresponding vertexes in the right panel of the *Linework* tab.
2. Click **Edit ▸ Add ▸ Insert Points to Line**. The pointer will change to indicate that the 'insert point' mode has been activated.
3. Click at the desired place in the CAD view. A new point will be created, the selected line will be deleted and three points (the start and end point of selected line and the new point) will be appended to the line (Figure 5-32).

   The new (created) point will not have a name and will not display on the *Points* tab.

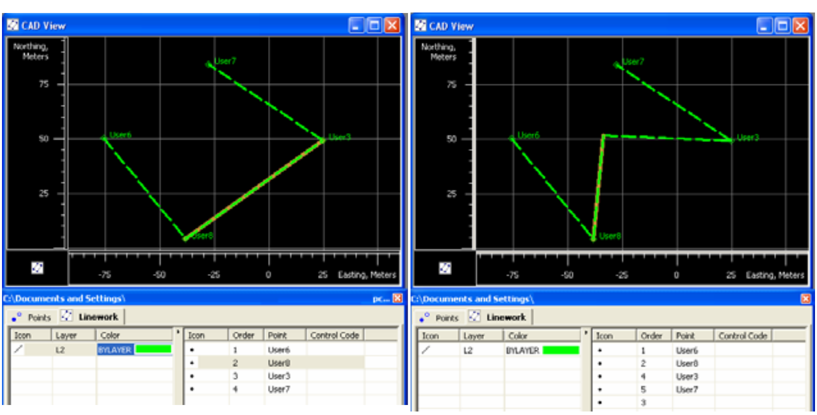


Figure 5-32. Inserting a New Point to the Selected Line

4. To edit the point name and view/edit the coordinates of the new (created) point, double click on this vertex in the right panel of the Linework tab and type in a name.

Icon	Order	Point
•	1	User6
•	2	User8
•	4	User3
•	5	User7
•	3	

Figure 5-33. Editing Name's Inserting point

5. When finished, click **Edit ▸ Add ▸ Insert Points to Line** to deactivate the 'insert point' mode. Save the job.

Option 2: Selecting the Point, then Selecting the Line

1. Right-click an existing point in the Cad View and click **Insert Points to Line** on the pop-up menu (Figure 5-34).

   The pointer will change to 'insert point' mode.

2. Click any line segment on the CAD view. The point will be automatically inserted.

   The Cad View and *Linework* tab display new line segments from the start point of the selected segment to this point, and from this point to the end point of the selected segment (Figure 5-34).

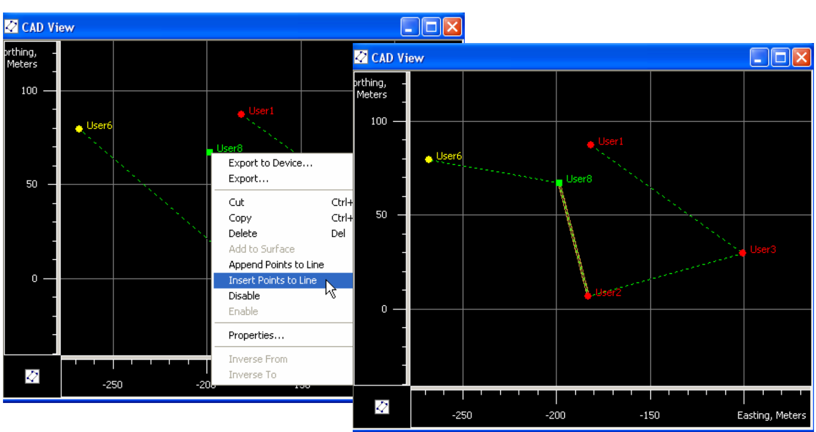


Figure 5-34. Example of Inserting Points to the Line

Deleting a Line

To delete a linework from the current job, right-click the desired line in the left panel of the *Linework* tab and click **Delete** on the pop-up menu. This function does not delete the points.

Deleting a Vertex from a Line

To delete a vertex from the linework, right-click the desired vertex in the right panel of the *Linework* tab and click **Delete** (Figure 5-35).

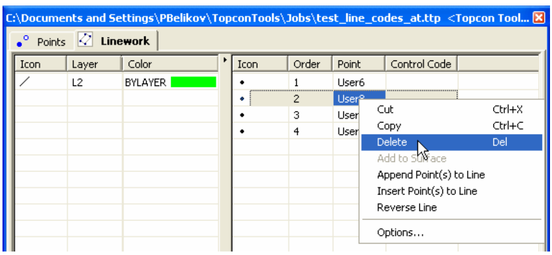


Figure 5-35. Deleting of the Vertex From the Line

This function does not delete the points, but only disconnects the start point of the selected segment from the line and appends the end point of the selected segment and the start point of the last segment to the line (Figure 5-36).

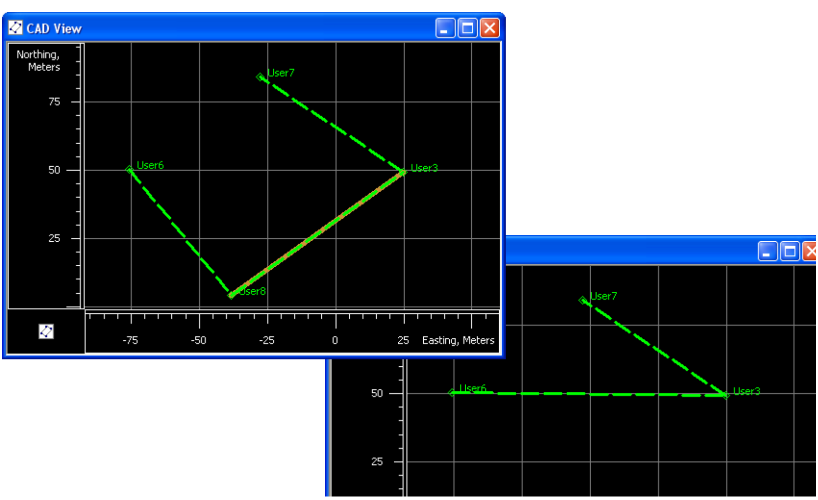


Figure 5-36. Deleting the Segment From the Line

Using Control Codes to Create an Arc

Using control codes, an arc can be created using linear segments and two or three points. To use control codes, enable the *Display String and Control Code* setting in Job Configuration (click **Job ▸ Job Configuration** and in the Display pane, click the String tab).

Creating a Two-Point Arc

A two-point arc uses three points and two line segments. One point is designated the "arc start" and one point is designated the "arc end"; the line segment between these two points becomes the arc. The third point and other line segment are the tangent to the arc. This tangent line determines the parameters of the arc (Figure 5-37).

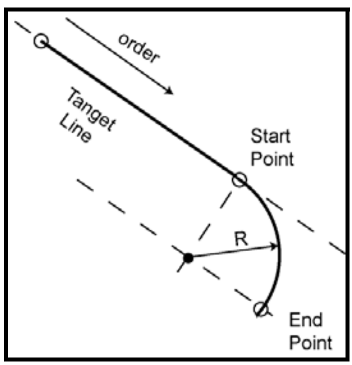


Figure 5-37. Tangent Line Determine Parameters of Arc

1. If needed, create the line segment that will become the arc. Use the 'append point' feature as described in "Appending Points to a Line" on page 5-22 to add points to the line (Figure 5-38 on page 5-28).
2. Select the new line segment. In this example, the 'User2' to 'User3' line.

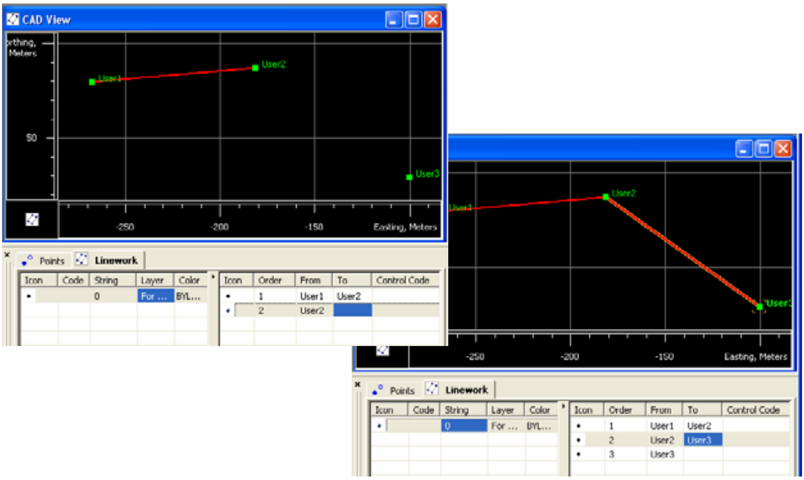


Figure 5-38. Create Line Segments for the Arc

3. In the right panel of the *Linework* tab, click the Control Code cell for the line segment and click *Arc Start* (Figure 5-39). Press **Enter** or click outside the cell.
4. Click the Control Code cell for the last point in the line and click *Arc End* (Figure 5-39). Press **Enter** or click outside the cell.

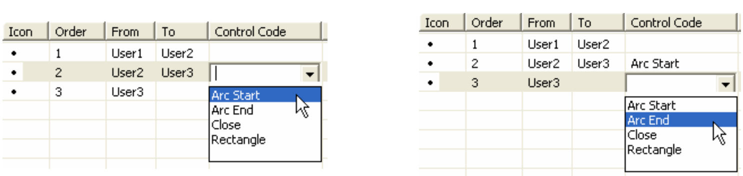


Figure 5-39. Selecting Control Code for Start and End Point of the Arc

TIP

Use the Properties dialog box to edit the control codes for the line (right-click the line and click Properties) or point (right-click the point and click Properties).

The Cad View updates and displays the created arc (Figure 5-40).

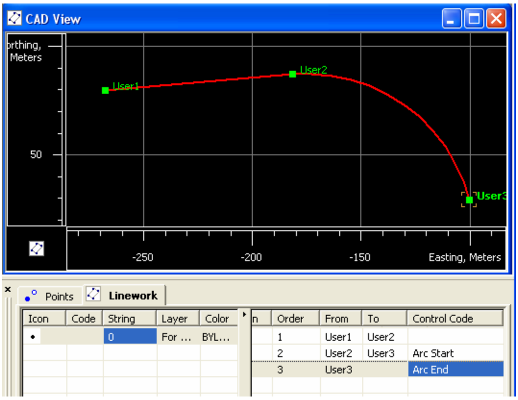


Figure 5-40. Two-point Arc Linework in Cad View and Linework Tab

Creating a Three-Point Arc

A three-point arc uses three points and two line segments to create an arc. One point is designated the “arc start”, one point is designated the center point, and one point is designated the “arc end”. The two line segments become part of the arc.

1. If needed, create the line segments that will become the arc. Use the ‘append point’ feature as described in “Appending Points to a Line” on page 5-22 to add points to the line (Figure 5-41).

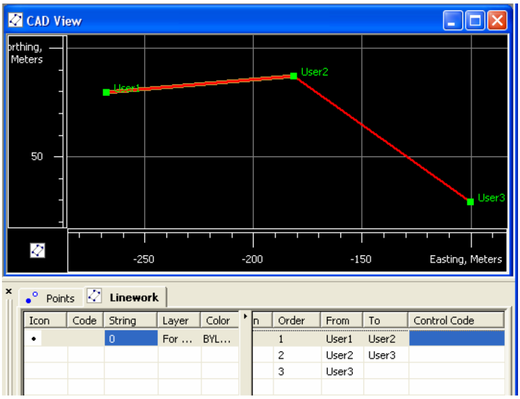


Figure 5-41. Create Line Segments for the Arc

2. Select the new line segment. In this example, the ‘User2’ to ‘User3’ line.
3. In the right panel of the *Linework* tab, click the Control Code cell for the first point in the line and click *Arc Start*. Press **Enter** or click outside the cell.
4. Click the Control Code cell for the last point in the arc and click *Arc End* (Figure 5-39). Press **Enter** or click outside the cell.

TIP

Use the Properties dialog box to edit the control codes for the line (right-click the line and click Properties) or point (right-click the point and click Properties).

The Cad View updates and displays the created arc (Figure 5-42).

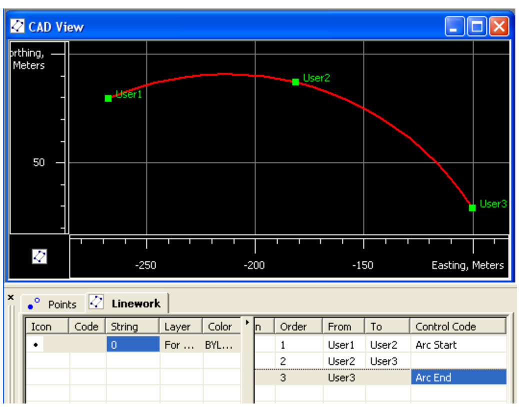


Figure 5-42. Three-point Arc Linework in Cad View and Linework Tab

Using Control Codes to Create a Rectangle

Using control codes, a rectangle can be created from three points. These three points are the first three vertices of a rectangle (parallelogram). To use control codes, enable the *Display String and Control Code* setting in Job Configuration (click **Job ▸ Job Configuration** and in the Display pane, click the String tab).

When using the rectangle control code, three points and two line segments are required. Applying this control code to the third point of a line automatically creates an extrapolated fourth point, creating a rectangle. The positions of the first and third points determine the diagonal of the parallelogram. This feature applies to lines with only three points.

1. If needed, create the line segments and points that will become the rectangle. Use the 'append point' feature as described in "Appending Points to a Line" on page 5-22 to add points and line segments (Figure 5-43).

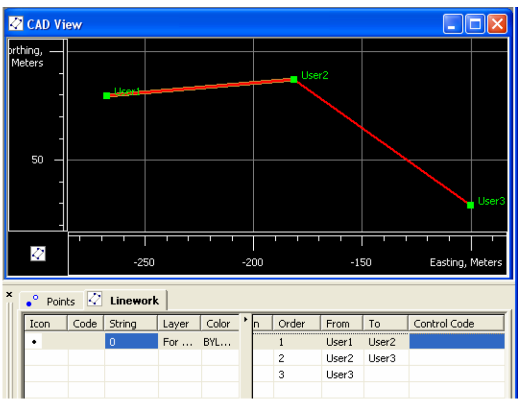


Figure 5-43. Create Line Segments for the Rectangle

2. In the right panel of the Linework tab, right-click the first or last point of the line and click **Properties**.
3. Select Rectangle as the control code for the point (Figure 5-44) and click **OK**.

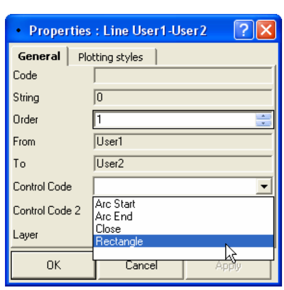


Figure 5-44. Selecting Control Code for Start Point of the Rectangle

The fourth vertex (point) of the rectangle is calculated and appended to the line. The Cad View updates and displays the created rectangle (Figure 5-45).

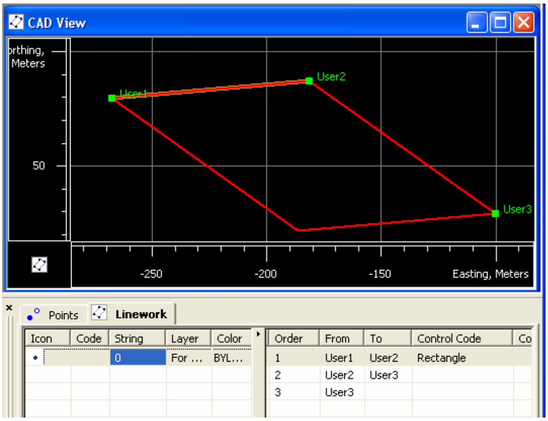


Figure 5-45. Rectangle Linework in Cad View

Using Control Codes to Connect Points in a Polyline

Using control codes, a rectangle can be created from three points. These three points are the first three vertices of a rectangle (parallelogram). To use control codes, enable the *Display String and Control Code* setting in Job Configuration (click **Job ▸ Job Configuration** and in the Display pane, click the String tab).

When using the connect control code, three or more points and two or more line segments are required. Applying this control code to the last point of a line automatically connects that point to the first point, creating a closed polygon.

1. If needed, create the line segments and points that will become the polygon. Use the ‘append point’ feature as described in “Appending Points to a Line” on page 5-22 to add points and line segments (Figure 5-46 on page 5-33).

Figure 5-46. Create Line Segments for the Polygon

2. In the right panel of the Linework tab, right-click the last (end) point of the line and click **Properties**.
3. Select Close as the control code for the point and click **OK**.

   A new line segments is created, with the first and last points automatically appended to this line. The Cad View updates and displays the created polygon (Figure 5-47).

Figure 5-47. Polygon Linework in Cad View

Editing GPS Occupation Methods

The occupation method (static or kinematic) for GPS occupations is one of the most commonly edited data fields when this field is mistakenly marked with the wrong method. See Table 5-1 on page 5-2 for a list of editable cells.

To change from static to kinematic, make the point name field for that occupation blank (Figure 5-48).

1. Highlight the GPS occupation point name to edit and press **F2**.
2. Press **Delete** to remove the point name and press **Enter**.

The static occupation is now a kinematic occupation (in the example below, also notice the change in icon next to the point name).

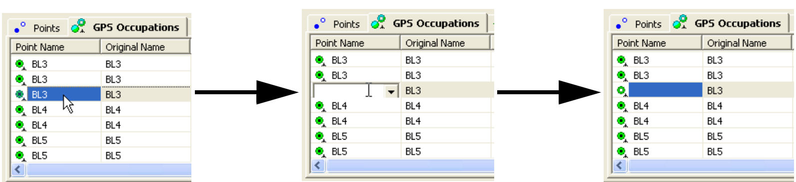


Figure 5-48. Changing GPS Occupation from Static to Kinematic

To change from kinematic to static, enter a name in the point name field for that occupation (Figure 5-49).

1. Highlight the GPS occupation point name to edit and press **F2**.
2. Select or type a name for the occupation and press **Enter**.

The kinematic occupation is now a static occupation (in the example below, also notice the change in icon next to the point name).

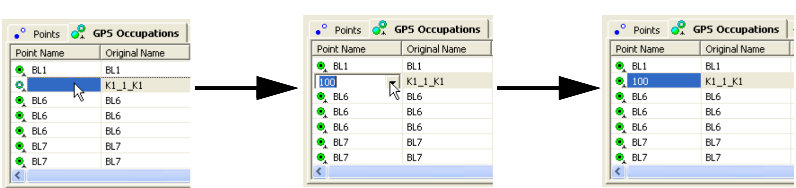


Figure 5-49. Changing GPS Occupation from Kinematic to Static

Note that Topcon Tools automatically determines whether the particular occupation is a static/kinematic or stop-and-go occupation using the following rule: if a chain of occupations have at least two static and two kinematic occupations, then all occupations are stop-and-go.

Editing Codes in the Codes View

Codes provide an abbreviated description of the feature being measured to. Attributes provide further details on the feature (code).

When creating a new code, selecting a layer will apply that layer's plotting styles to the code. If a layer is not selected for the code, the active layer will be automatically used for the code. For Topcon Tools jobs, this layer will be set for all codes and imported files without layer support.

NOTICE

If used in a job, codes and attributes cannot be edited.

Adding a Code

With the Codes view open (**View ▸ Codes**) and selected, right-click within the left panel and click **New Code** on the pop-up menu (Figure 5-50). When creating a new code, the user can select a layer.

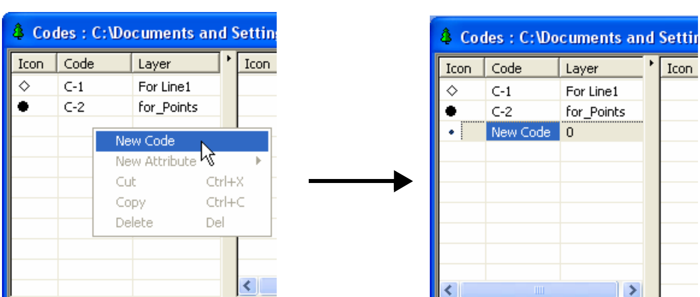


Figure 5-50. Add New Code

Editing a Code

If used in a job, codes cannot be edited. To remove a code from being used in a job, see “Editing Codes Used for Points” on page 5-38.

1. Right-click the selected code and click **Properties** on the pop-up menu (Figure 5-51).
2. On the *General* tab, edit the code’s name and select the layer (Figure 5-51).

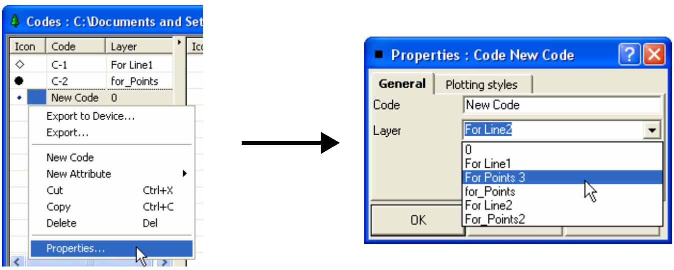


Figure 5-51. View Code Properties and Edit Name

3. On the *Plotting styles* tab, select the line style, line width, color and point symbol. The plotting style can be edited for any code with or without a layer (Figure 5-52).

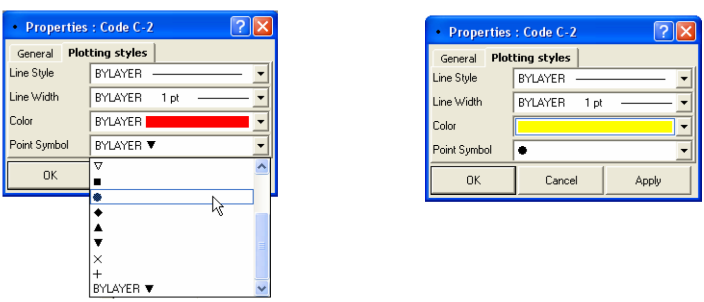


Figure 5-52. Select Outline Properties

Adding and Editing an Attribute

If used in a job, attributes cannot be added to a code. To remove a code from being used in a job, see “Editing Codes Used for Points” on page 5-38.

1. Right-click a code to add an attribute to and click **New Attribute** then select the attribute type on the pop-up menu (Figure 5-53).

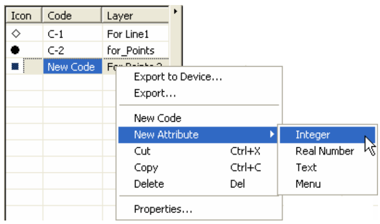


Figure 5-53. Select Attribute to Add

2. Select or enter the desired attribute parameters (Table 5-2).

Table 5-2. Properties for Code Attributes

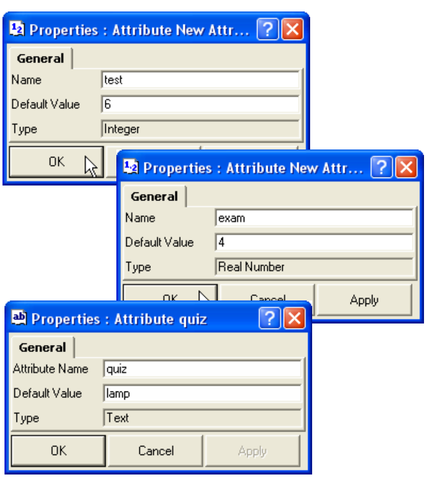
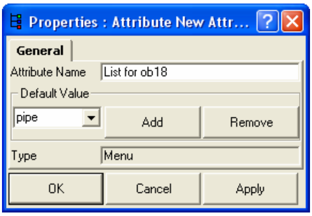
<table>
<tr><th>For this type of Attribute...</th><th>Edit these properties...</th></tr>
<tr><td>Integer, Real Number, and Text attributes (Figure 5-54)


Figure 5-54. Attribute Properties</td><td>• Name – type a name for the attribute
• Default Value – type a default value for the attribute</td></tr>
</table>

Table 5-2. Properties for Code Attributes (Continued)

For this type of Attribute...	Edit these properties...
Menu (Figure 5-55)  **Figure 5-55. Properties for Menu Attribute**	• Name – type a name for the attribute • Default Value – type a default value for the attribute or select one from the drop-down list – Click **Add** to add the value to the list. – Click **Remove** to delete the selected value from the list.

3. Click **Apply** to set data without closing; click **OK** to set data and close the dialog box. The right panel of the *Codes* view displays the list of the created attributes for the code selected in the left panel (Figure 5-56).

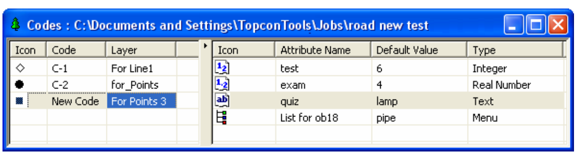


Figure 5-56. Codes View

Editing Codes Used for Points

Use this procedure to apply codes to points or remove codes from a point for processing or adjustment.

1. Right-click the desired point and click **Properties** on the pop-up menu (Figure 5-57).

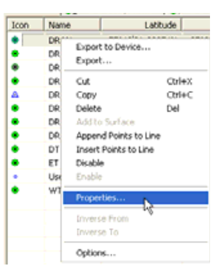


Figure 5-57. View Point Properties

2. Using the *General* tab, select a code and a layer (Figure 5-58). The plotting style for this code will be taken from the layer parameters.
3. Click the *CAD* tab to view currently used codes, add a code to the point, delete a code from being used in the point, or change the point symbol and color used for the point. Any attributes associated with the codes display in the right panel.
4. To add a code to the point, right-click in the left panel and click **New Code**. Select the code from the drop-down list and click outside the cell or press **Enter** (Figure 5-58). More than one code can be added to the point; codes will display in the *Points* tab.

   Note: typing a new code in the text entry box will add the code the job file and point. Use the *Codes* view to apply attributes.
5. To edit menu attributes associated with a code, select a new value from the Value column drop-down list.

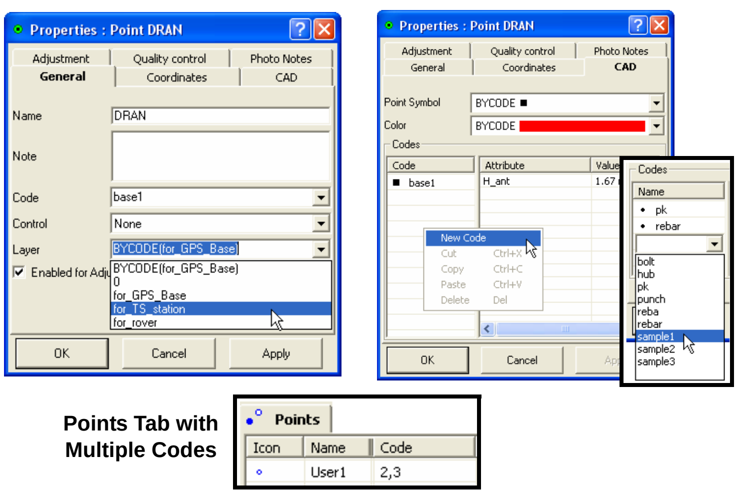


Figure 5-58. Add Code to Point

6. To delete a code from being used in the point, right-click in the left panel and click **Delete** (Figure 5-59 on page 5-40). Any attributes associated with the code are also deleted from the point.

   Note: deleting a code from the CAD tab only deletes the code from the point, not the job.
7. Click **OK** to save the settings.

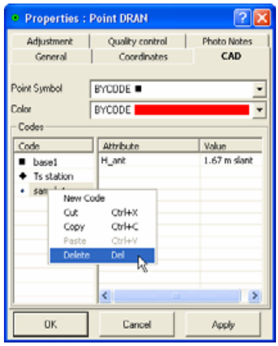


Figure 5-59. Delete Code from Point

Editing Layers

Layers are frequently used to group information by function, assigning line types, colors, and other attributes to distinguish this information from other data. By default, every Topcon Tools job includes a layer named 0 (zero). Layer 0 cannot be deleted or renamed; however, the attributes for this layer can be edited. New layers can be added to the job or imported from other files. The currently selected layer (whether layer 0 or another layer) will be the active layer. Any point, linework, surface, and road created will have the same plotting style defined by the active layer.

Adding a Layer

1. To create a new layer in the current job, click **Edit ▸ Add ▸ Layers**. (Or in the Layers view, click **Add Layers** on the pop-up menu. Or, on the toolbar, right-click in the Layers drop-down list.)
2. Enter the following general information for the layer (Figure 5-60 on page 5-41):
   - Name – the name of the layer.
   - Visible – select Yes to show the layer on the CAD and 3D views; select No to hide the layer.

- Note – enter desired comments.
- Breakline type – select desired type (Auto, Breakline, Boundary or Exclusion) for line is included to the surface.

3. Select the following plotting information for the layer (Figure 5-60):
   - Line Style – select the type of line to display for line information in the layer.
   - Line Width – select a width for lines in the layer.
   - Color – select a color for all data (point and line) in the layer.
   - Point Symbol – select a symbol to represent all points in the layer.
4. Select *Yes* to fill the areas of this layer (Figure 5-60).

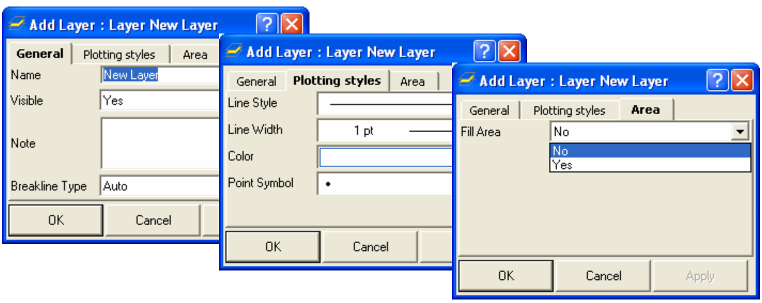


Figure 5-60. Enter and Select Layer's Attributes

Editing a Layer in the Layers View

If used in a job, layers can be edited. Layer 0 cannot be deleted from the job or renamed, but the plotting styles of the Layer 0 can be edited.

Edit a Layer using the Layers View:

- Click **View ▸ Layers** and select the desired layer(s) in the *Layers* view.
- Highlight and click any (except *Name*) cell in the *Layers* view, select and edit the desired parameters (Figure 5-61 on page 5-42).

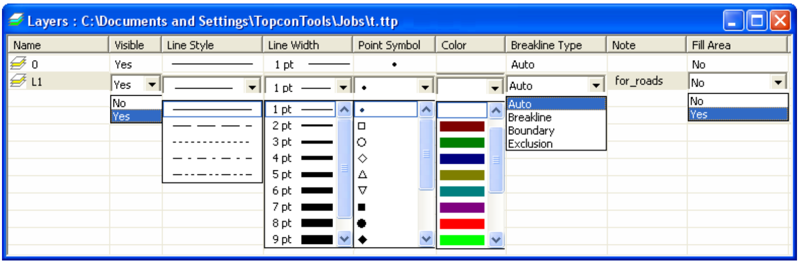


Figure 5-61. Editing Layer in the Layer View

Edit a Layer using the ***Properties*** dialog box for the layer:

- double-click in the Layer combo box in the Toolbar, select the desired layer from the drop-down list, and click .
- Click **View ▸ Layers** and right-click the desired layer. Select *Properties* from the pop-up menu.

Edit the layer's properties on the *General* and *Plotting styles* and *Area* tabs of the *Properties* window for the layer.

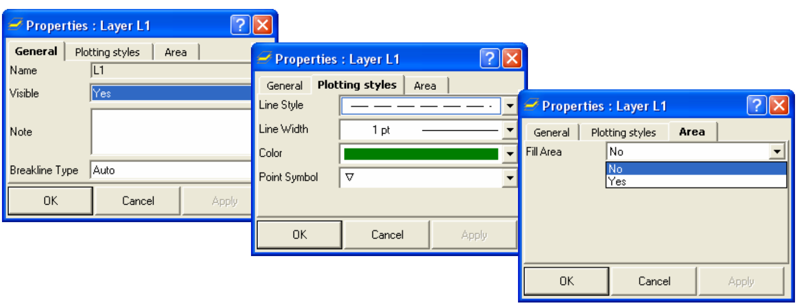


Figure 5-62. Editing Layer Parameters

Setting the Layer for Codes

When creating a new code, the user can select a layer. In this case, the plotting style for this code will be taken from the layer parameters.

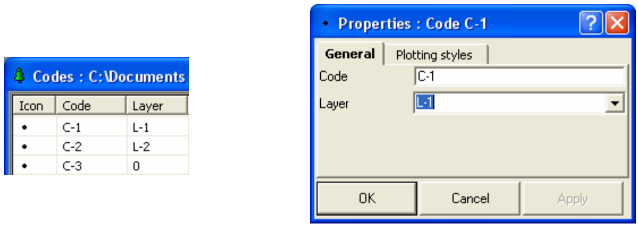


Figure 5-63. Codes and Layers

To edit the plotting style for any code with or without the layer, use the *Plotting styles* tab of the code's ***Properties*** dialog box (Figure 5-64).

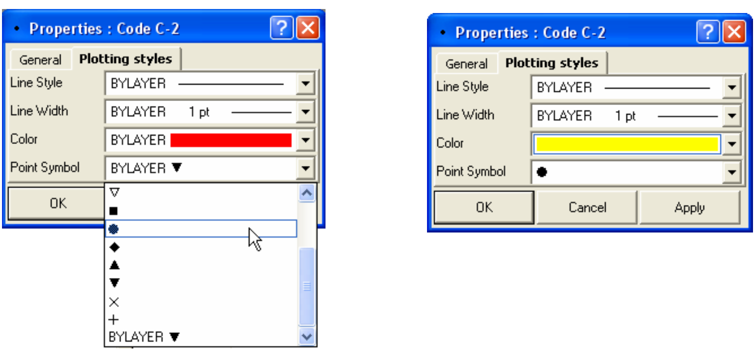


Figure 5-64. Editing Plotting Styles (Point Symbol) for Code

If no layer is selected for the code, the code will be automatically assigned to the active layer. This layer will be applied for all codes in Topcon Tools job and for imported files without layer support.

Setting the Layer for a New/Existing Point

To set the layer for a new (or existing) point, select the layer using the *General* tab in the ***Add Point*** (or the ***Properties: Point***) dialog box (Figure 5-65). The attributes (color and point style) for the selected layer will be assigned to this point.

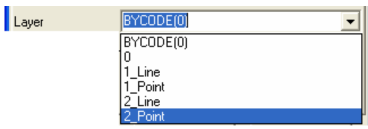


Figure 5-65. Setting Layer for Point

To apply codes (instead of layers) for a point, select the desired code in the *Code* field and set "BYCODE" in the *Layer* field. The attributes (color and point style) for the layer will be assigned to this point. Figure 5-19 shows an example of a point with code "101" in the *Cad View*. For this point, the layer was set to "BYCODE (For Points)" and this code uses the layer "For Points".

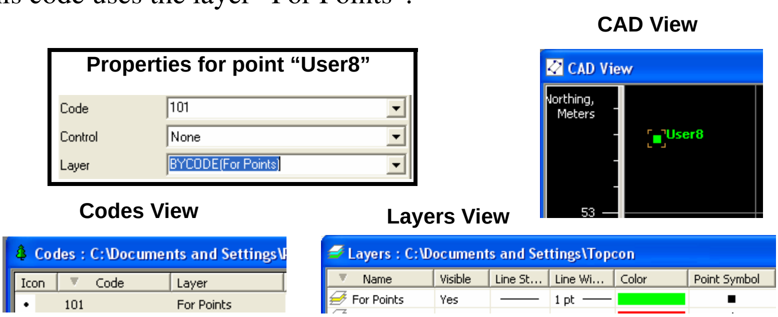


Figure 5-66. Setting Code for Point and Viewing Point

- If the point has multiple codes, setting Layer to "BYCODE" forces it to belong to multiple layers.
- If the point has no code, setting Layer to "BYCODE" forces the point to belong to layer 0 (zero).

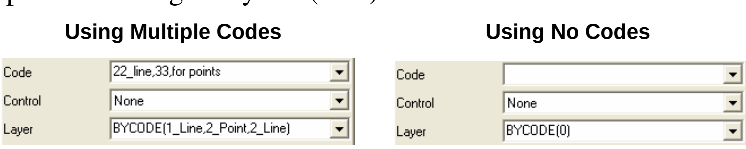


Figure 5-67. Layer Determination when Applying Codes

Setting the Layer for New/Existing Linework

To set the layer for new linework, select any layer from the list of existing layer in the Toolbar (Layer combo box). The plotting styles of the new line will be assigned by the active layer (Figure 5-68).

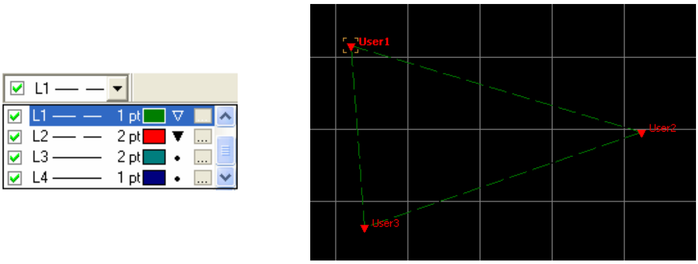
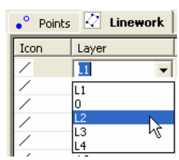


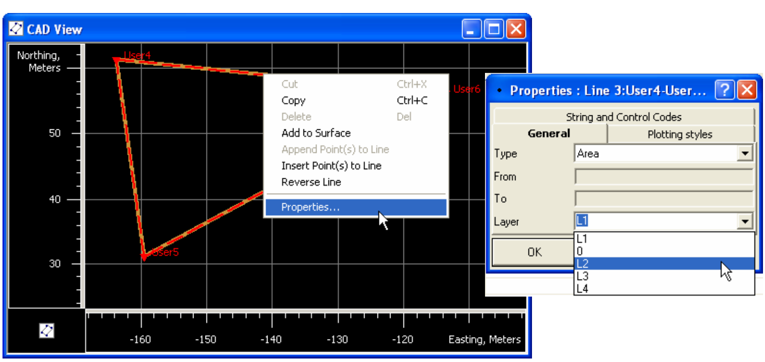
Figure 5-68. Setting the Layer for Linework

To change the layer for existing linework, do one the following:

- double-click in Layer column and select a different layer from the drop-down list in the left panel of the *Linework* tab.



- right click on the line (or selected lines) in the CAD View and select the Properties from pop-up menu. Select a different layer from the drop-down list in the Properties window.



Setting the Layer for a New/Existing Surface

To set the layer for a new/existing surface, select a layer using the ***Add Surface*** (or ***Properties***) dialog box. The plotting styles for the selected layer will be assigned to the surface (Figure 5-69).

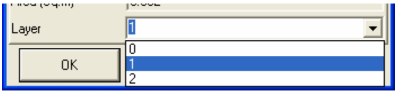


Figure 5-69. Setting the Layer for a Surface

To change the layer for an existing surface, in the *Surfaces* tab, double-click in Layer column and select a different layer from the drop-down list (Figure 5-70).

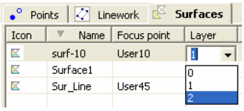


Figure 5-70. Selecting a Layer for an Existing Surface

Setting the Layer for New/Existing Road

To set the layer for a new/existing road, select a layer using the ***Add Road*** (or ***Properties***) dialog box. The plotting styles for the selected layer will be assigned to the road (Figure 5-71).

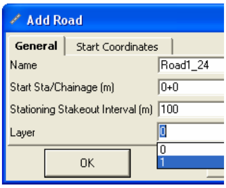


Figure 5-71. Setting the Layer for a Road

Editing TS Instrument Parameters

Total station instrument parameters assign height and type information for the TS instrument used for the TS data. See Table 5-1 on page 5-2 for a list of editable cells.

Instrument parameters define precisions of measurement performed by a particular TS model. By default (if no instrument is selected), Topcon Tools uses some reasonable default. Precisions of TS measurements slightly influence how measurements are accounted for during an adjustment; assigning correct instruments can slightly improve adjustment results. For most cases, however, the default applied precision are sufficient.

The *Custom TS-Instrument List* allows you to add user-defined instrument types to the instrument list.

Option 1: Edit in the Tabular View

1. In the column of the property you want to change, select the desired occupation.

   To select TS occupations with certain parameters, use the ***Select TS Occupations*** dialog box (see "Selecting TS Occupations" on page 4-49 for details).
2. Click a highlighted cell and edit the desired information (Figure 5-72).
   - For *Instrument Height*, type a height for the instrument.
   - For *Instrument Type*, select the model from the list.

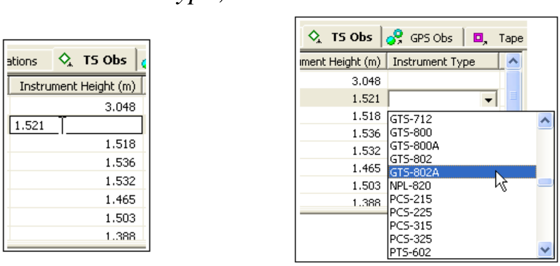


Figure 5-72. Editable Instrument Cells in Tabular View

3. After editing information in the column, click outside the cell or press **Enter** to save the new information.
4. Repeat steps 2 and 3 for each column until done (Figure 5-73).

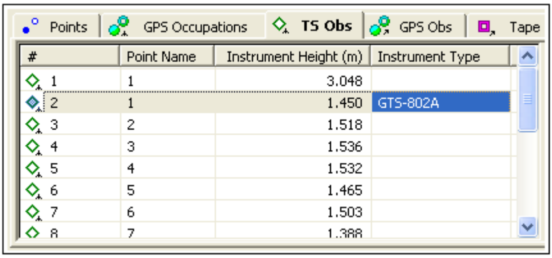


Figure 5-73. Edited Instrument Parameters

Option 2: Edit in the Properties Dialog Box

1. Select the desired occupation(s).

   To select TS occupations with certain parameters, use the ***Select TS Occupations*** dialog box (see “Selecting TS Occupations” on page 4-49 for details).
2. Right-click the selected occupation(s) and click **Properties** on the pop-up menu, or click **Edit ▸ Properties** (Figure 5-74).

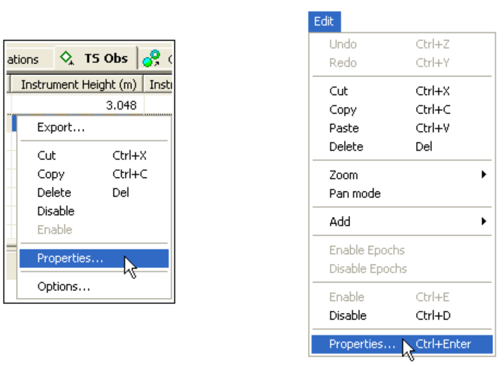


Figure 5-74. Ways to Open Properties

3. On the *General* tab, edit the height of the instrument as needed (Figure 5-75 on page 5-49).

4. On the *Instrument Type* tab, edit the type of instrument used as needed (Figure 5-75).

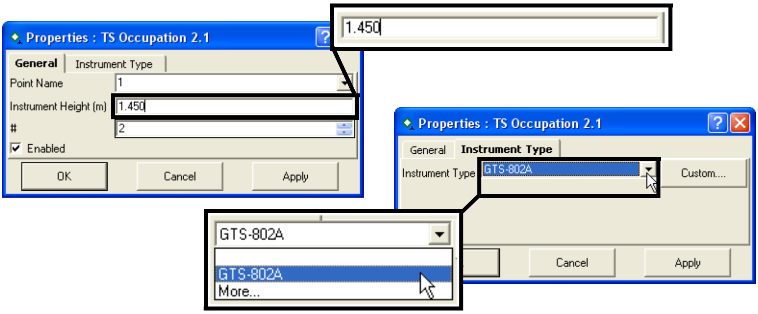


Figure 5-75. Enter New Parameters

5. Click **OK** to save the edited information, which can be viewed on the left panel of the *TS Obs* tab (Figure 5-76).

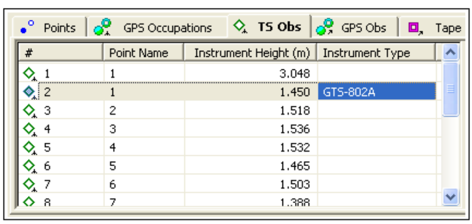


Figure 5-76. Edited TS Instrument Parameters

Adding TS Instruments Using the Custom TS Instruments List

Each TS instrument model has known measurement precision characteristics, which should be given in the TS instrument's documentation. A list of standard TS instruments, not viewable or editable, is stored in a TSinstrument.XML file.

1. To add a new instrument type to the instrument list or edit a current instrument type, right-click a TS occupation and click **Properties** on the pop-up menu (Figure 5-77).

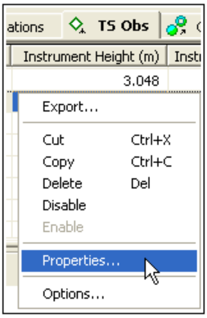


Figure 5-77. Open Properties

2. Click **Custom** (Figure 5-78) to display the ***Custom TS Instrument List***.

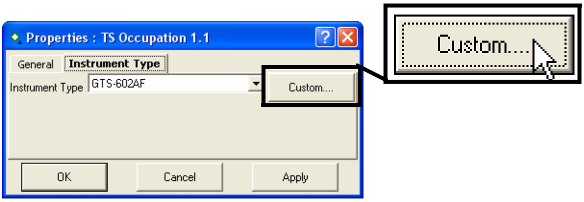


Figure 5-78. Open Custom TS Instrument List

3. Click **Add** (Figure 5-79 on page 5-51). To remove an instrument, click on the TS instrument's row and click **Remove**.

4. On the *General* tab, edit the *Name*, *Manufacturer*, and *Note* fields (Figure 5-79). Then click **Apply** to save the information.

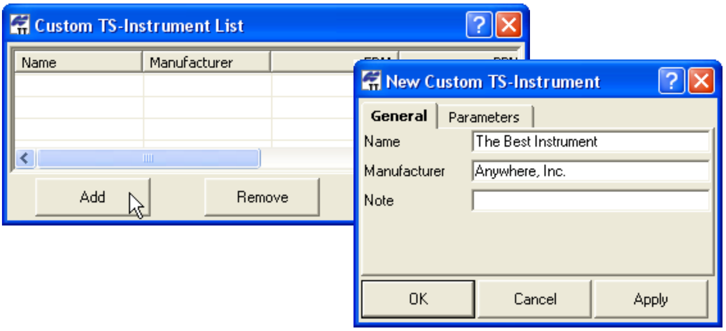


Figure 5-79. New Custom TS Instrument

5. Click the **Parameters** tab and enter the *EDM*, *PPM*, vertical and horizontal accuracies, and maximum distance (Figure 5-80).

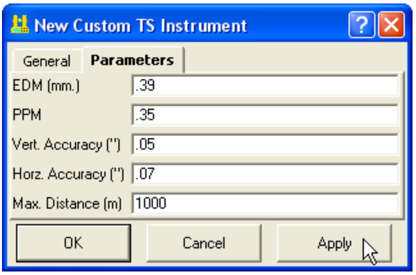


Figure 5-80. New Custom TS Instrument – Parameters

6. Click **OK** on the ***Properties*** dialog box.

Editing Data Properties

Each data type has a ***Properties*** dialog box associated with it that displays editable and viewable information particular to the selected data.

When selecting several items of the same data type, all items are represented on one dialog box, and any changes made to the editable fields are applied to all selected items.

Editing Point Properties

The ***Properties*** dialog box varies slightly depending on the number of points selected; the CAD tab is not available when viewing the properties of multiple points.

1. To view properties for one or several selected point(s):
   - right-click a point and click **Properties** on the pop-up menu.
   - click **Edit ▸ Properties**

   The ***Properties*** dialog box varies slightly depending on the number of points selected.
2. View or edit *General* tab fields (Figure 5-81):
   - Editable fields – point *Name* (for single points), *Notes*, *Codes*, *Layers*, and the type of *Control* used for the point(s).
   - Selectable fields – *Enabled for Adjustment* includes the point in the adjustment process only; disable this parameter to exclude the point from adjustment.

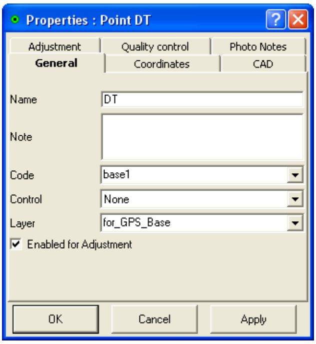


Figure 5-81. General Properties

3. For single point selections, view or edit *CAD* tab fields. These fields list point codes; right-click in the name field to add a code, copy/paste a code, or delete a code from the point (see “Editing Codes Used for Points” on page 5-38 for details on editing codes in this tab).
4. View or edit *Coordinates* tab fields (Figure 5-82). Available fields depend on the coordinate type selected in Job configuration.
5. View *Adjustment* tab fields for standard point deviations (Figure 5-82).

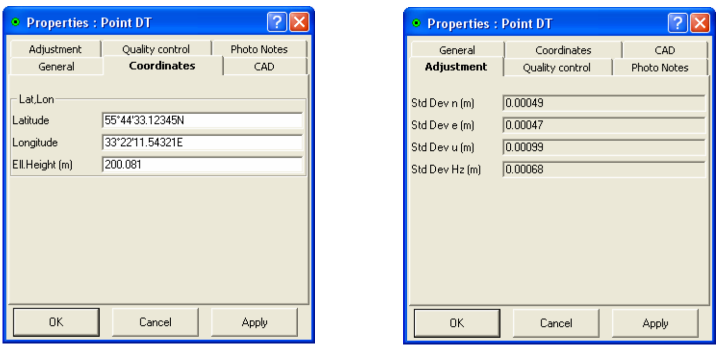


Figure 5-82. Coordinates and Adjustment Properties

6. The *Strings* tab edits the first string and displays the control code for the point (Figure 5-83 on page 5-54).
7. View *Quality Control* tab contains informational text on selected points (marked in red on the views) that did not pass some of the quality control checks (Figure 5-83 on page 5-54). To turn off the feature that marks a point red when it fails some quality control tests, select the *Ignore QC* check box.
8. When finished, click **OK** to apply the changes and close the dialog box.

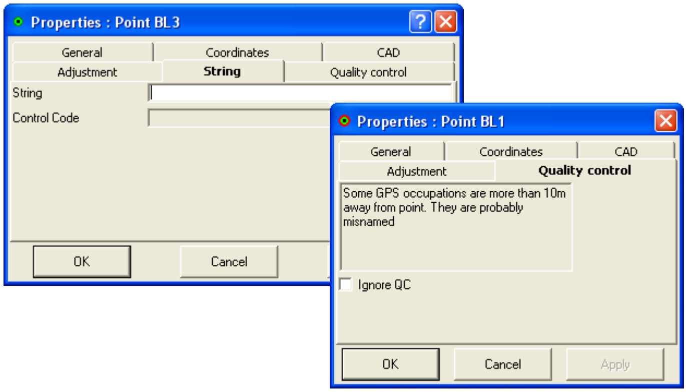


Figure 5-83. Strings and Quality Control Properties

Editing GPS Occupations Properties

The ***Properties*** dialog box varies slightly depending on the type of occupation selected. For some occupations, additional fields provide further information.

1. To view or edit properties for one or several selected GPS occupation(s):
   - right-click an occupation and click **Properties** on the pop-up menu
   - click **Edit ▸ Properties**
2. View or edit *General* tab fields (Figure 5-84 on page 5-55). The fields vary depending on the type of occupation selected.
   - Editable fields – original/point names and any *Notes* associated with the point(s).
   - Selectable fields – *Enabled* includes all vectors based on this occupation in processing; disable this parameter to exclude the occupation from processing.
   - For PP occupations, the *Orbit* field displays the type of orbit data available for processing this occupation. If “None” displays, the occupation is marked with red and the QC tab contains text describing the problem (for example: “No ephemeris”). No processing can be done without orbit data.

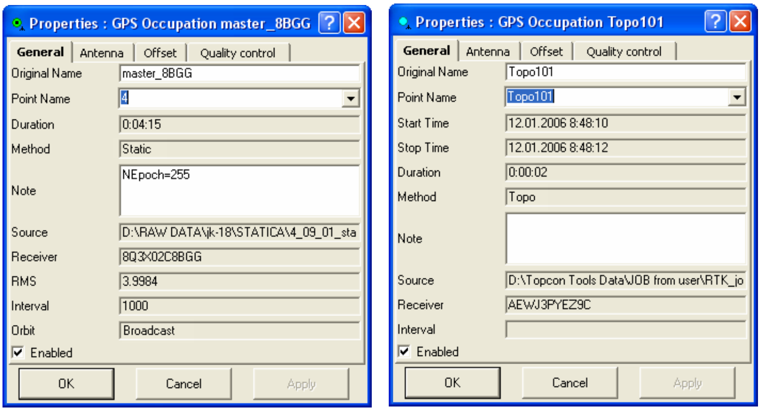


Figure 5-84. General Properties

3. View or edit *Antenna* tab fields. See "Option 2: Edit in the Properties Dialog Box" on page 5-8 for details on editing these fields.
4. View or edit *Offset* tab fields. See "Editing Antenna Offsets" on page 5-9 for details on editing these fields.
5. View *Quality Control* tab contains informational text on selected occupations (marked in red on the views) that did not pass some of the quality control checks (Figure 5-85). To turn off the feature that marks a point red when it fails some quality control tests, select the *Ignore QC* check box.

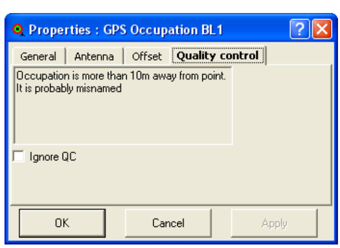


Figure 5-85. Quality Control Properties

6. When finished, click **OK** to apply the changes and close the dialog box.

Editing TS Obs Properties

The ***Properties*** dialog box varies slightly depending on the panel in which data is selected.

Edit TS Occupations Properties

The TS occupations panel ***Properties*** dialog box sets point name, point number, instrument height, and instrument type information.

1. To view properties for one or several selected TS occupation(s), right-click an occupation in the left panel of the *TS Obs* tab, then do one of the following:
   - click **Properties** on the pop-up menu
   - click **Edit ▸ Properties**
2. View or edit *General* tab fields (Figure 5-86).
   - Editable fields – point name, instrument height, and point number.
   - Selectable fields – *Enabled* includes all vectors based on this occupation in processing; disable this parameter to exclude the occupation from adjustment.

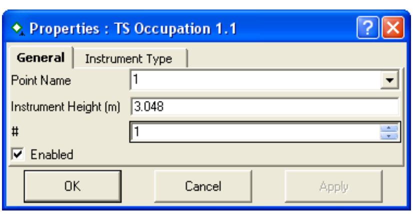


Figure 5-86. General Properties

3. View or edit *Instrument Type* tab fields. See “Option 2: Edit in the Properties Dialog Box” on page 5-48 for details on editing these fields.
4. When finished, click **OK** to apply the changes and close the dialog box.

Edit TS Observations Properties

The TS observations panel ***Properties*** dialog box sets point name, point number, instrument height, and instrument type information.

1. To view properties for one or several selected TS observation(s):
   - right-click an observation in the right panel of the TS Obs tab and click **Properties** on the pop-up menu
   - click an observation in the right panel of the TS Obs tab and click **Edit ▸ Properties**
2. View or edit *General* tab fields (Figure 5-87).
   - Editable fields – *Point To*, *Notes*, *#*, and *Code*.
   - Selectable fields – *Enabled* includes the vector during processing; disable this parameter to exclude the vector from processing.

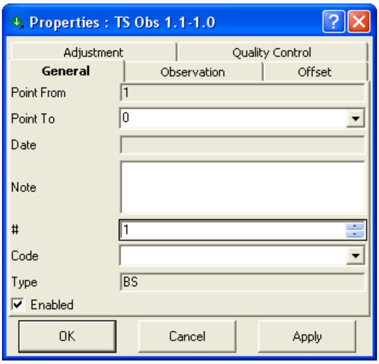


Figure 5-87. General Properties

3. View or edit *Observation* tab fields. Edit *Reflector Height* and *Azimuth* fields as needed (Figure 5-88 on page 5-58). Other fields depend on the selected Job Configuration option.
4. View or edit *Offset* tab fields for editing offsets and selecting the offset Type (Figure 5-88 on page 5-58).

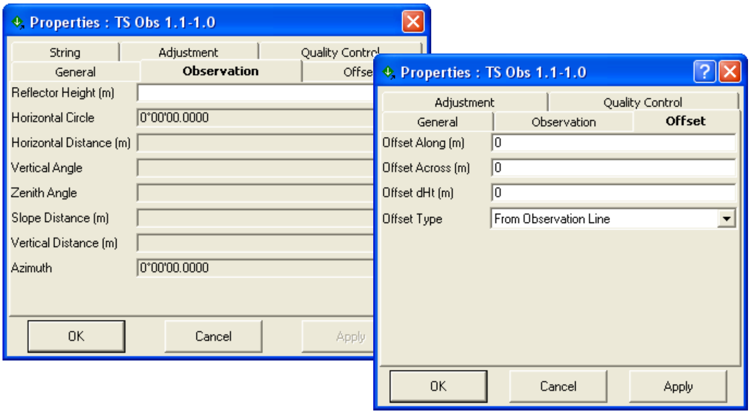


Figure 5-88. Observation and Offset Properties

5. The *Strings* tab displays the first string and displays the control code for the point (Figure 5-89).

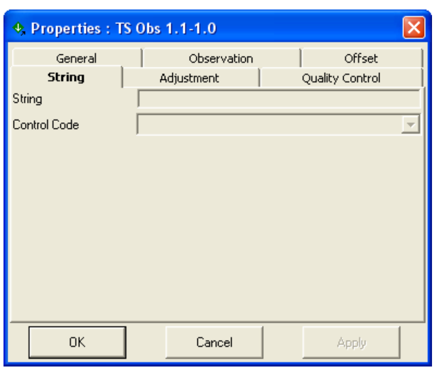


Figure 5-89. String Properties

6. View or edit *Adjustment* tab fields for setting the *AutoReject* option and viewing the status and residuals for the observation (Figure 5-89 on page 5-58).
7. View *Quality Control* tab contains informational text on selected observations (marked in red on the views) that did not pass some of the quality control checks (Figure 5-89 on page 5-58).
8. When finished, click **OK** to apply the changes and close the dialog box.

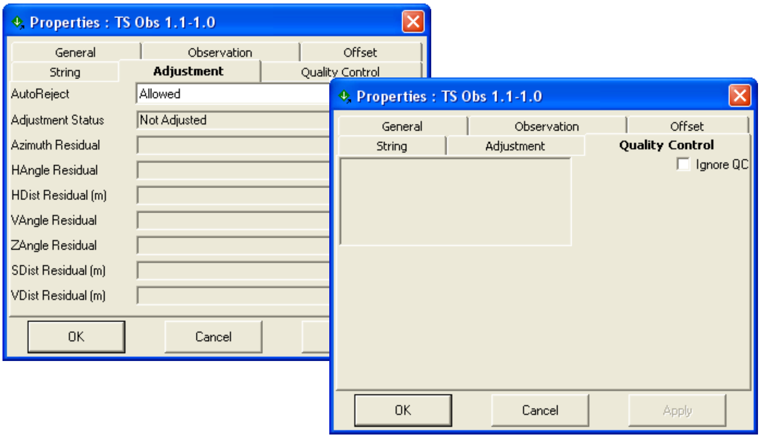


Figure 5-90. Adjustment Properties

Editing GPS Obs Properties

The ***Properties*** dialog box varies slightly depending on the type of observation selected. For some observations, additional fields provide further information: for kinematic observations, "Adjustment status" and "Reject mode" are not displayed; the "Point to" field for RTK autotopo observations can be edited

1. To view properties for one or several selected GPS observation(s):
   - right-click an observation in the right panel of the GPS Obs tab and click **Properties** on the pop-up menu
   - click an observation in the right panel of the GPS Obs tab and click **Edit ▸ Properties**
2. View or edit *General* tab fields (Figure 5-91 on page 5-60); available fields differ depending on the type of observation selected.
   - Editable fields – *Notes* for all observations, *Point to* for RTK autotopo observations
   - Selectable fields – *Enabled* includes the vector during processing; disable this parameter to exclude the vector from processing.

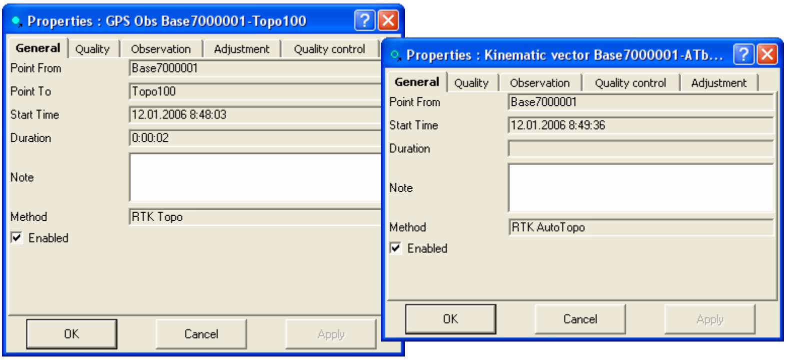


Figure 5-91. General Properties

3. View *Observation* tab fields which contain fields for viewing the vector solution type (dX,dY,dZ, Azimuth, Elevation Angle, Distance, dN,dE,dHt) (Figure 5-92).

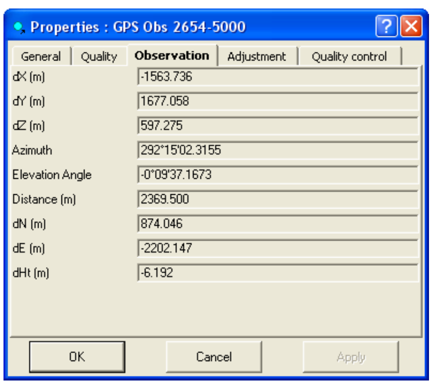


Figure 5-92. Observation Properties

4. View *Quality* tab fields which contain the fields for viewing:
   - Horizontal/vertical precisions.
   - The solution type.
   - The number of epochs over the common data time interval.
   - The number of GPS/GLONASS satellites (SV's). For RTK observation, the common number of SV's observed by the base and rover in the last common epoch. For PP observation, the common number of SV's observed by the base and rover during the whole observation time.

- The position dilution of precision (HDOP and VDOP) in the last common epoch for RTK observation (taken from the TopSURV RTK job).
- The type of orbit data available for processing this observation.

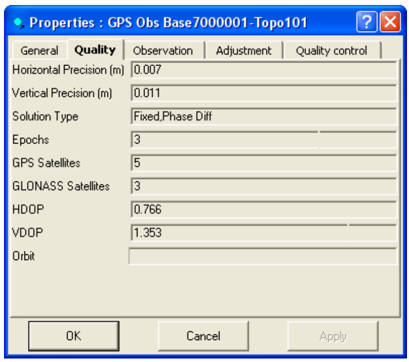


Figure 5-93. Quality Properties

5. View or edit *Adjustment* tab fields, which differ depending on the type of observation selected: for static observations, set the AutoReject option and view the status and residuals for the observation; for kinematic observations, only residuals information displays. Select the *AutoReject* parameter as needed (Figure 5-94).

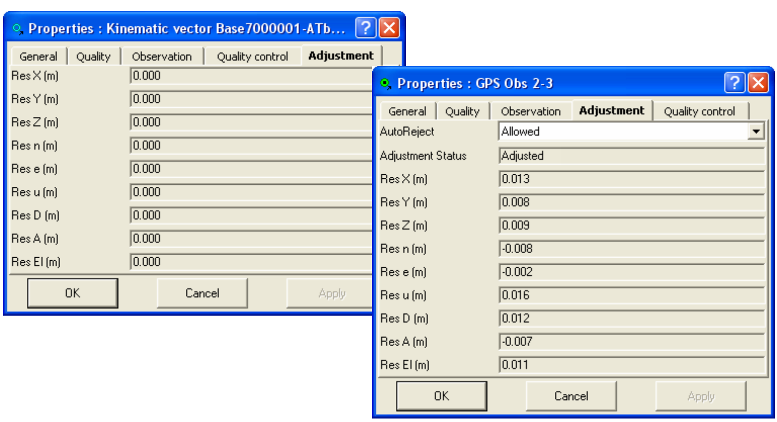


Figure 5-94. Adjustment Properties

6. View *Quality Control* tab contains informational text on selected observations (marked in red on the views) that did not pass some of the quality control checks (Figure 5-95).

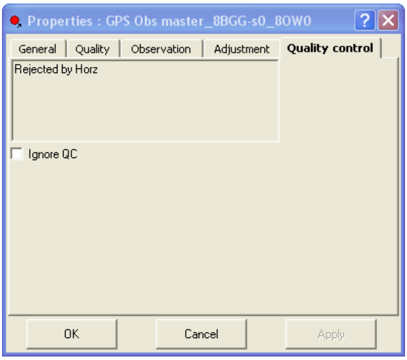


Figure 5-95. Quality Control Properties

7. When finished, click **OK** to apply the changes and close the dialog box.

Editing Digital Level Properties

The ***Properties*** dialog box for digital level observations varies slightly depending on the panel in which data is selected.

Edit DL Properties

The ***Properties*** dialog box in the left panel of *DL Obs* tab sets name, order and note of the DL job information.

1. To view properties for a selected DL dimension, click a DL dimension in the left panel of the *DL Obs* tab and click **Edit ▸ Properties**
2. View or edit *General* tab fields. Edit the name, order and note of the job, as needed (Figure 5-96 on page 5-63).

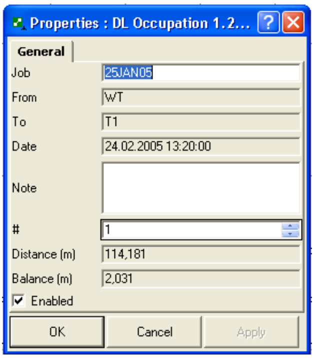


Figure 5-96. General Properties

3. When finished, click **OK** to apply the changes and close the dialog box.

Edit Digital Level Point Properties

The ***Properties*** dialog box in the right panel of *DL Obs* tab sets point distance, notes, and point number information.

1. To view properties for a selected traverse or sideshot point, click a point in the right panel of the *DL Obs* tab and click **Edit ▸ Properties**
2. Edit the *Point* and *Note* in the *General* tab and *AutoReject* in the *Adjustment* tab as needed (Figure 5-97).

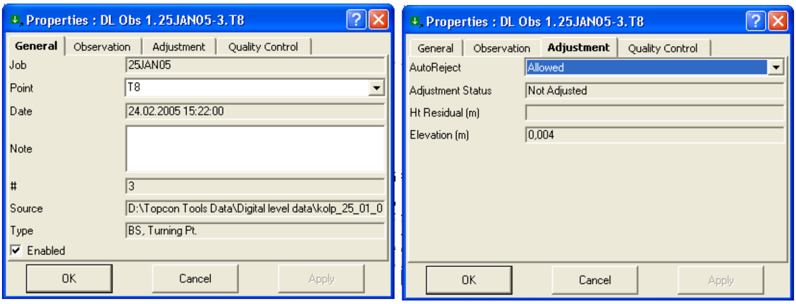


Figure 5-97. General and Adjustment Properties

3. When finished, click **OK** to apply the changes and close the dialog box.

Editing Tape Dimensions Properties

The ***Properties*** dialog box for tape dimensions varies slightly depending on the panel in which data is selected.

Edit Tape Dimensions Properties

The Reference Line panel ***Properties*** dialog box sets start point and end point information.

1. To view properties for one or several selected tape dimensions click a tape dimension in the left panel of the Tape Dimensions tab and click **Edit ▸ Properties**
2. View or edit *General* tab fields (Figure 5-96). Edit the *Start Point* and *End Point* parameters as needed.

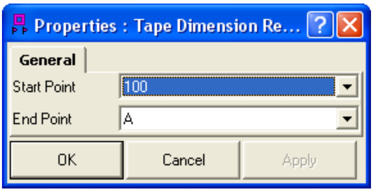


Figure 5-98. General Properties

3. When finished, click **OK** to apply the changes and close the dialog box.

Edit Tape Dimensions Point Properties

The Tape Dimension panel ***Properties*** dialog box sets point to, distance, notes, and point number information.

1. To view properties for one or several selected lines click a tape dimension in the right panel of the Tape Dimension tab and click **Edit ▸ Properties**
2. View or edit *General* tab fields (Figure 5-97 on page 5-63). Edit the *Point To*, *Distance*, *Notes*, and *#* parameters as needed.
3. When finished, click **OK** to apply the changes and close the dialog box.

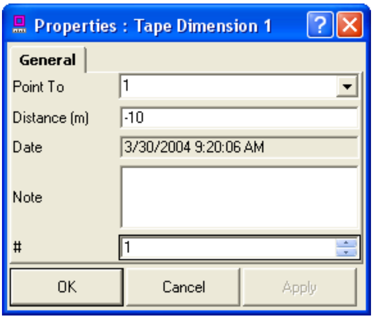


Figure 5-99. General Properties

Viewing Image Properties

Only the left panel of the Images tab has a properties option for the selected image. The right panel is view only.

1. To view properties for the selected image click **Edit ▸ Properties**
2. View the number of the image (Figure 5-100).

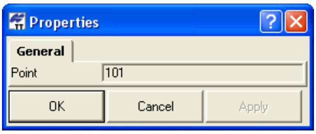


Figure 5-100. General Properties

3. When finished, click **OK** to close the dialog box.

Notes:

Processing, Adjusting, & Localizing Points

When working with GPS+ raw data, you will need to first process the GPS observation with GPS+ PostProcessing (DGPS PostProcessing for the GIS module) to obtain observation vectors and approximate coordinates of observed points. For some applications, the quality of the approximate coordinates will be good enough, but for high-precision applications, run an adjustment on the observations to further improve point coordinates.

The adjustment function also adjusts total station networks, combined GPS and total station networks, and recomputes coordinates of RTK solutions. The adjustment process will try to compute improved positions for all points in the job (that have not been disabled or filtered out).

To transform coordinates between a GPS coordinate system (WGS84) and a local coordinate system, use the localization process to compute transformation parameters.

Setting Process and Adjustment Properties

The properties dialog box for processing and adjusting applies adjustment, TS computation, and GPS+ PostProcess parameters.

1. To set process and adjustment parameters, do one of the following:
    - Click **Process ▸ Process Properties** to display the ***Process properties*** dialog box.

- Click **Job ▸ Job Configuration**, then click **Process** in the left panel of the ***Job Configuration*** dialog box.

The Process panel in the ***Job Configuration*** dialog box and the ***Process properties*** dialog box display the same parameters.

2. On the *Adjustment* tab, select the following adjustment parameters:
   - Confidence level for the adjustment process: either 68%, 95%, or 99% (Figure 6-1). The default confidence level is 95%.
   - Rejection criterion for rejecting bad observations. The default rejection criterion is By Quality Control.
   - Tests to run before adjusting the network. All tests are selected by default.
3. On the *TS-Computations* tab, select the refraction coefficient: either 0, 0.14, or 0.2 (Figure 6-1). The default is 0.14.
4. On the *GPS+ PostProcess* tab, select the elevation mask, combination of navigation system, and minimum observation time for the processing (Figure 6-1).

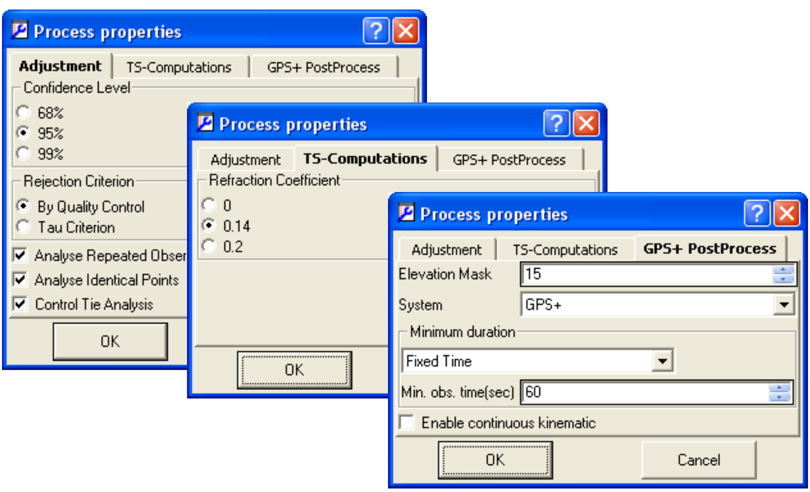


Figure 6-1. Process Properties

Enabling GPS Kinematic Data

By default, the display and processing of GPS kinematic data is turned off. To display and process GPS kinematic data, select the "Enable continuous kinematic" checkbox on the *GPS+ PostProcess* tab (Figure 6-1). This tab can be accessed in either the ***Job Configuration*** or ***Process properties*** dialog boxes.

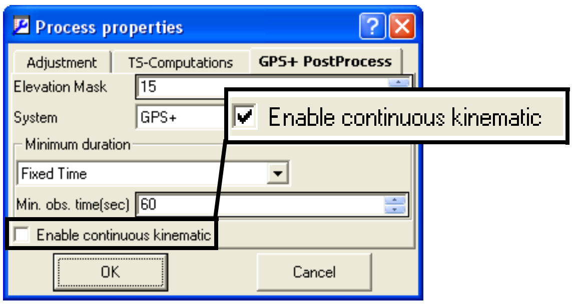


Figure 6-2. Select to Display/Process GPS Kinematic Data

When enabled, the following data will display in Topcon Tools if the job has kinematic data:

- kinematic points on the Points tab and Map view
- kinematic observations on the GPS tab
- kinematic trajectories on the Map view

For each epoch in kinematic occupations that can be postprocessed, Topcon Tools will generate a kinematic point, as well as create a unique name based on occupation name and epoch GPS time.

If importing TPS files collected with TopSURV in RTK+PP mode where points were generated by time, Topcon Tools will use the same time interval for generating points and the same naming rules. Therefore, RTK autotopo points and postprocessed kinematic points collected at the same time will merge.

Enabling or Disabling Point Data

In the Tabular, Map, or Occupation view, use the pop-up menu or Edit menu to include/exclude data in the processing and/or adjustment processes.

- Select single or multiple data, right-click and click **Enable** or click **Disable** on the pop-up menu.
- Select single or multiple data, click **Edit ▸ Enable** or **Edit ▸ Disable**.
- Select single or multiple data, open the ***Properties*** dialog box, enable/disable the *Enabled* parameter on the *General* tab. The ***Properties*** dialog box for some data types only allows this parameter for adjustment, or for processing and adjustment.

Disabled data is grayed-out in all views.

Enabling or Disabling Epochs

In the Occupation view, you can display the satellite vehicles for individual occupations. For advanced users, disabling or enabling epochs for use in postprocessing will help to “tune” the results of postprocessed data.

Click the **+/-** button next to the occupation or right click the occupation and click **Show SVs** on the pop-up menu. The total epoch for each satellite displays under the occupation (Figure 6-3).

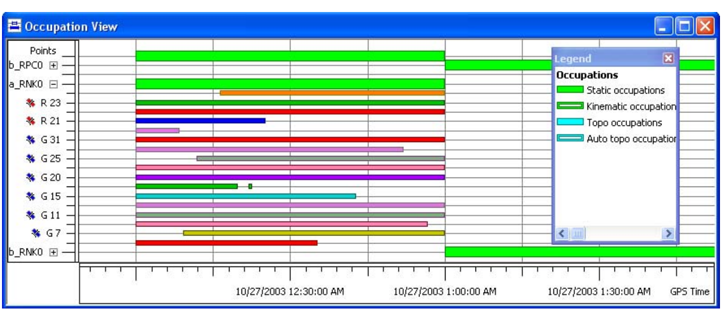


Figure 6-3. Satellite Occupation Times

1. To select individual epochs for disabling/enabling, zoom in on a selected satellite vehicle occupation.
2. Either drag a square around an epoch or click a satellite's epoch (Figure 6-4) to select the desired epoch(s) and time interval(s).
   - When dragging a square to select certain epochs, any epoch with starting times within the selection square will be selected; or, the entire epoch will be selected if the selection square falls within the start and end time of the epoch.
   - When selecting epochs, hold the CTRL or Shift to select multiple epochs.
   - To deselect and invert the selection for certain epochs, hold the CTRL key and click the epochs to deselect.

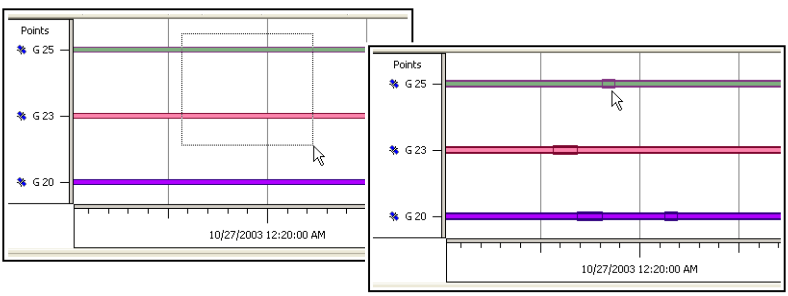


Figure 6-4. Selecting Epochs

3. Once selected, right-click within the view and click **Disable** (or **Enable**) on the pop-up menu. Disabled epochs display with slanting lines (Figure 6-5).

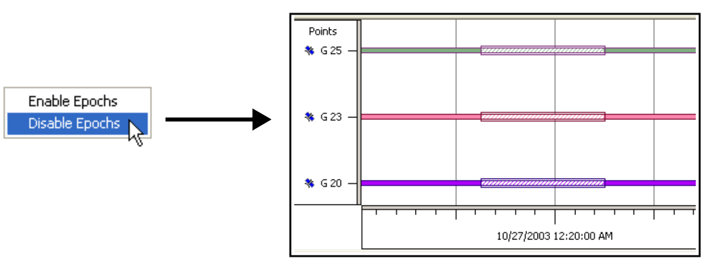


Figure 6-5. Disable Selected Epochs

Processing

The processing function processes vectors (observations) according to the parameters entered and selected in the Quality Control and Process panels in Job configuration. See “Setting Process and Adjustment Properties” on page 6-1 for setting process properties.

Processing All GPS Observations

To process all vectors in the job,

- click **Process ▸ GPS+ PostProcessing**
- press **F7** on the keyboard
- click the **GPS+ PostProcessing** button (Figure 6-6)

Figure 6-6. GPS+ PostProcessing Toolbar Button

Processing Selected GPS Observations

1. Select the desired observation(s) in the Map view or on the GPS Obs tab in the Tabular view.

   To select GPS observations with certain parameters, use the ***Select GPS Obs*** dialog box (see “Selecting GPS Observations” on page 4-53 for details).
2. In the *GPS Obs* tab, right-click the selected observation(s) and click **GPS+ PostProcessing** on the pop-up menu (Figure 6-7).

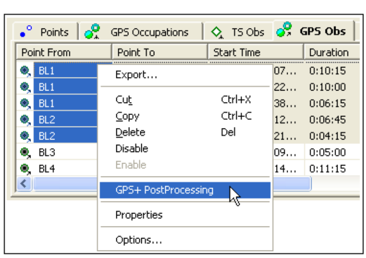


Figure 6-7. Process Selected GPS Observation(s)

Understanding the Results

The ***Legend*** window shows and describes the icons and colors used for each data item.

In the Map view, post processed data display as bright green and red lines. Baselines with horizontal/vertical precisions worse than the value set in the current job will display red. Figure 6-8 shows before and after example Map view screen shots of the PostProcess function for selected observations.

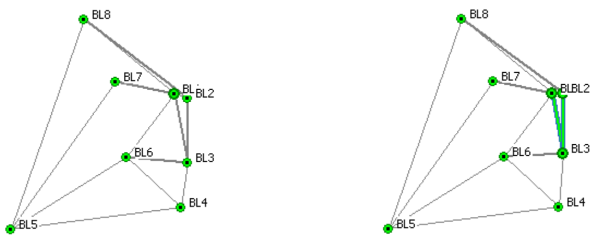


Figure 6-8. Example PostProcess in Map View

In the Tabular view, adjusted and post processed information display in the following data columns:

- horizontal and vertical precisions of the vector solution
- GPS observation values displays vector increments, in the selected display option
- type of solution used for the vectors; either Fixed (all ambiguities have been fixed to integers) or Float (all estimated ambiguities are float numbers)

Figure 6-9 on page 6-8 shows before and after example Tabular view screen shots of the Post Process function for selected observations.

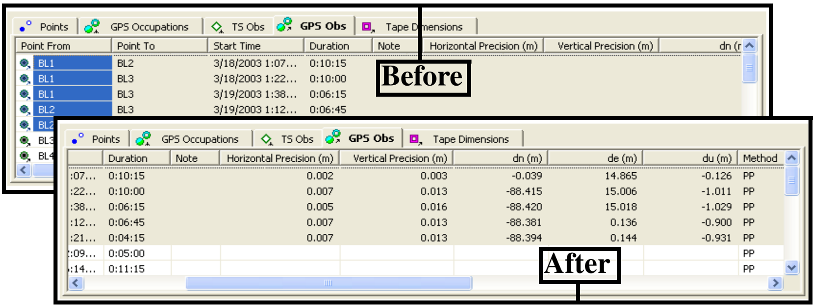


Figure 6-9. Example Post Process in Tabular View

About Vector Processing Modes

Topcon Tools uses the following modes for processing static vectors based on the distance of the vector. These modes are automatic based on the length of the vector, and cannot be changed.

The Solution Type column of the GPS Obs tab displays the type of mode used.

- VLBL (very long baselines) – used if the vector is longer than 40km. The VLBL mode is based on a trivial triple-difference technique and can give ONLY a float solution. In this case, “Iono Free” displays in the Solution Type column.
- WideLane – used for vectors between 30km and 40km. In this case. “Fixed,Wide Lane” or “Float,Wide Lane” displays in the Solution Type column.
- L1&L2c – used for vectors between 10km and 30km. In this case, “Fixed,Iono Free” or “Float,Iono Free” displays in the Solution Type column.
- L1&L2 – used for vectors shorter than 10km. In this case, “Fixed” or “Float” displays in the Solution Type column.

The Solution Type column of the GPS Obs tab displays the type of mode used.

Adjustment

TS observations, GPS observations, and DL observations can be adjusted, either together or separately and either constrained or free. In a constrained adjustment, network adjustment is performed from a fixed point(s). In a free adjustment, network adjustment is performed from an arbitrary point (selected by Topcon Tools). Note the following information about adjustments:

- Adjustments on GPS observations will use the selected datum. Adjustments on TS observations will use the sphere of the mean Earth radius. Both of these adjustments will take into account the parameters of the geoid in the current job.
- Before adjusting a network, GPS\TS\DL point coordinates will be re-computed using corresponding observations.
- Topcon Tools performs separate adjustments for plane coordinates and for heights.
- If a control point is fixed, either in the plane or by height, the adjustment will occur for either plane coordinates or heights, respectively.
- Using the Advanced module the dimension of the network adjustment can be selected (1D, 2D, 3D or Auto).

NOTICE *NOTICE*

Before performing a network adjustment with GPS observations, perform GPS+PostProcessing.

When performing a network adjustment, the adjustment module first analyzes the network and then adjusts the network. The following flowchart (Figure 6-10 on page 6-10) illustrates the adjustment process.

To adjust all observations in the current job, do one of the following:

- click **Process ▸ Adjustment**
- press **F8** on the keyboard
- click the **Adjust Network** button

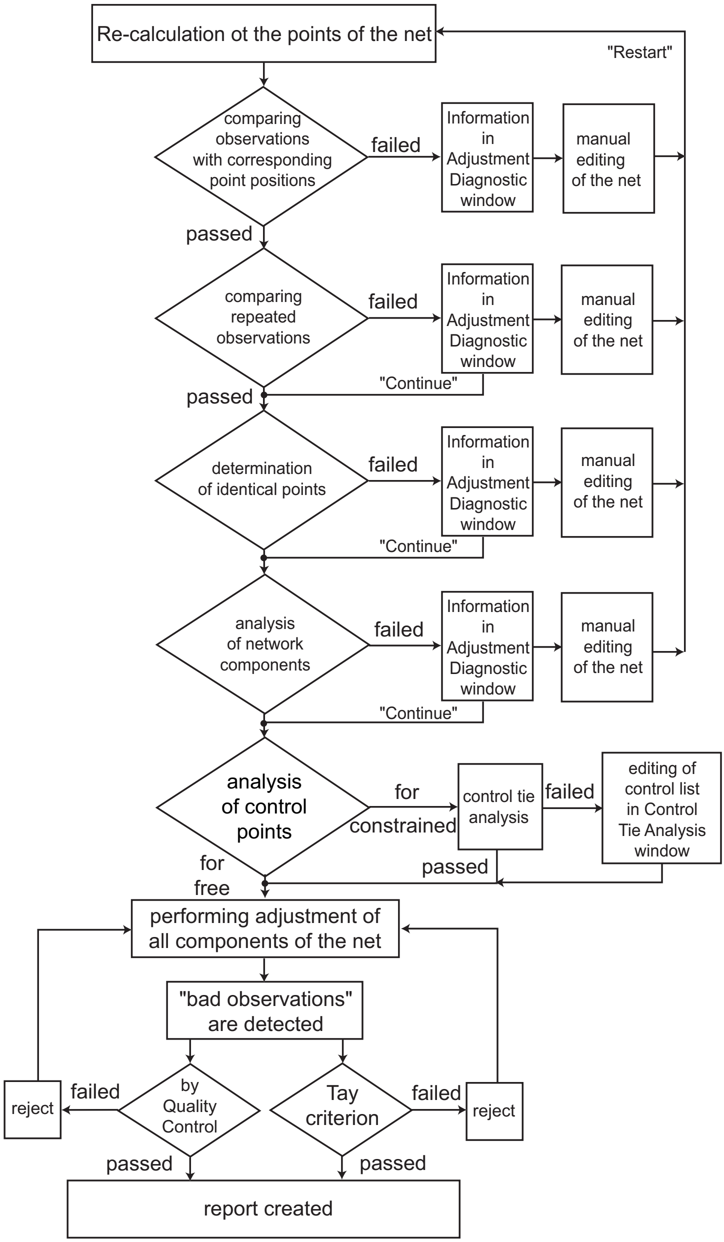


Figure 6-10. Network Adjustment Flowchart

After starting the adjustment procedure, the network is analyzed. While analyzing, network testing may be interrupted and the ***Adjustment Diagnostic*** dialog box will display (Figure 6-11). This dialog box displays some information about the test(s) being executed and possible issues with the data that could prevent accurate network adjustment. In this case,

- Click **Continue** to continue the adjustment without any changes to the data.
- Click **Cancel** the stop adjustment.
- Click the hyperlink to edit the indicated data of the job. Click **Restart** when done to continue the adjustment.
- Click **Save Preliminary Coordinates** to view the preliminary computed coordinates.

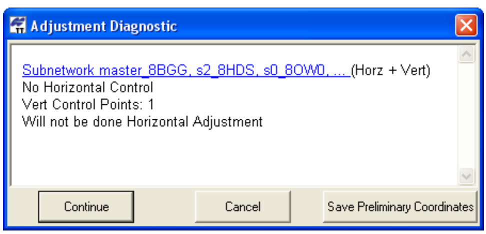


Figure 6-11. Adjustment Diagnostic

When viewing preliminary coordinates (clicking Save Preliminary Coordinates on the ***Adjustment Diagnostic*** dialog box), the Map view will display the point positions that have been computer; some points will not have positions. The following example (Figure 6-12 on page 6-12) shows the before and after Map views for a TS observation adjustment from a point with WGS-84 coordinates. The TS points did not have coordinates in WGS-84 system, only in the ground system used for the job can be viewed. After running the adjustment function, Save Preliminary Coordinates was clicked and a localization was performed on the points using one common point from the job. This localization process only calculated WGS-84 coordinates of the points without adjusting them.

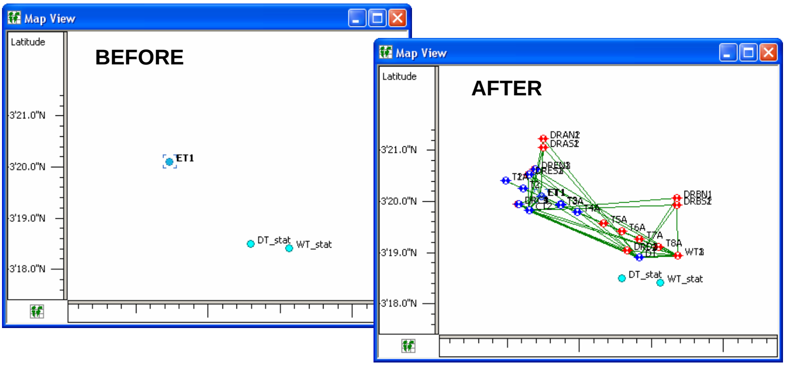


Figure 6-12. Example – Using the "Save Preliminary Coordinates" Option

The ***Process properties*** dialog box and *Adjustment* tab applies certain tests to the adjustment process (Figure 6-13). The following sections describe these and other tests in more detail.

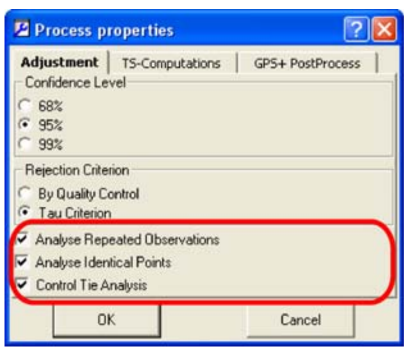


Figure 6-13. Process Properties Window

By default, these tests are enabled.

Adjustment Test: Checking Vector Coordinates

The check vector coordinates test compares the difference between the coordinates of the baseline end points and the baseline coordinates.

- For TS observations, if the difference in distances is more than 40 meters or in angles (horizontal or vertical) is more than 25 degrees, then the network adjustment is interrupted and the ***Adjustment Diagnostic*** dialog box displays (Figure 6-14).
- For GPS observations, if the difference in distances (computed as square root of sum of squared differences in all three coordinates) is more than 1000 meters, then the network adjustment is interrupted and the ***Adjustment Diagnostic*** dialog box displays (Figure 6-14).

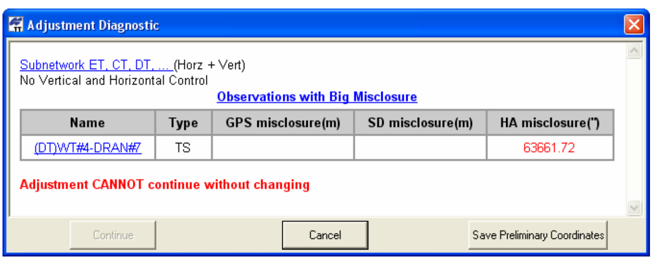


Figure 6-14. Messages After Comparing Observations with Corresponding Points

The presence of such observation(s) in the network is a fatal error and the adjustment cannot continue.

1. Click the hyperlink to access the data that caused the error. The Tab/Map view will display for the observation.
2. Edit the data in the current job.
3. Click **Restart** to continue the adjustment process.

Adjustment Test: Analysis of Repeated Observations

The repeated observations analysis averages the coordinates of the vector for two or more observations with common start/end names (for example, observations N1-N2 and N2-N1 are assumed as repeated). The averaged observation then replaces the repeated observations. The test will pass or fail based on the values set in the *TS observations/GPS Observations* tab of the ***Job Configuration*** dialog box (**Job ▸ Job Configuration ▸ Quality Control**).

- A successful test is where the difference between the computed observation and any one of the repeated observations is less than the values set in the ***Job Configuration*** dialog box.
- A failed test is where the difference is more than the values set in the ***Job Configuration*** dialog box. The network adjustment process will be interrupted and the ***Adjustment Diagnostic*** dialog box will display (Figure 6-15).

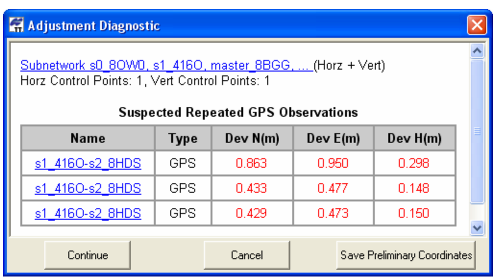


Figure 6-15. Messages After Analysis of the Repeated GPS Observation

The adjustment process can be continued or can be restarted after making changes to the data.

- Click **Continue** to continue the network adjustment.
- Click the hyperlink to access the data that caused the error. Edit the data and click **Restart** to continue the network adjustment (Figure 6-16 on page 6-15).

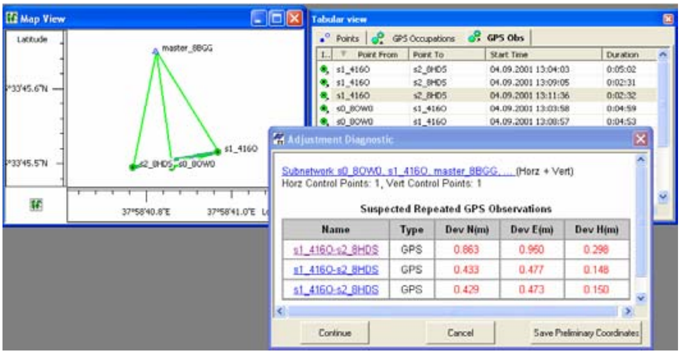


Figure 6-16. Selection of Repeated Observation in Map and Tabular View

Adjustment Test: Detecting Identical Points

The detect identical points test computes coordinate differences between all points of the current job. The test will pass or fail based on the values set in the *Point Precisions* tab of the ***Job Configuration*** dialog box (**Job ▸ Job Configuration ▸ Quality Control**).

- A successful test is where the coordinate difference for a pair of points is more than horizontal/vertical precision set in the ***Job Configuration*** dialog box.
- A failed test is where the difference is less than the values set in the ***Job Configuration*** dialog box. The network adjustment process will be interrupted and the ***Adjustment Diagnostic*** dialog box will display (Figure 6-17).

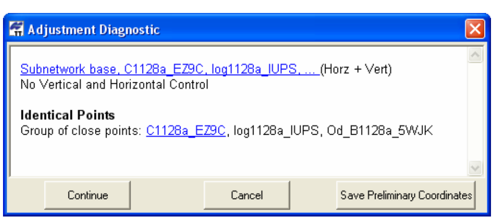


Figure 6-17. Messages After Searching of the Identical Point

The adjustment process can be continued or can be restarted after making changes to the data.

- Click **Continue** to continue the network adjustment.
- Click the hyperlink to access the data that caused the error. Edit the data and click **Restart** to continue the network adjustment.

Adjustment Test: Analysis of the Network

The network analysis test identifies the network components that either have no common connections or have weak connections with other components. This test only works on TS observations that have incomplete angle or distance measurements.

- In the absence of a severe error, the he isolated components will be adjusted separately.
- If a severe error exists, the network adjustment will stop for ALL components of the network and the ***Adjustment Diagnostic*** dialog box will display (Figure 6-18). For every component, the dialog box shows the existence/absence of horizontal and vertical control point(s).

If no control points are set for the network, a free adjustment will be performed.

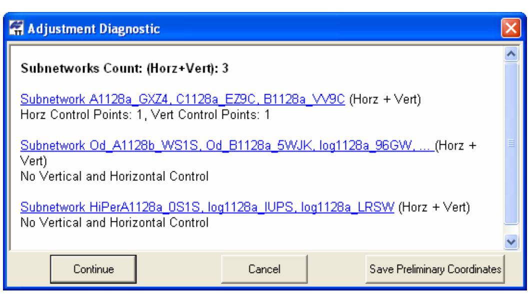


Figure 6-18. Messages After Analysis of the Net Components

The adjustment process can be continued or can be restarted after making changes to the data.

- Click **Continue** to continue the network adjustment.

- Click the hyperlink to access the data that caused the error. Edit the data and click **Restart** to continue the network adjustment.

Adjustment Test: Analysis of Vertical and Horizontal Control Point(s)

When the current job contains control points, an analysis will determine if the control point has vertical and horizontal coordinates.

- If only vertical control point(s) are found, the adjustment process stops and the *Adjustment Diagnostic* dialog box will display (Figure 6-19). Click **Continue** to perform ONLY a vertical adjustment of the network.

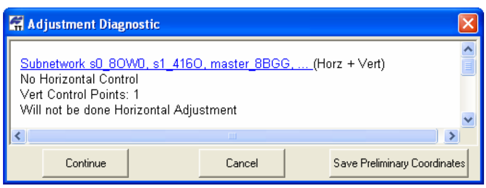


Figure 6-19. Only Vertical Control Point(s)

- If only horizontal control point(s) are found, the adjustment process stops and the *Adjustment Diagnostic* dialog box will display (Figure 6-20). Click **Continue** to perform ONLY a horizontal adjustment of the network.

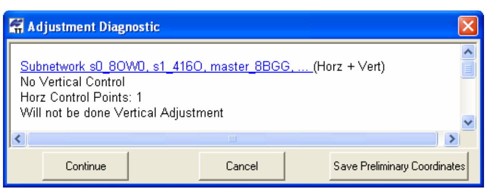


Figure 6-20. Only Horizontal Control Point(s)

Adjustment Test: Analysis of Consistency of Control

If more than one control point is used for the horizontal/vertical adjustment, the adjustment process also checks the accuracy of the control coordinates. The control tie analysis test compares control coordinates with the appropriate coordinates computed using GPS/TS/DL observations. The resulting residuals are used to estimate the accuracy of the local geodetic reference net being used and to find possible error with the control coordinates.

The ***Process properties*** dialog box and *Adjustment* tab enable/disables the "Control Tie Analysis" test to the adjustment process (Figure 6-13 on page 6-12). The test will pass or fail based on the values set in the *Point Precisions* tab of the ***Job Configuration*** dialog box (**Job ▸ Job Configuration ▸ Quality Control**).

- A successful test is where the difference is less than horizontal/vertical precision set in the ***Job Configuration*** dialog box.
- A failed test is where the difference is more than the value of horizontal/vertical precision set in the ***Job Configuration*** dialog box. The network adjustment process will be interrupted and the ***Control Tie Analysis*** dialog box will display (Figure 6-21).

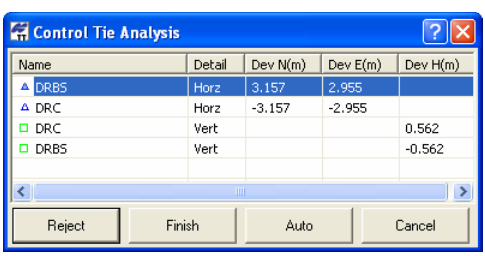


Figure 6-21. Control Tie Analysis

The adjustment process can be stopped, continued, altered, or restarted after making changes to the data.

- Click **Cancel** to stop the Control Tie analysis.
- Click **Finish** to continue the Control Tie analysis without making changes.

- Select a control point and click **Reject** to stop using it as a control point and restart the Control Tie analysis.
- Click **Auto** to automatically stop using the points with a maximum value of residual as control points and restart the Control Tie analysis.

Evaluating the Quality of the Adjusted Network

The quality of the adjusted network can be evaluated using either the quality control test or the tau criterion test.

1. Click **Process ▸ Process Properties**.
2. On the Adjustment tab, select the desired rejection criterion (Figure 6-22).

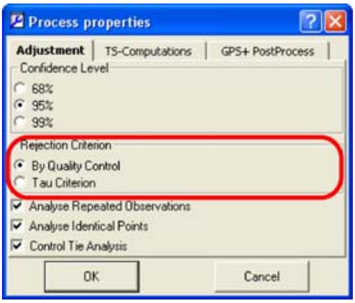


Figure 6-22. Select Rejection Criterion Test

3. To enable/disable using a bad observation for network adjustment, double-click the Autoreject column for the desired GPS/TS observation(s) and select the desired usage.
   - Allowed – a bad observation will be automatically rejected from the network adjustment.
   - Not Allowed – a bad observation will be included in the network adjustment. Observations with any residual values will be used in the network adjustment.

Figure 6-23. Allowing/Not Allowing Bad Observations in Network Adjustments

Network components will be retained for adjustment based on the values set in the *GPS Obs Precision* / *TS Obs Precision* tabs of the ***Job Configuration*** dialog box (**Job ▸ Job Configuration ▸ Quality Control**).

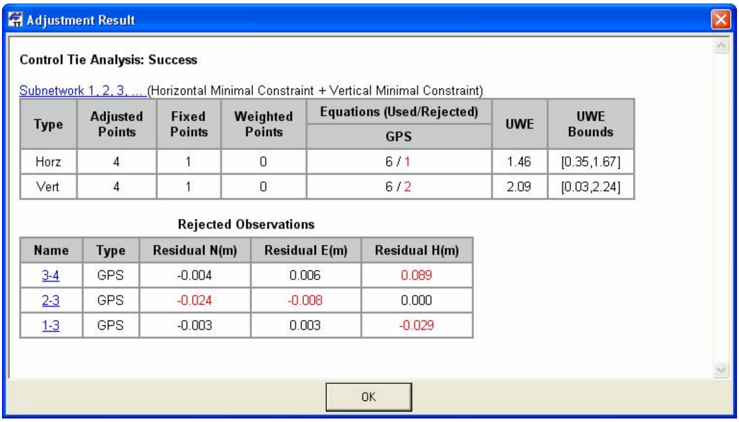
- A “By Quality Control” test will reject the following network components from the adjustment with residuals worse than the values set for the current job. These residials are calculated in the adjustment process for the closed figures and/or for repeated observations in the network.
  - – all plane components of the GPS observations and distances and/or horizontal angles of the TS observations for plane adjustment
  - – all height components of the GPS observations and vertical angles of the TS observation for vertical adjustment
- A “Tau Criterion” test will reject the following network components from the adjustment with a Tau value more than $\text{Tau}_{\text{critical}}$. These residials are calculated in the adjustment process for the closed figures and/or for repeated observations in the network.
  - – all plane components of the GPS observations and distances and/or horizontal angles of the TS observations for plane adjustment
  - – all height components of the GPS observations and vertical angles of the TS observation for vertical adjustment

  The formula for calculating Tau is: $Tau = (RES) / \delta_{Res}$

  where “*(RES)*” designates the residual calculated for the corresponding component of the observation and “δ_{Res}” is the RMS residual error.

  Note that $\text{Tau}_{\text{critical}}$ depends on the number of degrees of freedom and the selected level of confidence (Figure 6-22 on page 6-19).

When the network adjustment completes the ***Adjustment Result*** dialog box will display (Figure 6-24 on page 6-21).



Adjustment Result

Control Tie Analysis: Success

Subnetwork 1, 2, 3, ... (Horizontal Minimal Constraint + Vertical Minimal Constraint)

Type	Adjusted Points	Fixed Points	Weighted Points	Equations (Used/Rejected)	UWE	UWE Bounds
				GPS		
Horz	4	1	0	6 / 1	1.46	[0.35,1.67]
Vert	4	1	0	6 / 2	2.09	[0.03,2.24]

Rejected Observations

Name	Type	Residual N(m)	Residual E(m)	Residual H(m)
3-4	GPS	-0.004	0.006	0.089
2-3	GPS	-0.024	-0.008	0.000
1-3	GPS	-0.003	0.003	-0.029

OK

Figure 6-24. Adjustment Results

The results of every test performed on the network will be listed, and will display the following information:

- The results of the Control Tie analysis, either successful or not successful. If not successful, a list control points that will not be used as fixed control for horizontal/vertical network adjustment will be included.

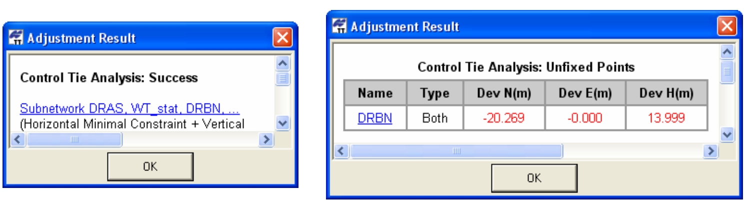


Figure 6-25. Control Tie Results – Successful and Not Successful Examples

- The type of the network adjustment, either free (inner) adjustment, horizontal only adjustment, vertical only adjustment, adjustment with one point in horizontal and vertical control, or adjustment with several points in horizontal and vertical control (Figure 6-26 on page 6-22).

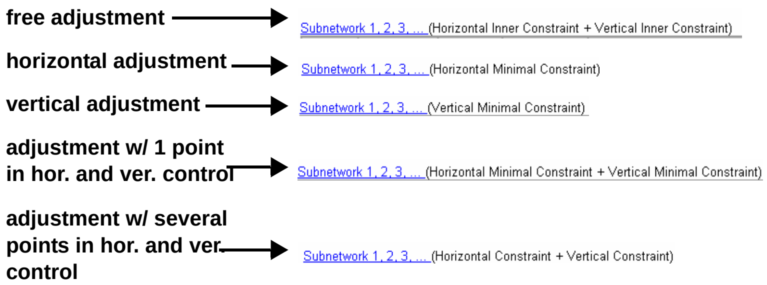
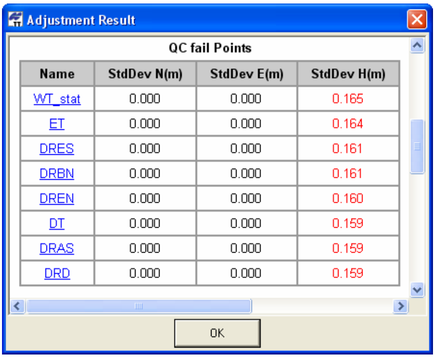


Figure 6-26. Types of Network Adjustments

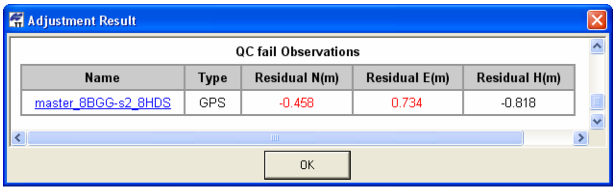
- The horizontal and vertical adjustments, separately, for the adjusted network, including: the quantity of adjusted points, fixed points and weighted points, the quantity of used observations and rejected observations, errors of unit weight (UWE) and UWE bounds.
- The rejected observations (or the components of observations), if applicable. This table displays the components of observations in red if they are rejected from the network and are not used in the final adjustment.
- The points with precisions worse than the values set for the current job.



Name	StdDev N(m)	StdDev E(m)	StdDev H(m)
WT_stat	0.000	0.000	0.165
ET	0.000	0.000	0.164
DRES	0.000	0.000	0.161
DRBN	0.000	0.000	0.161
DREN	0.000	0.000	0.160
DT	0.000	0.000	0.159
DRAS	0.000	0.000	0.159
DRD	0.000	0.000	0.159

Figure 6-27. Adjustment Results for Point Precisions

- The observations with residuals worse than the values set for the current job.



Name	Type	Residual N(m)	Residual E(m)	Residual H(m)
master_8BGG-s2_8HDS	GPS	-0.458	0.734	-0.818

Figure 6-28. Adjustment Results for Observation Residuals

After the adjustment the Map and Tabular views update with the adjusted data.

- In the Map view, adjusted points are displayed as a circle icon with equatorial lines, and observations are displayed as red lines if a component(s) of this observation was rejected from the network adjustment.

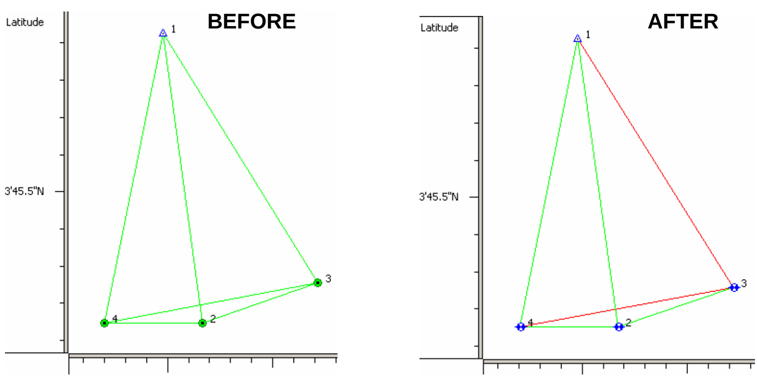


Figure 6-29. Map View – Example of Adjustment

- In the Tabular view, information on the adjustment displays in the following data columns:
  - – The *Points* tab displays the point's standard deviation.
  - – The *TS Obs* / *GPS Obs* tabs display observation residuals.

Std Dev n (m)	Std Dev e (m)	Std Dev Hz (m)	Std Dev u (m)
0.000	0.000	0.000	0.000
0.002	0.002	0.003	0.007
0.003	0.002	0.004	0.007
0.005	0.004	0.007	0.012

Adjustment Sta...	Res n (m)	Res e (m)	Res u (m)
Adjusted	-0.007	0.013	-0.009
Adjusted	0.007	0.003	-0.006
Adjusted	-0.002	-0.002	-0.002
Adjusted	0.002	0.000	-0.001
Adjusted	-0.002	-0.000	0.001
Adjusted	0.002	-0.002	0.002

Figure 6-30. Points and Obs Tabs – Examples of Adjustment

Viewing the Adjustment Report

After adjusting data in Topcon Tools, the adjustment report provides a summary of adjustments made to measured vectors.

Click **Report ▸ Adjustment** (Figure 6-31) to view the adjustment report,

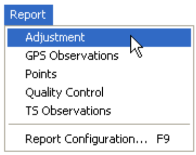


Figure 6-31. View Adjustment Report

The ***Adjustment Report*** opens in a separate window and displays information about the adjustment. See "Adjustment Report" on page 7-2 for details.

- To save the report as a file, click the **Save As** button. Enter the location and name information, then click **Save**.
- To copy the report to a text editor such as Microsoft® Word or Outlook Express, click the **Select All** then **Copy** buttons. Open the desired application and **paste** the information.
- To print the report, click the **Print** button.

Processing Loop Closures and Viewing the Report

Loop closures use GPS observations (vectors) that form a closed loop to sum all vectors in the loop to get a resulting residual vector close to zero. This residual is compared against a threshold value (*Horz Tolerance* and *Vert Tolerance*). The threshold values calculated as

$$\text{Horiz Tolerance} = \text{Horiz Tolerance abs} + \text{Horiz Tolerance rel} \bullet \text{Length} \bullet 10^{-6}$$

$$\text{Vert Tolerance} = \text{Vert Tolerance abs} + \text{Vert Tolerance rel} \bullet \text{Length} \bullet 10^{-6}$$

where the values of the *HorzTolerance abs / Vert Tolerance abs* and *Horz Tolerance rel/ Vert Tolerance rel* are configured in **Job Configuration ▸ Quality Control ▸** *Loop Closure* tab.

The residual shows as red in the report, if the value of the residual is greater than this threshold.

1. To generate a loop closure report, click **Process ▸ Loop closures**. The ***Loop closures*** dialog box will display (Figure 6-32).

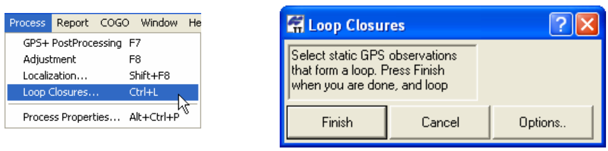


Figure 6-32. Process Loop Closure

2. On the main screen (Map View or *GPS Observations* tab) select static GPS observations that form a loop(s) (Figure 6-33).

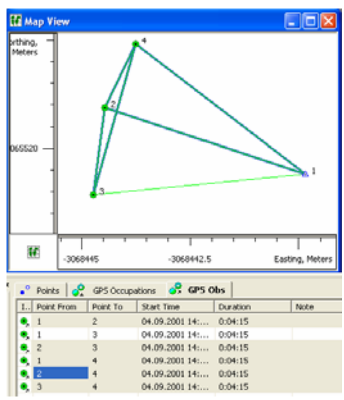


Figure 6-33. Select Vectors the Form a Loop

3. Perform one of the following to view or edit the loop closure report:
   - Click **Finish** on the ***Loop closures*** dialog box to display the standard Loop Closure Report. The standard Loop Closures Report opens in a separate window (Figure 6-34).
   - Click **Cancel** on the ***Loop closures*** dialog box to stop creating of the Loop Closure Report.
   - Click **Options** on the ***Loop closures*** dialog box to edit the configuration of the standard Loop Closure Report. See “Editing Loop Closure Report Options” on page 6-26 for more information.

Loop Closures							
Loop	**dHz (m)**	**dU (m)**	**Horz Tolerance (m)**	**Vert Tolerance (m)**	**dHz (ppm)**	**dU (ppm)**	**Length (m)**
1-2(04.09.2001 14:07:43) 1-4(04.09.2001 14:07:43) 2-4(04.09.2001 14:07:43)	0.0024	0.0007	0.0301	0.0401	201.67	58.32	12.097
2-3(04.09.2001 14:07:43) 2-4(04.09.2001 14:07:43) 3-4(04.09.2001 14:07:43)	0.0179	0.0535	0.03	0.04	2259.98	6749.8	7.9293

Figure 6-34. View Loop Closure Report

The standard Loop Closure Report displays the following information about selected static GPS observations:

- Loop – the observations that form a closed loop.
- dHz and dU – displays the absolute horizontal and vertical misclosures for the given loop.
- Horz Tolerance / Vert Tolerance (m) – the threshold values used during the process.
- dHz (ppm), dU (ppm) – the accuracy of the loop in parts per million.
- Length (m) – the length of the loop.

Editing Loop Closure Report Options

To edit the type of information that displays on the Loop Closure Report, click **Options** on the ***Loop closures*** dialog box

The window *Loop Closure Report Options* will be displayed after clicking **Options** on the ***Loop closures*** dialog box.

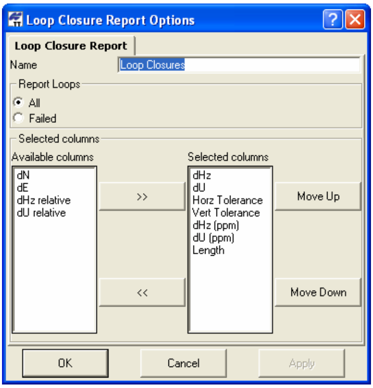


Figure 6-35. Loop Closure Report Options

Using the ***Loop Closure Report Options*** dialog box, select and/or arrange the informational columns that will display on the report. Click **Ok** when done, then run the report as described above.

- To rename the report (create customized loop closure reports), enter a name for the report.
- If adding items to the report, select the items to include in the left column and click the move right (**>>**) button.
- If removing items from the report, select the items to remove and click the move left **(<<)** button.
- Use the **Move Up** and **Move Down** buttons to order included/ existed items.

Localization

Localization involves comparing and computing local jobsite coordinates with a global reference system.

A GPS+ system is capable of precise positioning, but the positions it computes are relative to a global reference system defined in terms of a geographic latitude, longitude, and height above the earth's surface. To be useful for local site work, global GPS coordinates need to be converted into local site coordinates, defined in terms of a distance north and east of some origin point and some distance above an elevation datum. These north, east, and elevation coordinates (often abbreviated to NEZ coordinates) can be regional coordinates system—for example, a state plane system in the United States—or the project's survey crew may arbitrarily define these coordinates for the specific site. NEZ coordinates must be defined in terms of the construction design data. In either case, a mathematical conversion is necessary to turn global GPS coordinates into NEZ coordinates relative to the locally defined coordinate system.

The basic approach to calculating the mathematical conversion is to provide pairs of point coordinates for each Control Point on the project. A point pair consists of:

- local NEZ coordinates for the point (obtained from the project's survey crew), and

- global latitude, longitude, and height coordinates for the point.

These pairs of points are needed to calculate an approximate mathematical conversion formula for converting all global GPS coordinates (generated in the GPS+ or GPS receiver) to local NEZ coordinates for a particular project.

Use the following guidelines to ensure high-quality localization:

- The surveyor's local Control Points must be precisely measured. The quality of measurements directly affects accuracies.
- The Control Points should be located more or less evenly around the site. Generally, the more Control Points the better, but if they are clustered together or are all at one section of the site, then localization results will be less than ideal.

  A good rule of thumb is to locate Control Points evenly distributed around a perimeter of the site or grading area. While not directly related to the quality of localization, Control Points should be elevated, easily accessible, and clear of trees, buildings, other structures, moving vehicles, etc.

If the job has already been localized, it will automatically be re-localized when any data changes.

Horizontal and Vertical Localization Determinations

In Topcon Tools (and Topcon Link and TopSURV), horizontal localization and vertical localization are performed separately.

- Horizontal localizations use two-dimensional conformal transformations. This kind of transformation is also known as a four-parameter similarity transformation (rotation (α), scale and two translation parameters (DX, DY)). To relate the points' ellipsoidal geodesic coordinates (measured with GNSS receivers) to local plane coordinates (obtained with total stations, etc.), an oblique stereographic map projection is used as an intermediate step:

$$\begin{bmatrix} X \\ Y \end{bmatrix}_{Local} = Scale \cdot \begin{bmatrix} \cos\alpha - \sin\alpha \\ \sin\alpha \cos\alpha \end{bmatrix} \cdot \begin{bmatrix} N \\ E \end{bmatrix}_{Stereo} + \begin{bmatrix} DX \\ DY \end{bmatrix}$$

- Vertical localizations use a three-parameter transformation (one shift (HO) and two slopes (Hx, Hy)) to convert between the points' ellipsoidal or orthometric heights and the elevations in the local height system. These three parameters are necessary in order to specify the plane that would adequately model the difference between the local geoid and the WGS84 ellipsoid in the given local area:

$$H_{Local} = U + Ho + Hx \cdot N_{Stereo} + Hy \cdot E_{Stereo}$$

Topcon Tools (and Topcon Link and TopSURV) uses an algorithm for localization that computes parameters for conversion from WGS84 to a local system using one, two, or more Control Points with known coordinates in both systems. If a geoid is present in the job, Topcon Tools will use the geoid to during the localization. The geoid model is used to correct local heights for the geoid before computer localization parameters; consequently, localization parameters will be different with or without a geoid in the job. The presence of a geoid will not significantly affect localization results when using three or more vertical controls, but will improve localization quality if using less than three vertical controls.

- When using ONE control point, the following assumptions have already been determined (Table 6-1):

Table 6-1. Localization with One Control Point

For Horizontal Localization	The system is oriented to North. The Horizontal scale factor (K_h) is set to one. The horizontal offsets (DX, DY) are computed.
For Vertical Localization	The components of the deflection of vertical are set to zero. The vertical offset is determined.
For Horizontal and Vertical Localization	The system is oriented North. The combined scale factor is set to $K_{comb} = K_h \cdot K_v = (1 \cdot (1 + U/R))$, where R is the average radius of curvature. The components of deflection of vertical are set to zero. The horizontal (DX, DY) and vertical (DH) offsets, azimuth (rotation), and scale factor are computed.

- When using TWO control points, the following have already been determined for horizontal and vertical localization:
  – The components of deflection of vertical are set to zero.
  – The horizontal (DX, DY) and vertical (DH) offsets, azimuth (rotation), and scale factor are computed.
- When using THREE or more control points, the horizontal (DX, DY) and vertical (DH) offsets, azimuth (rotation), scale factor, and components of deflection of vertical are computed for horizontal and vertical localization.

Accuracy Estimation for Localization Parameters

Localization parameters are estimated using the least-mean-square method in the following two instances:

- When three or more control points are used for horizontal localization.
- When three or more control points are available for horizontal and vertical localization.

The ***Localization*** dialog box will display the residuals for all control points (Figure 6-36).

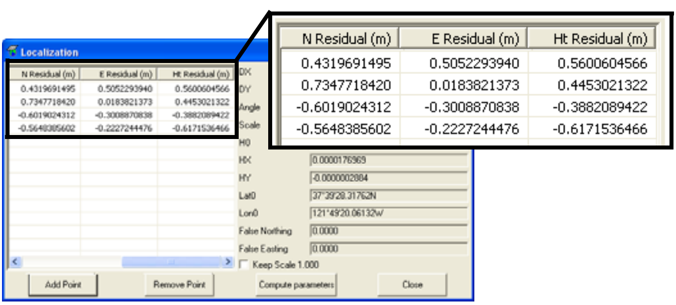


Figure 6-36. Localization Residuals

When using fewer than three control points for localization, the residual are computed with the following values:

- When using ONE control point, the horizontal and vertical residuals will equal zero.

- When using TWO control points, the horizontal residuals are equal to zero, but the vertical residual can have a value different from zero.
- When using THREE control points, the horizontal residuals are equal to zero, but the vertical residual can have a value different from zero.

Localizing the Job

NOTICE

NOTICE

Import a coordinate file before localizing.

To localize global coordinates to site coordinates, first import a local coordinate file into the job file, then import the desired point file. If importing a TopSURV™ job file with pre-computed localization, the localization parameters will also be imported.

1. To import a control file, click **File ▸ Import**. Navigate to and select the desired WGS84 coordinate file, then click **Open** (Figure 6-37).

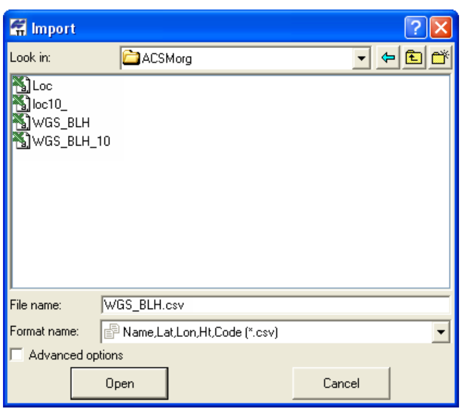


Figure 6-37. Import Coordinate File

The Tabular and Map views display the coordinate file's information.

2. Click **Process ▸ Localization** or press **Shift+F8** to open the ***Localization*** dialog box. Click **Add Point** (Figure 6-38).

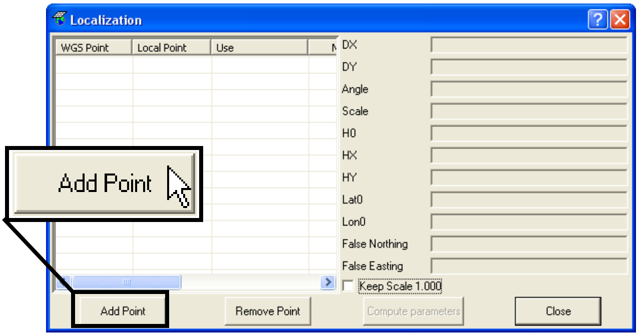


Figure 6-38. Add Point to Localize

3. Select the following information (Figure 6-39):
   - The point to include in the localization from the *WGS Point* drop-down list.
   - A corresponding point in the *Local Point* column.
   - The point type in the *Use* column.

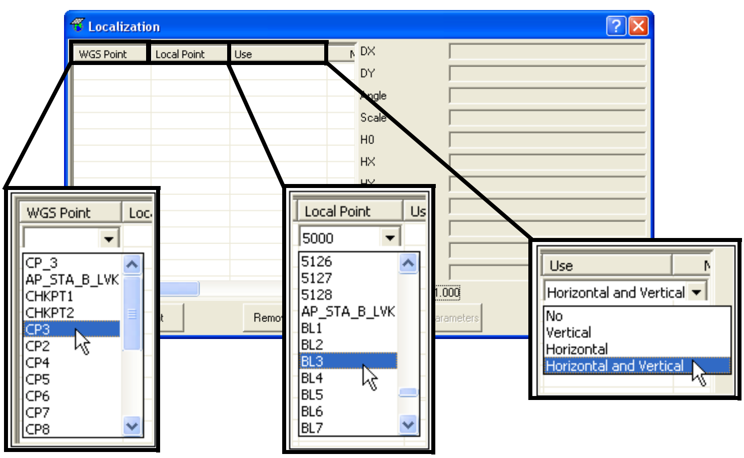


Figure 6-39. Select WGS, Local Point, and Use Data

4. Click **Add Point** and repeat steps 2 and 3 until all desired points are added to the localization table.

5. To ensure a scale of one for localization computation, enable **Keep Scale 1.000** before computing localization parameters.
6. Click **Compute parameters** to localize the GPS coordinates (Figure 6-40).
   - The *North*, *East*, and *Height* residual columns in the left panel display compound values after computing localization.
   - The right panel displays the localization parameters for the entered WGS and Local points.

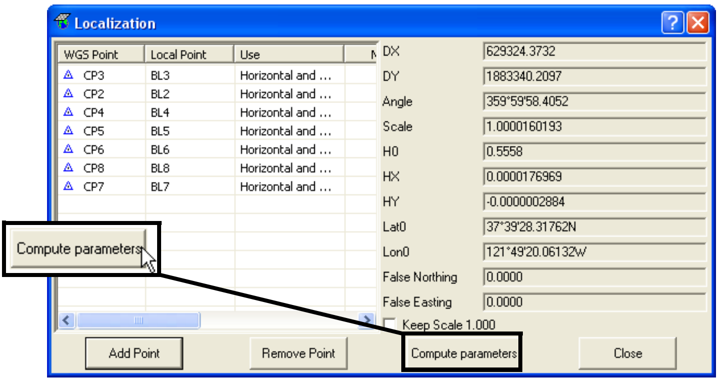


Figure 6-40. Localized Coordinate Points

After computing the localization, these parameters will be used to transfer WGS coordinates into local coordinates, and vice versa.

The Tabular View and Map View update with the localized coordinates. Figure 6-41 on page 6-34 shows before and after localization views of the Map and Tabular views.

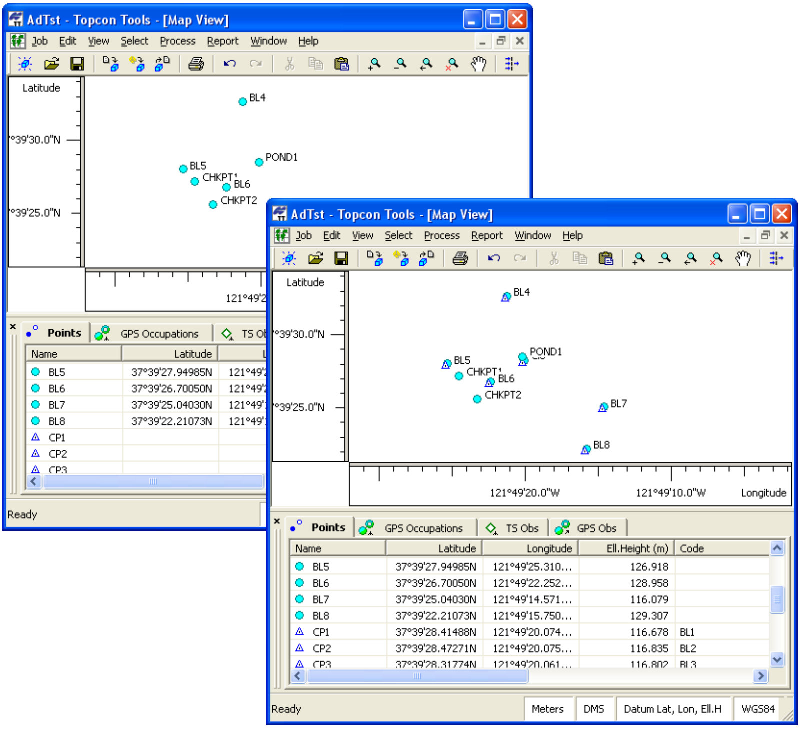


Figure 6-41. Map and Tabular Views Before and After Localization

Reporting

Topcon Tools processes reports based on desired information and report parameters for viewing data summaries.

Besides reports, Topcon Tools supports many different file formats for exporting data to be used in other software or devices.

Standard Reports

Reports provide a way to view data offline, or to track data through changes when report versions are saved to the computer. Reports also provide a quick summary of information in a relatively compact form.

The following sections describe default reports and their initial report items. See "Customized Reports" on page 7-14 for changing the report's information.

- To save a report as a file, click the **Save As** button. Enter the location and name information, then click **Save**.
- To copy a report to a text editor such as Microsoft® Word or Outlook Express, click the **Select All** then **Copy** buttons. Open the desired application and **paste** the information.
- To print a report, click the **Print** button.

Adjustment Report

To view the adjustments summary report, click **Report ▸ Adjustment**.

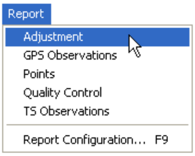


Figure 7-1. View Adjustment Report

The default Adjustment report has the following fields that include applicable information (Figure 7-2 on page 7-3):

- Project Summary
- Adjustment Summary
- Used GPS Observations
- GPS Observations Residuals
- Control Points
- Adjusted Points

File Edit Help

Save As... Select All Copy Print

TOPCON

Project Summary

Project name: **London Place.ttp**
Surveyor:
Comment:
Linear unit: **Meters**
Projection: **SPC83-Alaska (Zone 10)**
Geoid:

Adjustment Summary

Adjustment type: **Minimal constraint**
Confidence level: **95**
A posteriori standard error of unit weight: **1,384347**
Number of adjusted points: **3**
Number of plane control points: **1**
Number of height control points: **1**
Total number of vectors: **6**
Number of used vectors: **6**
Number of rejected vectors: **2**

Used GPS Observations

Name	Solution Type	dn (m)	de (m)	du (m)	Distance (m)	Horizontal Precision (m)	Vertical Precision (m)
master_8BGG-s0_8OW0	Fixed	-4,828	0,668	-0,534	4,903	0,005	0,007
master_8BGG-s1_416O	Fixed	-4,151	2,589	-1,747	5,195	0,004	0,007
master_8BGG-s2_8HDS	Fixed	-4,828	-0,978	-1,702	5,212	0,003	0,004
s0_8OW0-s1_416O	Fixed	0,654	1,914	-1,173	2,338	0,003	0,004
s0_8OW0-s2_8HDS	Fixed	-0,002	-1,641	-1,149	2,003	0,001	0,002
s1_416O-s2_8HDS	Fixed	-0,684	-3,558	0,111	3,625	0,005	0,008

GPS Observation Residuals

Name	Res n (m)	Res e (m)	Res u (m)	Status
master_8BGG-s0_8OW0	-0,000	0,006	0,013	Adjusted
master_8BGG-s1_416O	0,000	0,000	0,000	Adjusted
master_8BGG-s2_8HDS	0,001	-0,000	-0,004	Adjusted
s0_8OW0-s1_416O	-0,022	-0,013	0,027	Auto-Rejected
s0_8OW0-s2_8HDS	-0,001	-0,000	0,001	Adjusted
s1_416O-s2_8HDS	-0,006	0,010	0,062	Auto-Rejected

Control Points

Name	Grid Northing (m)	Grid Easting (m)	Elevation (m)	Code
s0_8OW0	7065521,302	-3068444,853	153,272	

Adjusted Points

Name	Grid Northing (m)	Grid Easting (m)	Elevation (m)	Code
master_8BGG	7065519,750	-3068440,230	153,819	Dome
s1_416O	7065519,273	-3068445,104	152,073	
s2_8HDS	7065522,774	-3068444,126	152,122	

Figure 7-2. Printable Adjustment Summary Report

GPS Observations Report

To view the GPS Observations report, click **Report ▸ GPS Observations**.

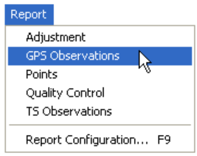
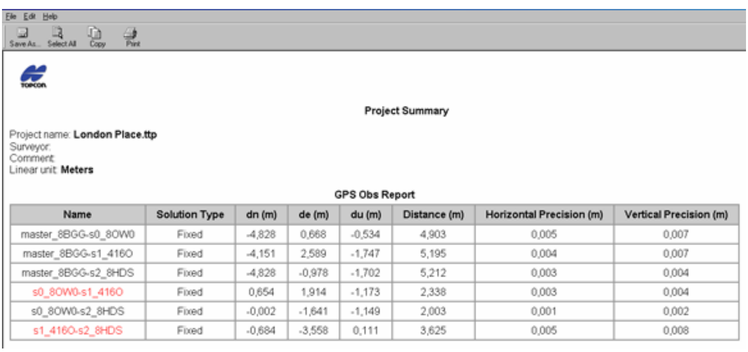


Figure 7-3. View GPS Observations Report

The default GPS Observations report has the following fields that include applicable information:

- Project Summary
- GPS Observations



Project Summary

Project name: **London Place.ttp**
Surveyor:
Comment:
Linear unit: **Meters**

GPS Obs Report

Name	Solution Type	dn (m)	de (m)	du (m)	Distance (m)	Horizontal Precision (m)	Vertical Precision (m)
master_8BGG-s0_8OW0	Fixed	-4,828	0,668	-0,534	4,903	0,005	0,007
master_8BGG-s1_416O	Fixed	-4,151	2,589	-1,747	5,195	0,004	0,007
master_8BGG-s2_8HDS	Fixed	-4,828	-0,978	-1,702	5,212	0,003	0,004
s0_8OW0-s1_416O	Fixed	0,654	1,914	-1,173	2,338	0,003	0,004
s0_8OW0-s2_8HDS	Fixed	-0,002	-1,641	-1,149	2,003	0,001	0,002
s1_416O-s2_8HDS	Fixed	-0,684	-3,558	0,111	3,625	0,005	0,008

Figure 7-4. Printable GPS Obs Report

Points Report

To view the Points report, click **Report ▸ Points**.

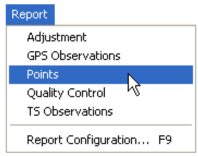
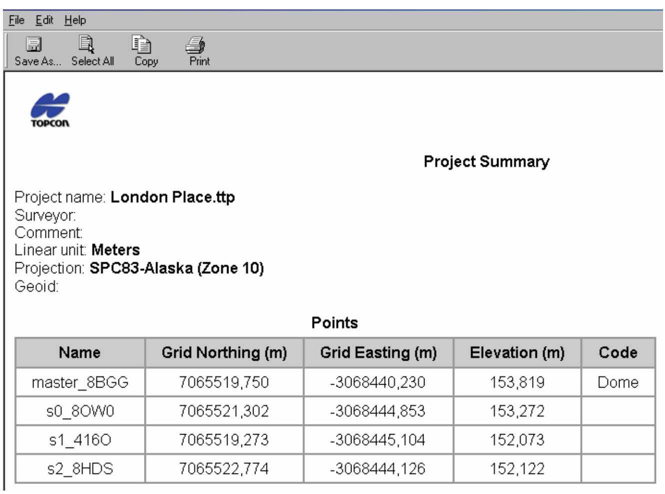


Figure 7-5. View Points Report

The default Points report has the following fields that include applicable information:

- Project Summary
- Points



Project Summary

Project name: **London Place.ttp**
Surveyor:
Comment:
Linear unit: **Meters**
Projection: **SPC83-Alaska (Zone 10)**
Geoid:

Points

Name	Grid Northing (m)	Grid Easting (m)	Elevation (m)	Code
master_8BGG	7065519,750	-3068440,230	153,819	Dome
s0_8OW0	7065521,302	-3068444,853	153,272	
s1_416O	7065519,273	-3068445,104	152,073	
s2_8HDS	7065522,774	-3068444,126	152,122	

Figure 7-6. Printable Points Report

Quality Control Report

To view the Quality Control report, click **Report ▸ Quality Control**.

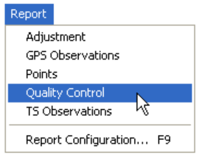
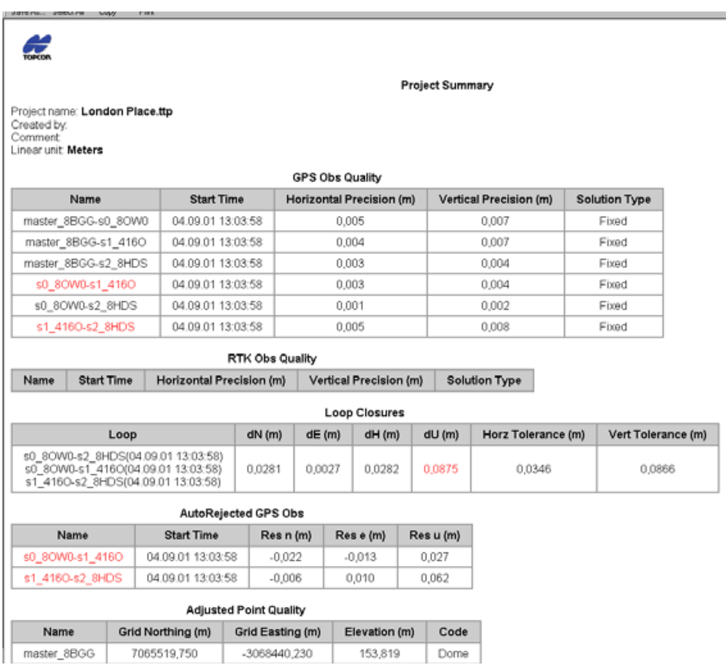


Figure 7-7. View Quality Control Report

The default Quality Control report has the following fields that include applicable information:

- Project Summary
- GPS Obs Quality
- RTK Obs Quality
- Repeated Observations
- Failed Loop Closures
- Identical Points
- Misnamed GPS Occupations
- AutoRejected GPS Obs
- Adjusted Point Quality



Project Summary

Project name: **London Place.ttp**
Created by:
Comment:
Linear unit: **Meters**

GPS Obs Quality

Name	Start Time	Horizontal Precision (m)	Vertical Precision (m)	Solution Type
master_8BGG-s0_8OW0	04.09.01 13:03:58	0,005	0,007	Fixed
master_8BGG-s1_416O	04.09.01 13:03:58	0,004	0,007	Fixed
master_8BGG-s2_8HDS	04.09.01 13:03:58	0,003	0,004	Fixed
s0_8OW0-s1_416O	04.09.01 13:03:58	0,003	0,004	Fixed
s0_8OW0-s2_8HDS	04.09.01 13:03:58	0,001	0,002	Fixed
s1_416O-s2_8HDS	04.09.01 13:03:58	0,005	0,008	Fixed

RTK Obs Quality

Name	Start Time	Horizontal Precision (m)	Vertical Precision (m)	Solution Type

Loop Closures

Loop	dN (m)	dE (m)	dH (m)	dU (m)	Horz Tolerance (m)	Vert Tolerance (m)
s0_8OW0-s2_8HDS(04.09.01 13:03:58) s0_8OW0-s1_416O(04.09.01 13:03:58) s1_416O-s2_8HDS(04.09.01 13:03:58)	0,0281	0,0027	0,0282	0,0875	0,0346	0,0866

AutoRejected GPS Obs

Name	Start Time	Res n (m)	Res e (m)	Res u (m)
s0_8OW0-s1_416O	04.09.01 13:03:58	-0,022	-0,013	0,027
s1_416O-s2_8HDS	04.09.01 13:03:58	-0,006	0,010	0,062

Adjusted Point Quality

Name	Grid Northing (m)	Grid Easting (m)	Elevation (m)	Code
master_8BGG	7065519,750	-3068440,230	153,819	Dome

Figure 7-8. Printable Quality Control Report

TS Observations Report

To view the TS Observations report, click **Report ▸ TS Observations**.

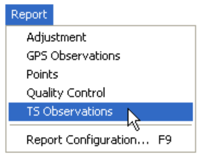
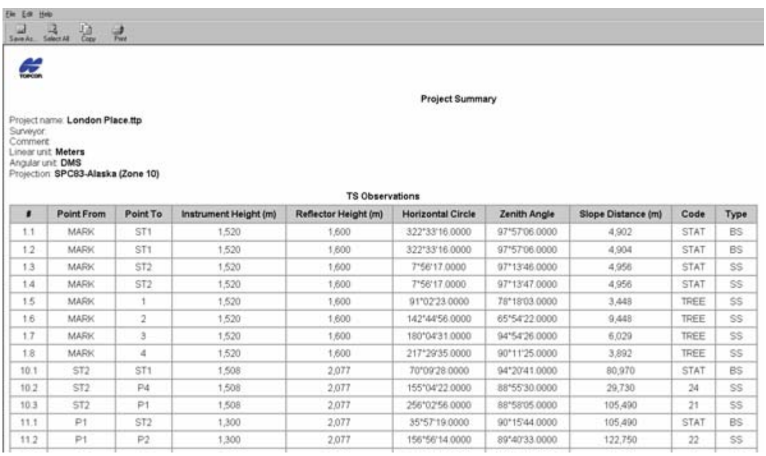


Figure 7-9. View TS Observations Report

The default TS Observations report has the following fields that include applicable information:

- Project Summary
- TS Observations



Project Summary

Project name: **London Place.ttp**
Surveyor:
Comment:
Linear unit: **Meters**
Angular unit: **DMS**
Projection: **SPC83-Alaska (Zone 10)**

TS Observations

#	Point From	Point To	Instrument Height (m)	Reflector Height (m)	Horizontal Circle	Zenith Angle	Slope Distance (m)	Code	Type
1.1	MARK	ST1	1,520	1,600	322°33'16.0000	97°57'06.0000	4,902	STAT	BS
1.2	MARK	ST1	1,520	1,600	322°33'16.0000	97°57'06.0000	4,904	STAT	BS
1.3	MARK	ST2	1,520	1,600	7°56'17.0000	97°13'46.0000	4,956	STAT	SS
1.4	MARK	ST2	1,520	1,600	7°56'17.0000	97°13'47.0000	4,956	STAT	SS
1.5	MARK	1	1,520	1,600	91°02'23.0000	78°18'03.0000	3,448	TREE	SS
1.6	MARK	2	1,520	1,600	142°44'56.0000	65°54'22.0000	9,448	TREE	SS
1.7	MARK	3	1,520	1,600	180°04'31.0000	94°54'26.0000	6,029	TREE	SS
1.8	MARK	4	1,520	1,600	217°29'35.0000	90°11'25.0000	3,892	TREE	SS
10.1	ST2	ST1	1,508	2,077	70°09'28.0000	94°20'41.0000	80,970	STAT	BS
10.2	ST2	P4	1,508	2,077	155°04'22.0000	88°55'30.0000	29,730	24	SS
10.3	ST2	P1	1,508	2,077	256°02'56.0000	88°58'05.0000	105,490	21	SS
11.1	P1	ST2	1,300	2,077	35°57'19.0000	90°15'44.0000	105,490	STAT	BS
11.2	P1	P2	1,300	2,077	156°56'14.0000	89°40'33.0000	122,750	22	SS

Figure 7-10. Printable TS Observations Report

Cogo Inverse Report

To view the Inverse report, right-click in the bottom pane of the ***Inverse*** dialog box and click **Report**.

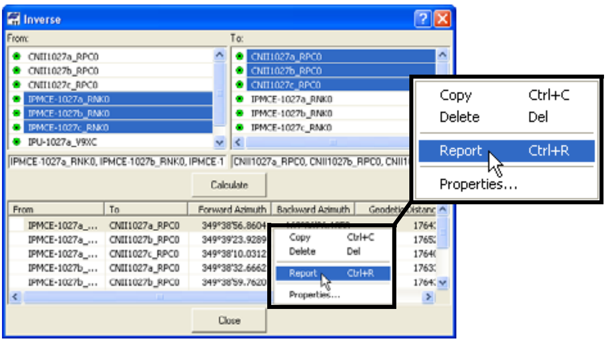
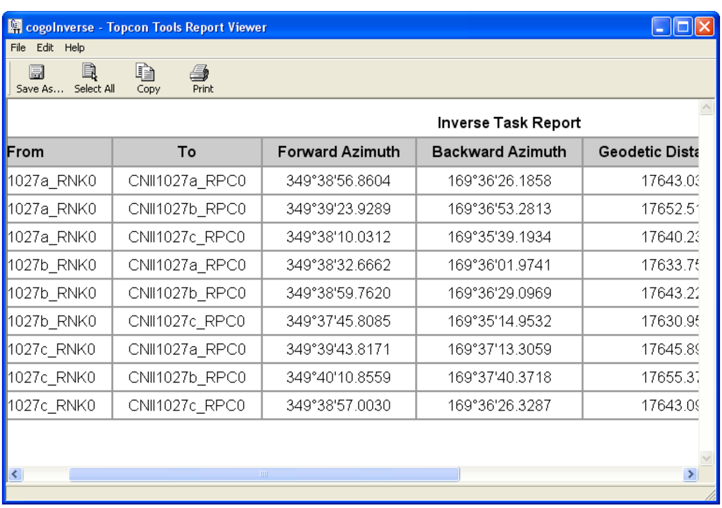


Figure 7-11. Inverse

The Inverse Task Report has the following fields:

- From and To points
- Forward and Backward Azimuths
- Geodetic and Ground Distances
- Delta Ell. Height



From	To	Forward Azimuth	Backward Azimuth	Geodetic Dista
1027a_RNK0	CNII1027a_RPC0	349°38'56.8604	169°36'26.1858	17643.0
1027a_RNK0	CNII1027b_RPC0	349°39'23.9289	169°36'53.2813	17652.5
1027a_RNK0	CNII1027c_RPC0	349°38'10.0312	169°35'39.1934	17640.2
1027b_RNK0	CNII1027a_RPC0	349°38'32.6662	169°36'01.9741	17633.7
1027b_RNK0	CNII1027b_RPC0	349°38'59.7620	169°36'29.0969	17643.2
1027b_RNK0	CNII1027c_RPC0	349°37'45.8085	169°35'14.9532	17630.9
1027c_RNK0	CNII1027a_RPC0	349°39'43.8171	169°37'13.3059	17645.8
1027c_RNK0	CNII1027b_RPC0	349°40'10.8559	169°37'40.3718	17655.3
1027c_RNK0	CNII1027c_RPC0	349°38'57.0030	169°36'26.3287	17643.0

Figure 7-12. Printable Inverse Report

Cogo Intersection Report

To view the Intersection report, right-click in the bottom pane of the ***Intersection*** dialog box and click **Report**.

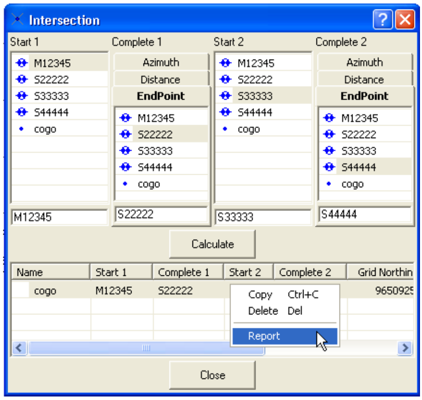
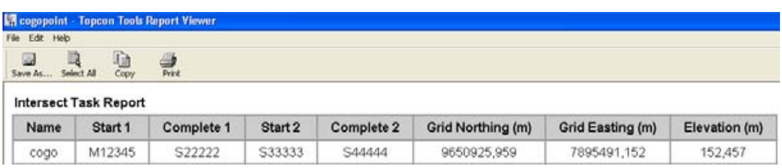


Figure 7-13. Intersection Dialog Box

The Inverse Task Report has the following fields:

- Name - the intersection point name (by default -'cogo')
- Start1 and Start2 - the start point name of the ray or the sphere
- Complete 1 / Complete 2 - the end point name or the azimuth for the ray or the distance for the sphere
- Latitude/ Longitude/Ell. Height or Northing/Easting/Elevation - displays the coordinate of the intersection (cogo) point



Intersect Task Report

Name	Start 1	Complete 1	Start 2	Complete 2	Grid Northing (m)	Grid Easting (m)	Elevation (m)
cogo	M12345	S22222	S33333	S44444	9650925.959	7895491.152	152.457

Figure 7-14. Printable Intersection Report

Cogo Compare Surfaces Report

To view the Compare Surfaces report, right-click in the bottom pane of the ***Compare Surfaces*** dialog box and click **Report**.

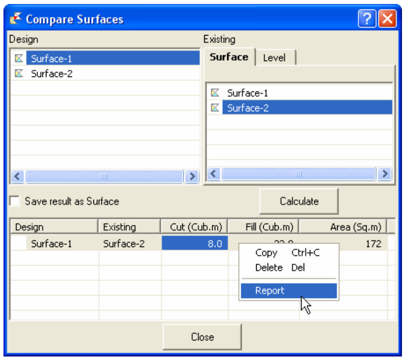


Figure 7-15. Compare Surfaces Dialog Box

The Compare Surfaces Task Report has the following fields:

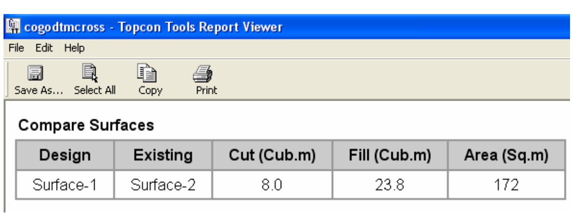
- Design/Existing - the names of the surfaces selected to calculate the difference between
- Cut / Fill - in the case of comparing two surfaces:

    the volume for cutting / filling needed for correction of the existing surface for the design surface

  - in the case of comparing surfaces and the horizontal plane:

    the volume for cutting / filling needed for creating of the design surface relative to the desired level

- Area - the common area of two surfaces or a surface and the horizontal plane



Compare Surfaces

Design	Existing	Cut (Cub.m)	Fill (Cub.m)	Area (Sq.m)
Surface-1	Surface-2	8.0	23.8	172

Figure 7-16. Printable Compare Surfaces Report

Cogo Inverse Point to Line Report

To view the Inverse Point to Line report, right-click in the bottom pane of the ***Inverse Point to Line*** dialog box and click **Report** (Figure 7-17).

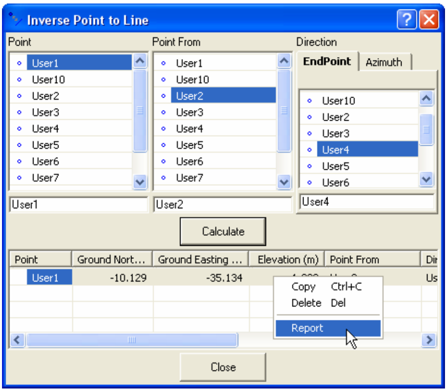


Figure 7-17. View Cogo Inverse Point to Line Report

The Inverse Point to Line Task Report has the following fields (Figure 7-18 on page 7-12):

- Name – the point name relative to which the software will calculate the offsets.
- Latitude/Longitude/Ell.Height or Grid Northing/Grid Easting/ Elevation or Ground Northing/Ground Easting/Elevation – the coordinates of this point.
- From Point – the name of the start point of the line (or ray).
- Direction – either the name of the line’s end point or the value of the azimuth.
- Offset Along – the value of the offset along the selected point from the given line. This value will be positive if the point is located to the right of the given line.
- Offset Across – the value of the offset across of the selected point from the given line. This value will be positive if the point is located in the direction of the given line, and will be negative if the point is located in the opposite direction of the line.

- Offset H – the height difference between the selected point and the start point of the line (ray).

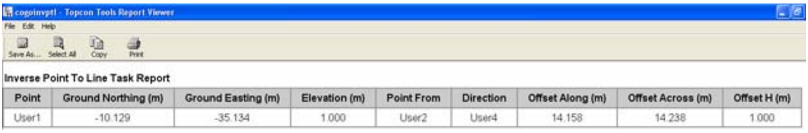


Figure 7-18. Printable Inverse Point to Line Report

Cogo Traverse Report

To view the Traverse report, right-click in the bottom pane of the ***Traverse*** dialog box and click **Report** (Figure 7-19).

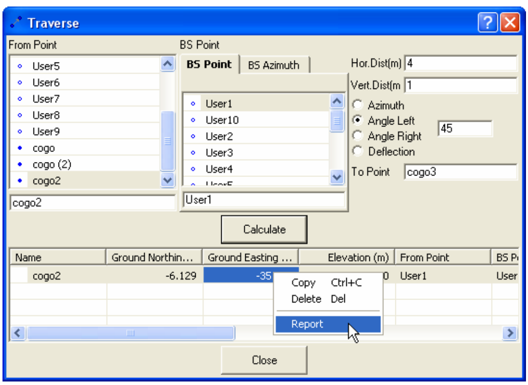
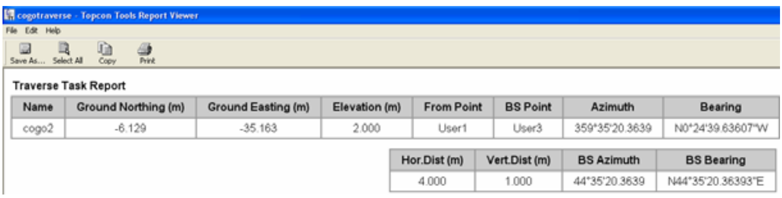


Figure 7-19. View Traverse Report

The Traverse Task Report has the following fields:

- Name – the traverse point name.
- Grid Northing/Grid Easting/Elevation or Ground Northing/ Ground Easting/Elevation – the calculated grid/ground coordinates of the traverse point.
- From Point – the station name.
- BS Point – the BS point name.
- Azimuth – the entered or calculated value of the azimuth from the station to the traverse point.

- Bearing – the calculated value of the bearing from the station to the traverse point.
- Hor. Dist /Vert. Dist – the horizontal/vertical offset from the station to the traverse point.
- BS Azimuth – the entered or calculated value of the azimuth of the direction line (ray) through the station.
- BS Bearing – the calculated value of the bearing of the direction line (ray) through the station.



Traverse Task Report

Name	Ground Northing (m)	Ground Easting (m)	Elevation (m)	From Point	BS Point	Azimuth	Bearing
cogo2	-6.129	-35.163	2.000	User1	User3	359°35'20.3639	N0°24'39.63607"W

Hor.Dist (m)	Vert.Dist (m)	BS Azimuth	BS Bearing
4.000	1.000	44°35'20.3639	N44°35'20.36393"E

Figure 7-20. Printable Traverse Report

Cogo Point In Direction Report

To view the Point In Direction report, right-click in the bottom pane of the ***Point In Direction*** dialog box and click **Report** (Figure 7-21).

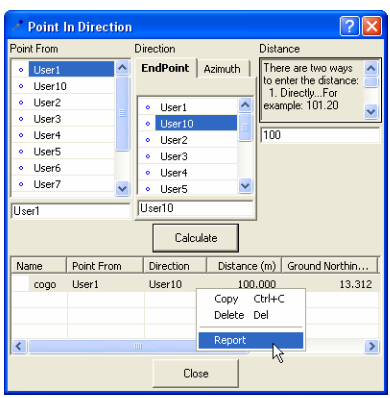
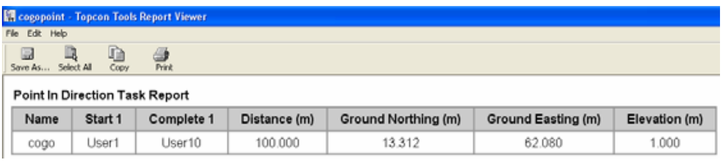


Figure 7-21. View Cogo Point In Direction Report

The Inverse Point In Direction Task Report has the following fields:

- Name – the name of the created (CoGo) point.

- Start1 – the name of the start point of the line (or ray).
- Complete1 – either the name of the line's end point or the value of the azimuth.
- Distance – the distance from the start point to the CoGo point along the selected line.
- Latitude/Longitude/Ell.Height or Grid Northing/Grid Easting/Elevation or Ground Northing/Ground Easting/Elevation – the coordinates of the CoGo point. Note that the Ell.Height or Elevation of the CoGo point equal to Ell.Height or Elevation of the start point of the line.



Point In Direction Task Report

Name	Start 1	Complete 1	Distance (m)	Ground Northing (m)	Ground Easting (m)	Elevation (m)
cogo	User1	User10	100.000	13.312	62.080	1.000

Figure 7-22. Printable Point In Direction Report

Customized Reports

Report customization allows you to include or exclude certain information from generated reports.

To configure a customized report, click **Report ▸ Report Configuration** (Figure 7-23).

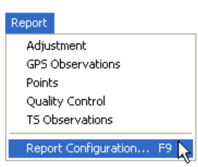


Figure 7-23. View Report Configuration

The ***Report Configuration*** dialog box provides a set of tools for displaying printed report information (Figure 7-24 on page 7-16).

- The *Reports* field displays current reports. Click a report to display its items.

- The **New report** button creates a new report. See “Creating a New Report Configuration” on page 7-25 for details.
- The **Delete report** button deletes the selected report.
- The **Copy report as** button copies the selected report. Use this button to copy a report to make modifications to the copied report without deleting the original report.
- The **Execute** button runs the selected report on the open job file, displaying the report screen.
- The *Available report templates* field displays items that can be included in the report.
- The *Included report items* field displays the items included in the report.
- The move right (**>>**), **Move Up**, **Move Down**, and **Remove** buttons include/exclude and order report items.
- The **Options** button configures options for selected items.
- The *Report format* items selects the format for export.

The same item (for example, with different options) can be included in the same report to display information for data in customized groups. Using the **Options** button (see “Edit Item Options” on page 7-19 for details), the name of almost any report item can be changed. When changing an item’s name in the right-hand *Included report items* list, only the name changes, a new item is not added; the item still corresponds to the previous name of the item in the left-hand *Available report items* list.

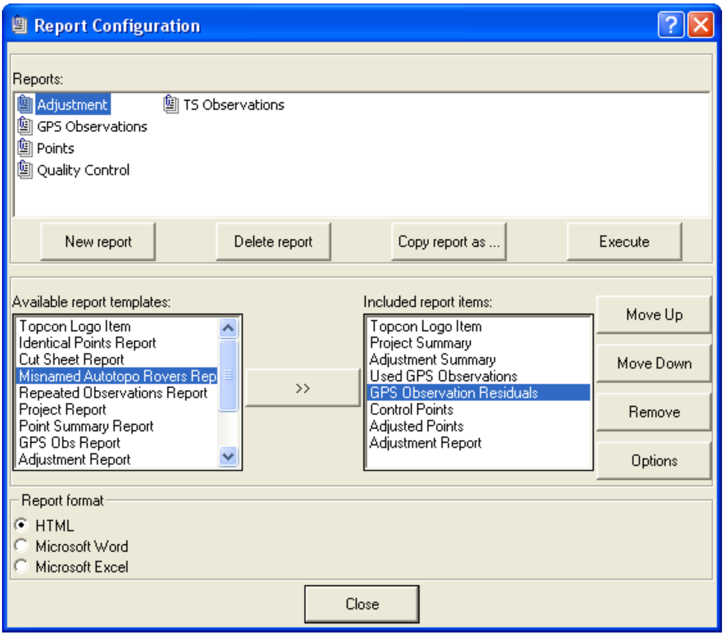


Figure 7-24. Report Configuration Dialog Box

To generate a report, select the report on the ***Report Configuration*** dialog box and click **Execute**. Customized reports also appear on the Reports menu.

TIP

Customize a toolbar report button to quickly run a frequently used report. See “Customizing the Toolbar” on page 1-20 for details.

Editing a Report Configuration

Reports and report items can be edited to provide only the desired information in the report output.

Copy a Report

1. Select the desired report in the *Reports* panel and click **Copy report as**. A configuration with the same items as the original report is added to the *Reports* window (Figure 7-25).

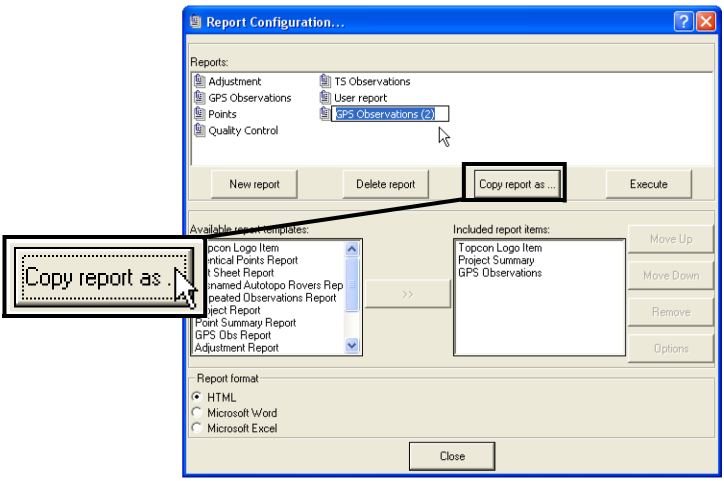
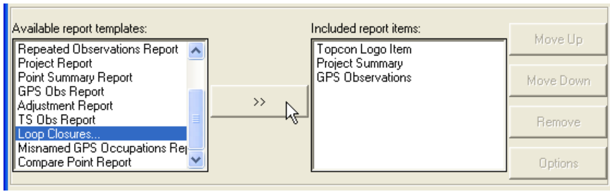


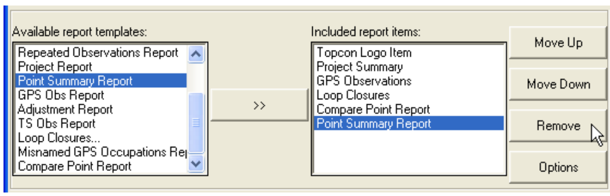
Figure 7-25. Copy Selected Report

2. Rename the configuration. If needed, click-pause-click the configuration name to activate the naming editor.
3. If adding items, select the items to include in the left column and click the move right (**>>**) button (Figure 7-26 on page 7-18).
4. If removing items, select the items to remove and click **Remove** (Figure 7-26 on page 7-18).
5. Use the **Move Up** and **Move Down** buttons to order included items (Figure 7-26 on page 7-18).

Include Items



Remove Items



Order Items

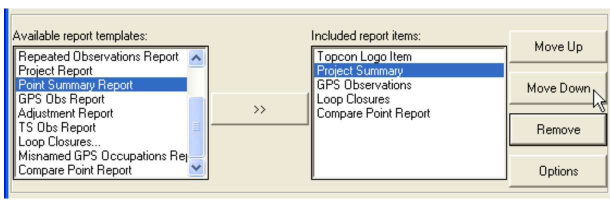


Figure 7-26. Edit Item Columns

6. Click **Execute** to view the report or click **Done** to save the report configuration.

Edit Items in the Selected Report

1. Select the desired report in the *Reports* panel.
2. If adding items, select the items to include in the left column and click the move right (**>>**) button (Figure 7-26).
3. If removing items, select the items to remove and click **Remove** (Figure 7-26).
4. Use the **Move Up** and **Move Down** buttons to order included items (Figure 7-26).
5. Click **Execute** to view the report or click **Done** to save the report configuration.

Edit Item Options

Changing item options will apply those changes to the currently selected report only.

Select a configuration in the *Reports* panel, click the desired item in *Included report items* column, and click **Options**.

Depending on the selected item, the **Options** dialog box displays different item parameters.

- Identical Points Report – edit the name and click **OK** (Figure 7-27).

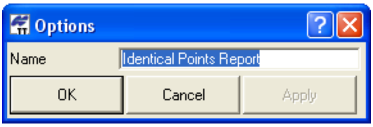


Figure 7-27. Item Options – Identical Points Report

- Cut Sheet Report – edit the name select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, and click **OK** (Figure 7-28).

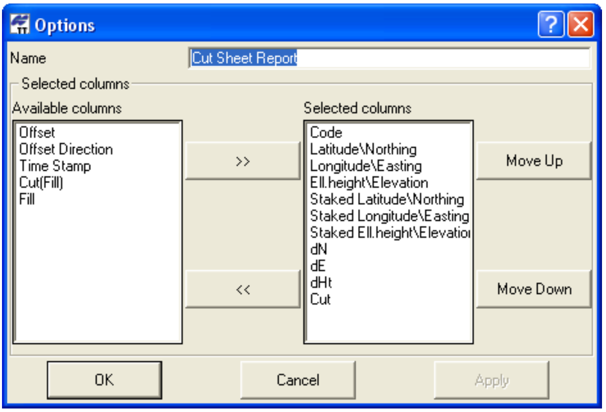


Figure 7-28. Item Options – Staked Points Report

- Misnamed Autotopo Rovers Report – edit the name and click **OK** (Figure 7-28).

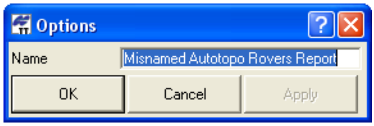


Figure 7-29. Item Options – Misnamed Autotopo Rovers Report

- Repeated Observations – edit the name and select the report type for vectors, then click **OK** (Figure 7-30).

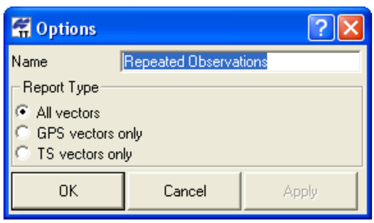


Figure 7-30. Item Options – Repeated Observations

- Project Report – edit the name, type template items in the same manner as displayed on screen or delete template items, then click **OK** (Figure 7-31).

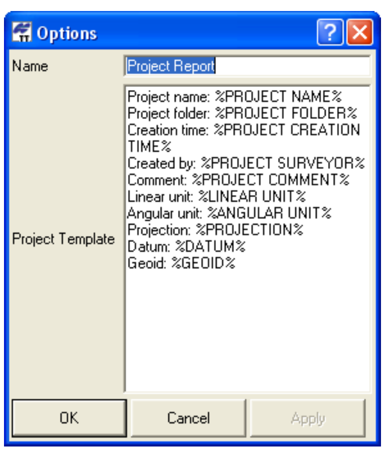


Figure 7-31. Item Options – Project Report

- Point Summary Report – edit the name, select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, enable the type of points to apply the parameters to, and click **OK** (Figure 7-32).

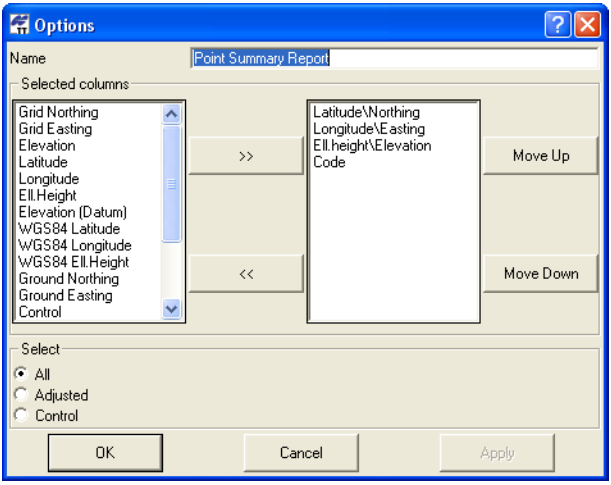


Figure 7-32. Item Options – Point Summary Report

- GPS Obs Report – edit the name, select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, select the type of points to apply the parameters to, select the method used for points to apply parameters to, and click **OK** (Figure 7-33 on page 7-22).

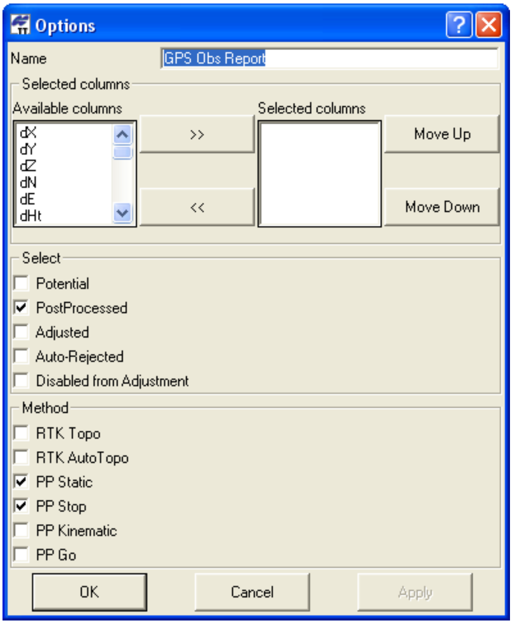


Figure 7-33. Item Options – GPS Obs Report

- Adjustment Report – edit the name, type template items in the same manner as displayed on screen or delete template items, then click **OK** (Figure 7-34).

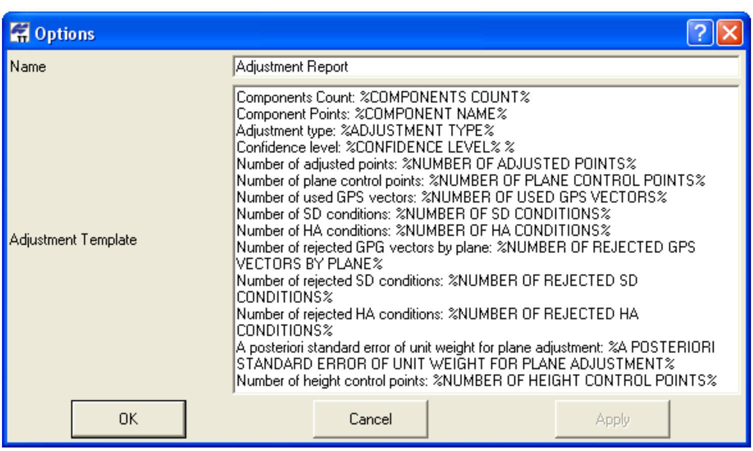


Figure 7-34. Item Options – Adjustment Report

- TS Obs Report – edit the name, select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, and click **OK** (Figure 7-35).

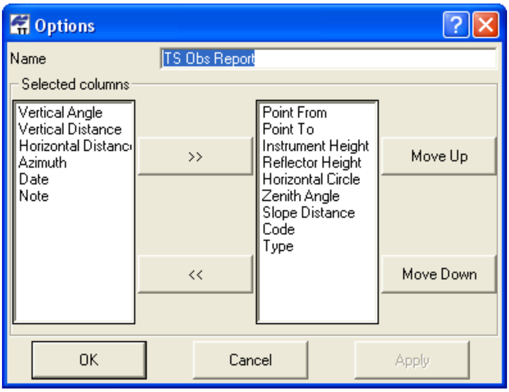


Figure 7-35. Item Options – TS Obs Report

- Loop Closures – edit the name, select the loops to report, select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, and click **OK** (Figure 7-38).

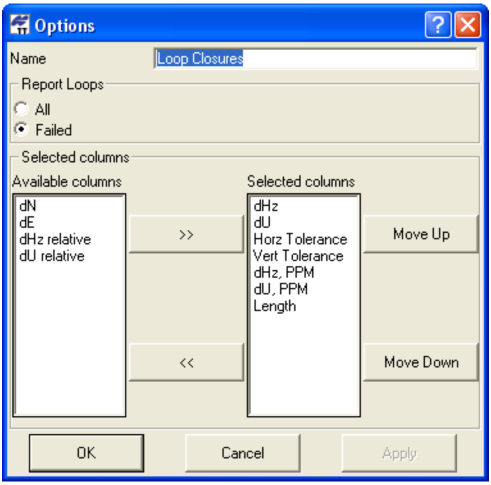


Figure 7-36. Item Options – Loop Closures

- Misnamed GPS Occupations Report – edit the name and click **OK** (Figure 7-37).

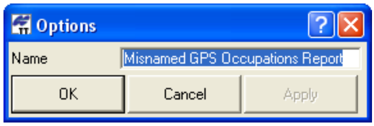


Figure 7-37. Item Options – Misnamed GPS Occupations Report

- Compare Points – edit the name, select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, and click **OK** (Figure 7-38).

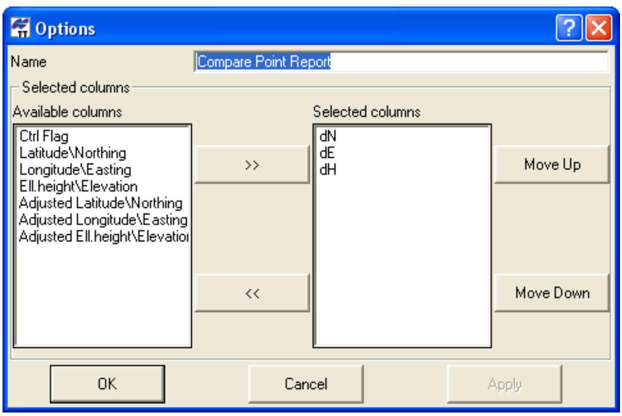


Figure 7-38. Item Options – Loop Closures

Creating a New Report Configuration

1. On the ***Report Configuration*** dialog box, click **New report**. A report called "User report" appears in the *Reports* window (Figure 7-39).

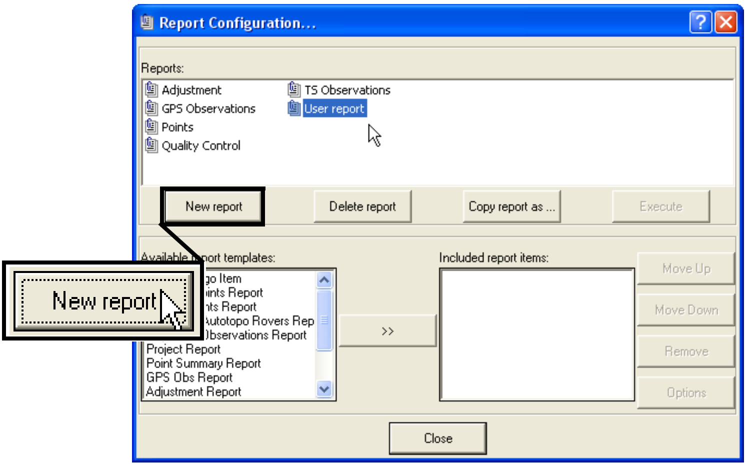


Figure 7-39. Create New Report

2. Select the desired item in the *Available report templates* list and click the move right button (>>) to move the item to the *Included report items* list. Continue selecting and moving items until all desired items are included (Figure 7-40).

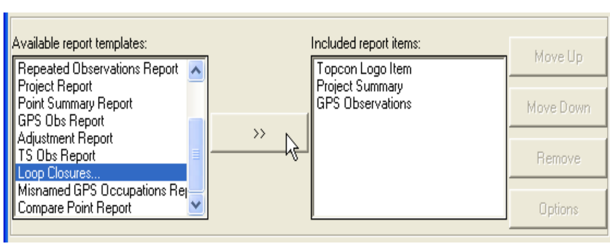


Figure 7-40. Include Items in Report

3. Select items and click the **Move Up** and **Move Down** buttons to set the order of items in the included list (Figure 7-41).

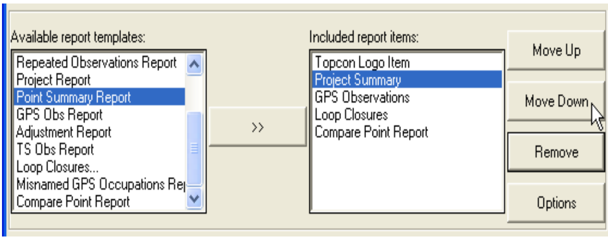


Figure 7-41. Order Included Items

4. To edit item options, select the desired item and click **Options**. For details on the various ***Options*** dialog boxes for the selected item, see “Editing a Report Configuration” on page 7-17.
5. Click **Execute** to view the report or click **Done** to save the report configuration.

Exporting

The export process allows data to be saved to other files and formats for opening in other Topcon Tools jobs, for opening in other file-compatible software, or for downloading to a device.

Topcon Tools exports the following file formats:

• Code Library files DBF Code Library (*.dbf) TDD Code Library (*.tdd) XML Code Library (*.xml) • Coordinate files APA Coordinates (*.zk) CR-5 Files (*.CR5) Custom Text Format files (*.*) FC-4 Points (*.xyz; *.fc4; *.pnt) FC-5 Points (*.xyz; *.fc5; *.pnt) GTS-210/310-10 Points (*.xyz; *.pnt) GTS-210/310-12 Points (*.xyz; *.pnt) GTS-7 Points (*.xyz; *.pnt) Land XML Points (*.xml) Name,E,N,Z,Code (*.csv) Name,Lat,Lon,Ht,Code (*.csv) Name,N,E,Z,Code (*.csv) SIMA Coordinates (*.sim) Topcon Japan Coordinates (*.zt) Topcon XML Points (*.xml) TopSurv Coordinates (*.txt)	• Cut Sheet files Cut Sheet Standard (*.css) Cus Sheet User Defined (*.csu) • GPS+ Raw Data Files Compact RINEX (*.??D; *.??G; *.??N) RINEX (*.??O; *.??G; *.??N) TPD (*.tpd) • Localization Files (*.gc3) • Road Files CLIP (*.plt) ISPOL (*.ali) LandXML Roads (*.xml) TDS RD5 (*.rd5) Topcon MC (*.rd3) Topcon SSS (*.hal) Topcon XML Roads (*.xml) TopSURV (*.thl) VGP (*.vgp) • Topcon Tools Jobs (*.ttp) • Topcon XML Files (*.xml) • TopSURV PC Job Files (*.tlsv)

(continued below)

• Design Files DWG (*.dwg) DXF (*.dxf) Land XML (*.xml) TN3 Surface (*.tn3) • Field Scan Data files (*.fsc) • GIS Files Shape (*.shp) • GPS Obs files BlueBook Sheet (*.gfl, *.bfl) Custom Text Format (*.*) LandXML GPS Obs (*.xml) O files (O*.*) Topcon RTK Vectors (*.tvf) Topcon Vectors (*.tvf) Topcon XML GPS Obs (*.xml)	• TS Obs Files Custom Text Format (*.*) FC-5 Raw (*.raw; *.dat; *.fc5) GTS-210_310 Raw (*.raw; *.dat; *.gts; *.gt6) GTS-6 No Station Raw (*.raw; *.dat; *.gts; *.gts6; *.gt6) GTS-6 Raw (*.raw; *.dat; *.gts; *.gts6; *.gt6) GTS-7 Raw (*.raw; *.dat; *.gts; *.gts7; *.gt7) GTS-7+ Raw (*.raw; *.dat; *.gts; *.gts7; *.gt7) LandXML TS Obs (*.xml) Topcon Japan TS Obs (*.o1t) Topcon XML TS Obs (*.xml) • X-Section Template files TDS TP5 (*.tp5) Topcon SSS (*.xtl) Topcon XML X-Section Templates (*.xml) TopSURV (*.xst)

NOTICE

If exporting ground coordinates, change the display option to "ground" and then export to a file that stores coordinates in NEZ format.

For further details on the file formats, see the corresponding section in Chapter 3. Topcon Tools exports some formats not imported:

- Cut sheet files are stakeout cut/fill data sheets. If a TopSURV job with staked points was imported, use this export format to export the job's cuts and fills to a printable format.
- DWG, DXF, and Shape files are popular formats used to transfer CAD and GIS data. DWG and DXF are native formats of AutoCAD and Shape are native formats of ArcInfo™. Most GIS and CAD software packages accept these formats and can be used

to transfer survey results (point coordinates and codes. For DWG and DXF, some linework are auto-created from codes.

- O files are a native Ashtech format for transferring observations (vectors) between software packages.
- Topcon vectors is a simple comma delimited format for transferring vector solutions between software packages.

Exporting to a File

Topcon Tools exports either desired data or all data of the current job file to a corresponding file format.

1. To export information to the select file format:
   - All data – click **Job ▸ Export**, press **F4**, or click the **Export to File** Toolbar button.
   - Selected data – click **Job ▸ Export**, press **F4**, click the **Export to File** Toolbar button, or right-click and click **Export**.
2. Navigate to the location in which to save the file.
3. Select the *Format name* (Figure 8-1).

NOTICE

Define the export format before continuing.

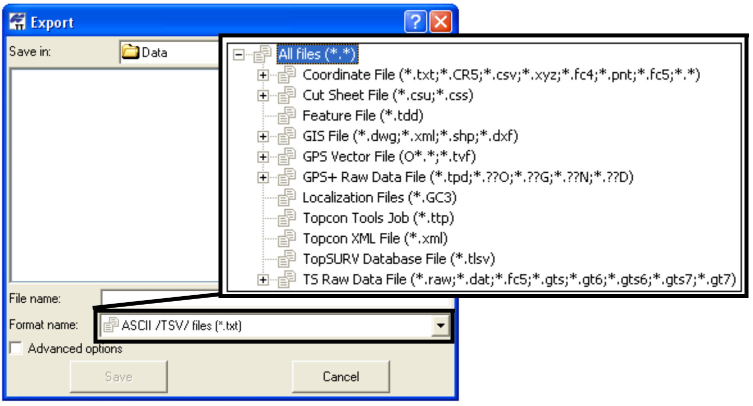


Figure 8-1. Select Export Format

4. If desired, select detailed export options in the *Advanced options* panel (Figure 8-2).

   The advanced options differ depending on the format selected.

NOTICE

Unless selected, heights will be orthometric (for grid->ground) or ellipsoidal (for longitude/latitude).

- Depending on the exported file format, define the projection type, datum, coordinate type, grid->ground transformation parameters, units, and geoid model.
- Enable *Orthometric Height* to export these heights.

Advanced options available for exported coordinate, GIS, GPS+ raw data, localization, Topcon Tools jobs, Topcon XML, TopSURV database, and TS raw data files.

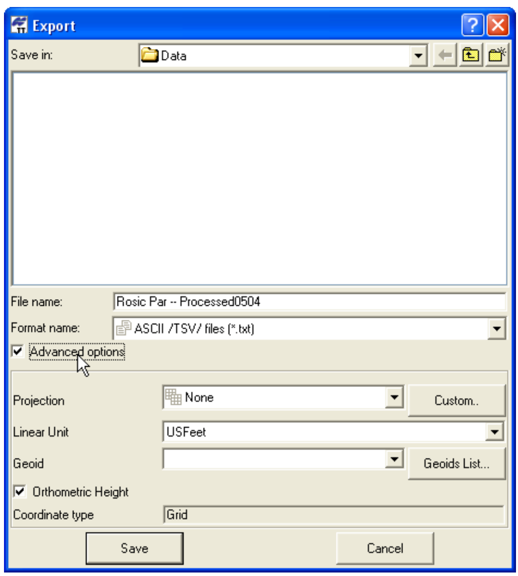


Figure 8-2. Export – Advanced Options Example

NOTICE

Unless selected or changed in Advanced Options, Topcon Tools will use the projection, datum, and geoid settings of the active job.

5. Type a name for the file and click **Save**.

Exporting Files to a Device

The following sections describe exporting from a computer:

- coordinate data files to a Conventional/Robotic Total Station
- any files to a TPS Controller.

Topcon Tools allows export of data to Topcon devices in two ways:

- using Windows Explorer
- using the Topcon Tools buttons in the Toolbar or commands in the main menu

Installation of Topcon Tools to the computer creates three additional folders in the computer.

To export data to a Total Station or TPS Controller using Windows Explorer, click the appropriate folder.

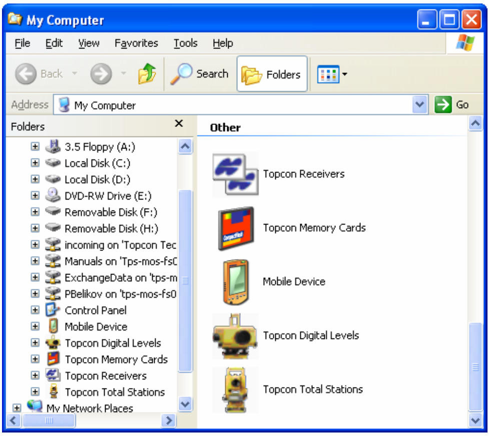


Figure 8-3. Topcon's Devices Folders

Export to a TPS Controller

1. Follow the manufacturer's directions for connecting the computer and the TPS Controller.
2. Be sure that Microsoft ActiveSync is installed on the computer and a successful computer-to-device connection is established. In this case system tray displays a green ActiveSync circle.

Using Windows Explorer

1. Open Windows Explorer and click the *Mobile Device* folder. The right panel of the window displays the contents of the Topcon Controller (Figure 8-4). Select the folder in the TPS Controller where the exported file will be saved and select the desired file in the computer.

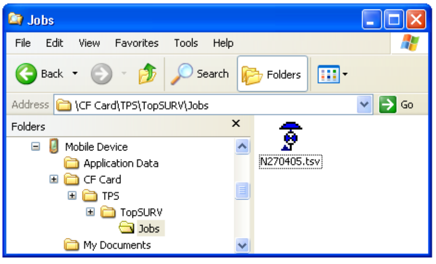


Figure 8-4. Selecting the Folder in the TPS Controller

2. To export a file from the computer to the TPS Controller copy the file to the selected folder in the TPS Controller.
3. When exporting a TopSURV database file(s) from the computer to the TPS Controller, Topcon Tools converts *.tlsv job to the *.tsv job format for TopSURV database files.
4. When the process of sending and converting the file(s) from the computer to the TPS Controller begins, the *Copy & Convert Progress* window displays the export and conversion in progress (Figure 8-5 on page 8-7).

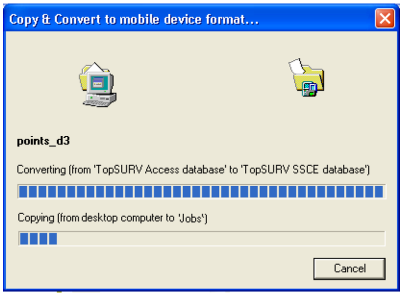


Figure 8-5. Export and Conversion in Progress

Using Topcon Tools

1. Start Topcon Tools and open a job. To export information to a device:
   - Click **Job ▸ Export to Device**, press **Shift+F4**, or click the **Export to Device** button on the Toolbar to export all data to the selected file format and send the created file to a Topcon Device.
   - Select the desired data and click **Job ▸ Export to Device**, or press **Shift+F4**, or click the **Export to Device** button on the Toolbar, or right-click and click **Export to Device** on the pop-up menu to export desired data to the selected file format and send a created file to a Topcon Device as shown in Figure 8-6.

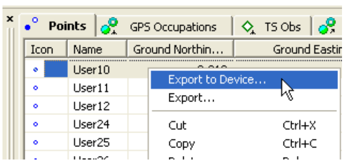


Figure 8-6. Export of the desired data to Device

2. Double-click the *Mobile Device* in the *Export to Device* window (Figure 8-7), select the folder in the TPS Controller where the exported file will be saved. Select the desired file format and enter the name of the creating file. Click **Save** in the *Export to Device Window.*

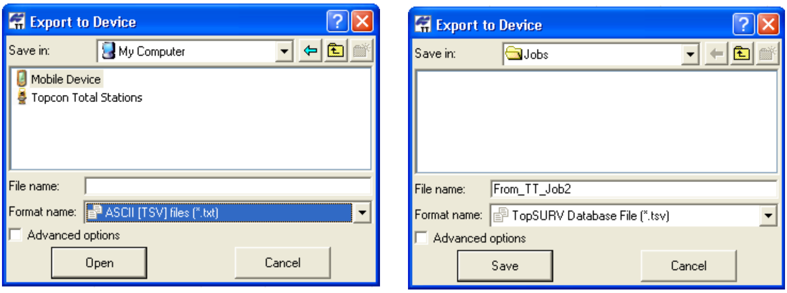


Figure 8-7. Export To Device Window

3. When the process of writing with conversion to the selected file format and sending of the created file from the current job to the TPS Controller begins, the *Copy & Convert Progress* window displays the export and conversion in progress.

Figure 8-8. Export and Sending in Progress (Status Bar)

Export to a TPS Total Station

Refer to the Topcon total station's manual for connecting the computer and a total station.

Using Windows Explorer

1. Open Windows Explorer and click the folder Topcon Total Stations. The right side of the window displays the '*Add New Station*' icon. To add a new device right click this icon and select *Create Station* on the pop-up menu.

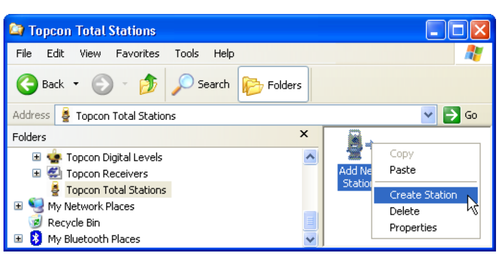


Figure 8-9. Creating a New Station in Windows Explorer

2. In the *General* tab of the *Create Statio*n dialog box, enter the following information and click **OK** (Figure 8-10).
   - Name – type a unique name for the device
   - Notes – type in any necessary notes
   - Port – select the COM Port that the device connects to
   - Model and Software – the type of the total station model
3. In the *Advanced* tab of the *Create Statio*n dialog box, enter the baud rate, parity, data bits, stop bits, and protocol used for communication with the TS (Figure 8-10).

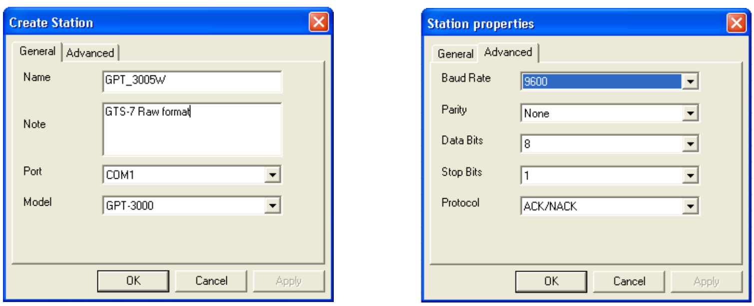


Figure 8-10. Total Station Properties

4. A new icon for the Total Station will appear in the right panel and a new sub-folder will be created in the *Topcon Total Stations* folder of the Windows Explorer. To change the properties (communication parameters, name, model) for this Total Station, right click on the icon and select *Properties* on the pop-up menu. The *Station Properties* dialog box for the Total Station is identical to the *Create Statio*n dialog box for a new Total Station.

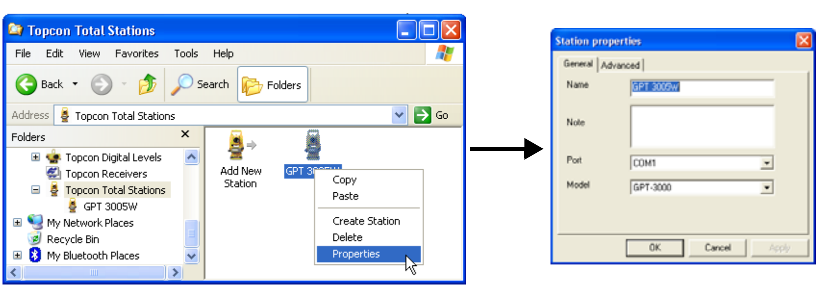


Figure 8-11. Changing the Total Station Properties

5. To export a coordinate file from the computer to the Total Station copy the selected file to the Total Station.
6. Follow all the steps given in the *Upload File(s) to Total Station* window to prepare the Total Station for exporting file.
7. When ready to sent the file, press **F3** for "yes" at the Total Station. Click **Start** in the ***Upload File(s) to Total Station*** dialog box. The upload process begins.

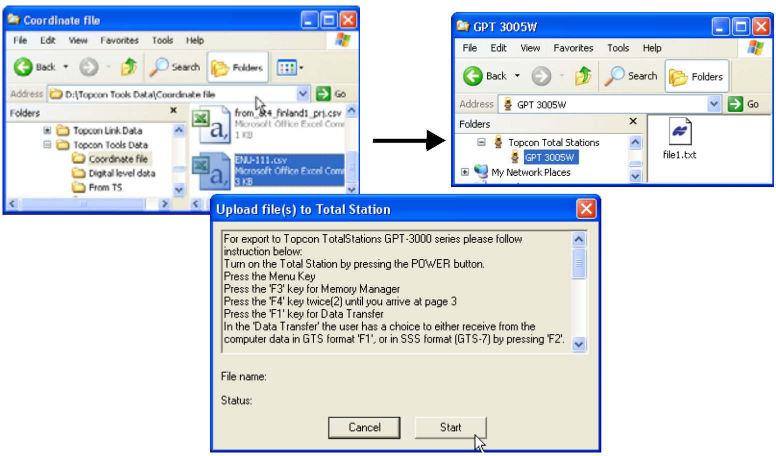


Figure 8-12. Start of Export a Coordinate File to the Total Station

8. When the process of the sending data from the computer to the Total Station begins, the status is changed from "Waiting to start..."to "Performing the transfer..." in the *Upload File(s) to Total Station* window.
9. Then the exported file is saved in the Total Station.

Using Topcon Tools

1. Start Topcon Tools and open a job. To export a coordinate file to a Total Station:
   - Click **Job ▸ Export to Device**, or press **Shift+F4**, or click the **Export to Device** button on the Toolbar to export all data to the selected coordinate file format and send a created file to a Total Station.

- Select the desired data and click **Job ▸ Export to Device**, or press **Shift+F4**, or click the **Export to Device** Toolbar button, or right-click and click **Export to Device** on the pop-up menu (Figure 8-13) to export data to the coordinate file format and send the created file to the Total Station.

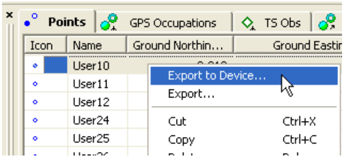


Figure 8-13. Export of the desired data to a Device

2. Double click the *Topcon Total Stations* in the *Export to Device* window.

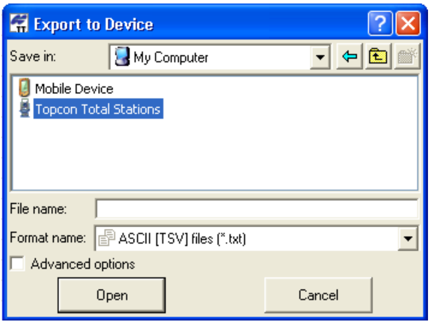


Figure 8-14. Export From Device Window

3. To add a device, right click or double click the icon '*Add New Station*' and select *Create Station* from the pop-up menu.

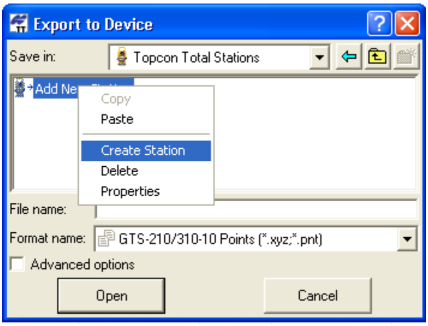


Figure 8-15. Creating a New Station

4. In the *General* tab of the *Create Statio*n dialog box, enter the following information and click **OK**.
   - Name – type a unique name for the device
   - Notes – type in any necessary notes
   - Port – select the COM Port that the device connects to
   - Model and Software – the type of total station model
5. In the *Advanced* tab of the *Create Statio*n dialog box, enter the baud rate, parity, data bits, stop bits, and protocol used for communication with the TS.

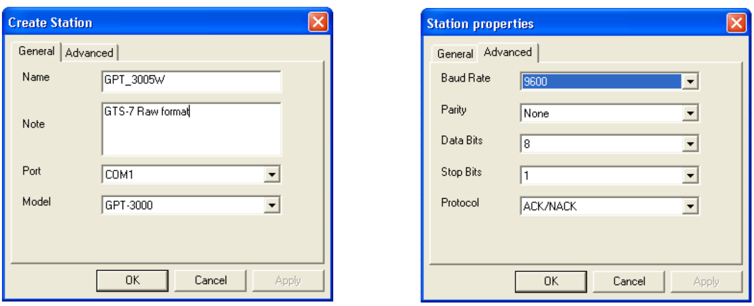


Figure 8-16. Total Station Properties

6. Then a new icon for the Total Station will appear in the *Export to Device* window. To change the properties (communication parameters, name, model) for this Total Station, right click on the icon and select *Properties* on the pop-up menu. The *Station Properties* dialog box for the Total Station is identical to the *Create Statio*n dialog box for a new Total Station.

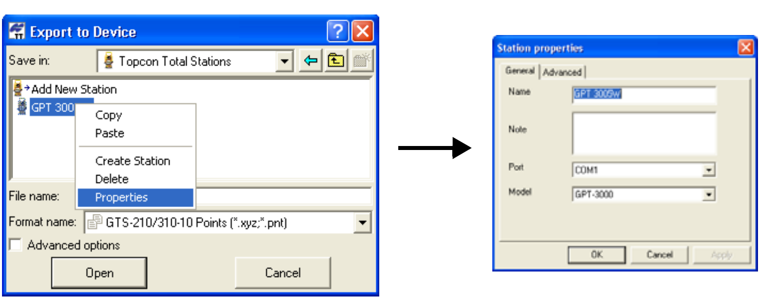


Figure 8-17. Changing the Total Station Properties

7. To export a coordinate file from the current job to the Total Station, select a coordinate file format and enter the file name of the creating file. Click **Save** in the ***Export to Device*** window.

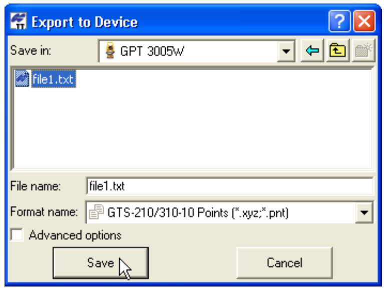


Figure 8-18. Setting the name and type the exported file

8. Follow all the steps given in the *Upload File(s) to Total Station* window to prepare the Total Station for exporting file.

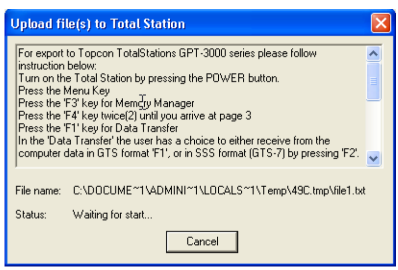


Figure 8-19. Start of Export a Coordinate File to the Total Station

9. When the process of sending data from the computer to the Total Station begins, the status is changed from "Waiting to start..." to "Performing the transfer..." in the *Upload File(s) to Total Station* window.
10. Then the exported file is saved in the Total Station.

Notes:

Design Module

Topcon Tools' Design module can:

- create a new digital terra model called “surface” that will be visible in the general CAD View
- open, view, edit a surface created in the TopSURV
- solves Coordinate Geometry tasks (compare surfaces, intersection, inverse point to line, point in direction, and traverse)
- open, view, edit a surface contained in the *.tn3 file
- create a new road
- open, view, edit a road created in the TopSURV (*.tlsv and *.thl)
- open, view, edit a road contained in the following formats:
  – Topcon MC Road File (*.rd3)
  – Topcon SSS Road File (*.hal)
  – TDS Road File (*.rd5)
  – CLIP Road File (*.plt)
  – ISPOL Road File (*.ali)
- import X-section templates saved in the following formats to the current job:
  – TopSURV XS-Template (*.trd)
  – TDS XS-Template (*.tp5)
  – SSS XS-Template (*.rd)

Before creating a new surface form or new a road, be sure that the Design Module is active in Topcon Tools. When active, the Design Module appears in the list of active modules (**Help ▸ Access Codes**).

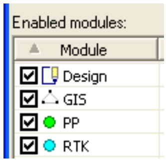


Figure 9-1. Enter Access Window - Enabled Modules

The commands *Surface*, *Add to Surface*, and *Road* will be available in the Topcon Tools menu bar (Edit ▸ Add).

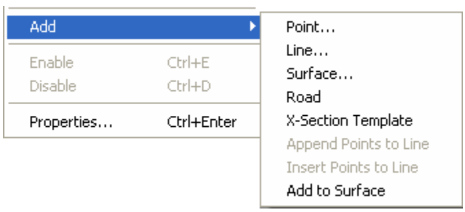


Figure 9-2. Edit ▸ Add

The Surface icon will be available in the Topcon Tools menu bar.

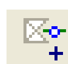
 and 

Figure 9-3. Add Surface, and Add Points and Lines to Surface Icons

Creating a New Surface

Before creating a new surface, have the Cad View open and set either grid or ground coordinates using the Status bar.

1. To create a new Surface, either click **Edit ▸ Add ▸ Surface** or click the **Add Surface** button on the Toolbar.
2. In the *General* tab of the ***Add Surface*** dialog box, enter a name of the surface being created, select the desired layer for the surface, and enter necessary notes.
   - The *Need Update* field will display No if no changes have been made to the surface; it will display Yes if changes have been made.
   - To automatically update a surface if changes are made, enable *Auto Update*; otherwise, the user will be required to manually update the surface.
3. In the *Option* tab, set constraints for creating triangles inside this surface:
   - minimal allowable interior angle of triangle
   - minimal allowable area of triangle

   The parameters set in the *Option* tab will define the number of points and triangles of the Surface.

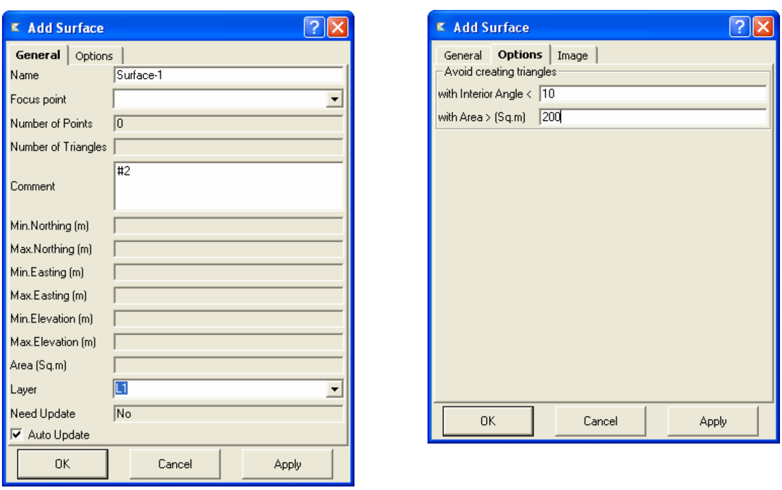


Figure 9-4. Add Surface Dialog Box

4. Click **OK**. The new surface will be created. The *Surfaces* tab displays in the Tabular view. This tab displays information about surfaces contained in the current Topcon Tools job.

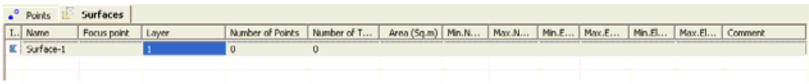


Figure 9-5. Tabular View - Surfaces tab

Use the *Add to Surface* option to add points and lines to this surface. Or create a new surface using the points and lines existing in the Topcon Tools job. A line contained in the surface will be a breakline of this surface (line between the points *User 2 - User 8* at Figure 9-6).

To create a new surface, select desired points and lines in the CAD view and click the **Add Surface** button on the Toolbar.

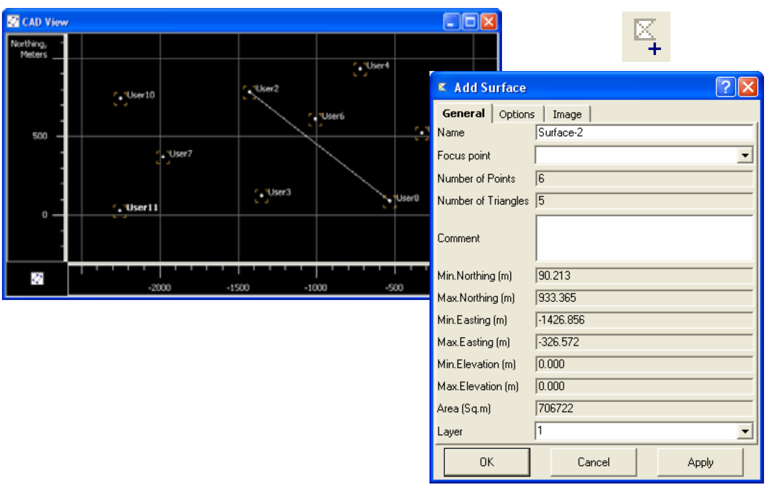


Figure 9-6. Create a new Surface using the selected points

In this case, the ***Add Surface*** dialog box displays information about the surface being created: the number of points and triangles in the model and min/max values of Northing, Easting and Elevation for the points. Enter a name for the surface and any notes, and set constraints for creating triangles inside this surface in the *Option* tab, then click **OK**. The *Surfaces* tab and CAD View displays the created surface brown lines linking the selected points (Figure 9-7 on page 9-5) in the CAD View.

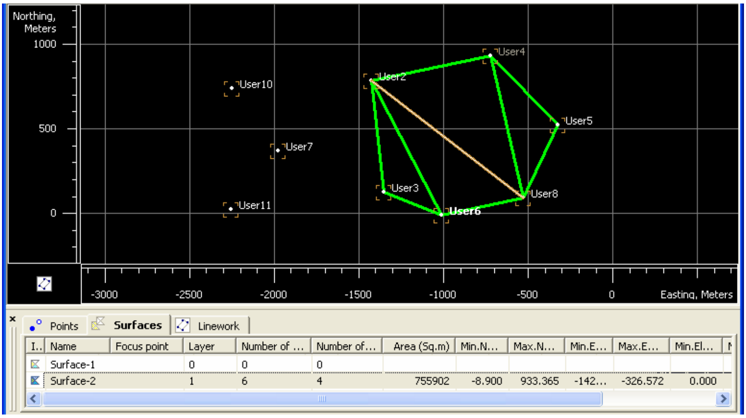


Figure 9-7. Created Surface

To hide the surface in the *Cad View*, select the invisible layer (that was created in the *Layers* view) for this surface in the *Properties* window.

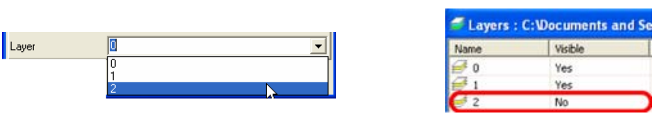


Figure 9-8. Selecting Layer for Hiding a Surface

The created surface (Figure 9-7) is displayed from a some point located over this surface (used successfully only for horizontal surfaces). For a vertical surface, this view does not display the whole surface. Topcon Tools allows the user to view a surface from a focus point in horizontal direction.

To select the focus point for viewing the surface, right click the desired surface in the *Surface* tab point and select the point from the list in the *Focus point* field of the *Add Surface* window.

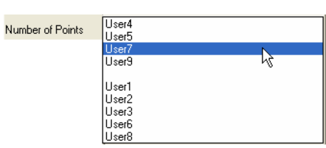
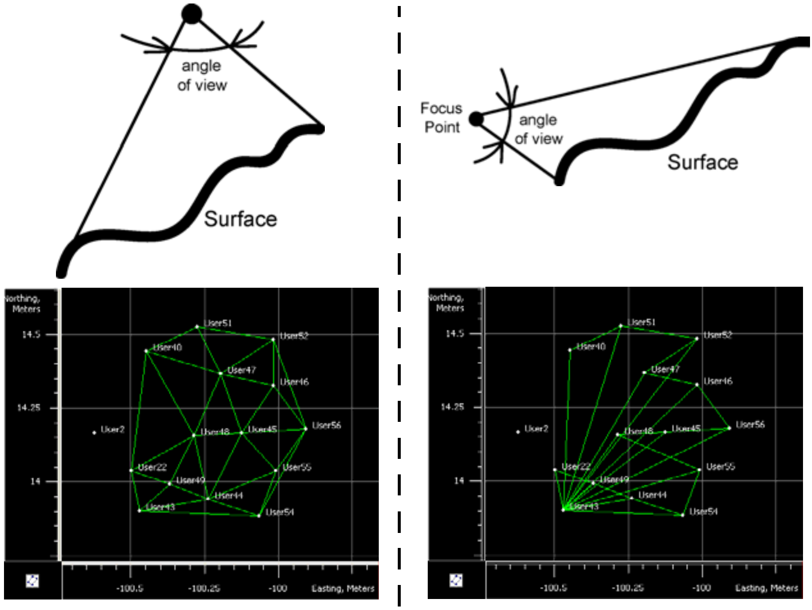


Figure 9-9. Select Focus Point

The Cad view displays the surface from the selected point.



If focus point is not specified

If focus point is specified

Figure 9-10. Viewing Created Surface from Point7

When creating a new surface or editing an old surface, the points in the Topcon Tools job with no coordinates in the current grid or ground system will be missing from the surface. In this case, the following dialog box will display.

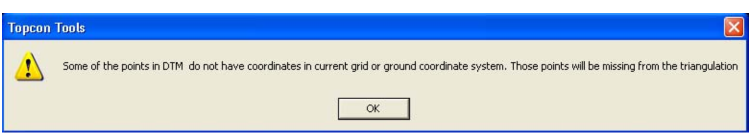


Figure 9-11. There are points with no grid/ground coordinates

Displaying the Surface

The surfaces and other objects (points and lines) not included in the surface, can be displayed in the CAD View. Topcon Tools will only display a surface in the CAD View and/or in the 3D View. To view the surface, right click the desired Surface on the *Surfaces* tab and select the CAD View/3D View. The name of this surface will be displayed in the title of the CAD View/3D View.

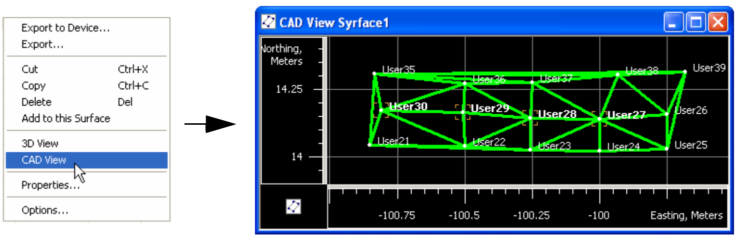


Figure 9-12. Cad View for the Surface

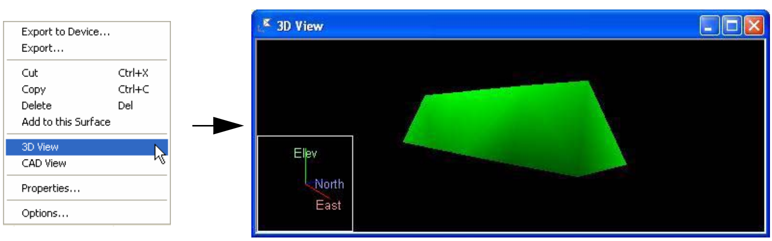


Figure 9-13. 3D View for the Surface

To view all objects in the CAD view window, select in **Window ▸ CAD View**.

Adding to a Surface

Topcon Tools allows adding points and lines to the created Surface (Figure 9-14). In the CAD view window for the Surface, it is impossible insert new objects.

To add new objects in the surface, select the desired point or line in the CAD view and do one the following:

- click the **Add Points and Lines to Surface** button on the Toolbar
- click **Edit ▸ Add ▸ Add to Surface** on the Main Menu
- click **Add to Surface** in the pop up menu for the selected objects either in the *Points* tab or in the Cad View

In the Tabular View In the CAD View

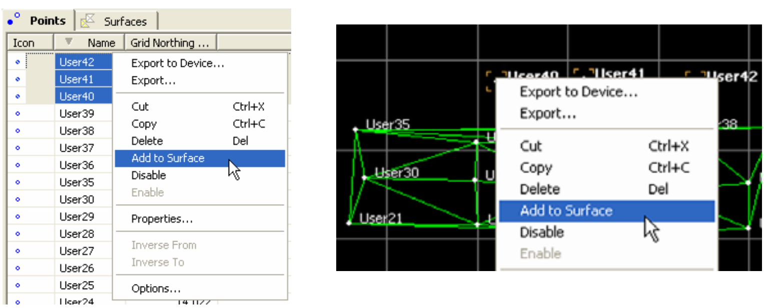


Figure 9-14. Add to Surface Using Pop-up Menu for the Selected objects

If the current Topcon Tools job contains more than one surface, choose the desired Surface to add new objects to.

Figure 9-15. Choosing the desired Surface to add new objects

To add points/lines to the surface using pop-up menu for the job in the Surfaces tab, right-click the desired Surface in the *Surfaces* tab, then click **Add to this Surface**.

The cursor changes. Using the cursor, select the desired objects in the CAD View.

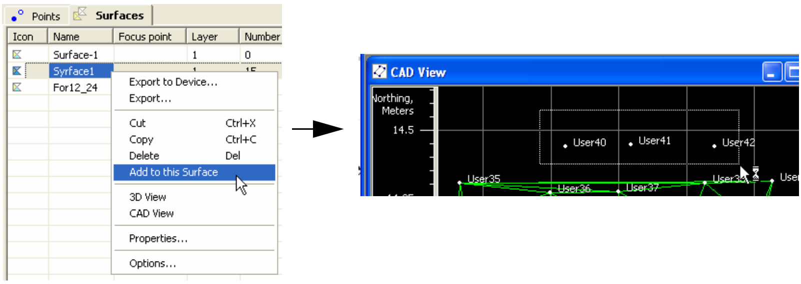


Figure 9-16. Add to Surface for desired Surface in Surfaces Tab

The objects are added to the desired surface.

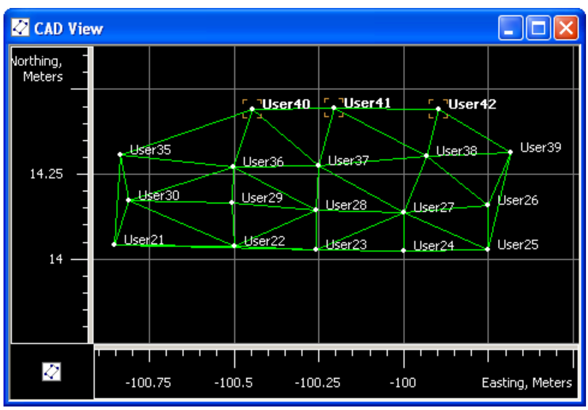


Figure 9-17. Addition to Surface new points and line

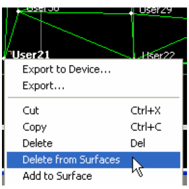
Editing a Surface

The following sections describe different ways of editing a surface:

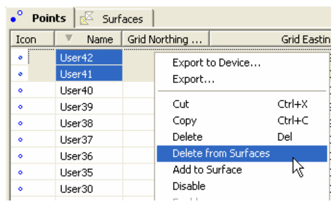
- Deleting points and lines from a surface
- Creating holes

Deleting Points from a Surface

To delete a point from Surface, right-click the desired point in the CAD View or *Points* tab and click *Delete from Surface*.



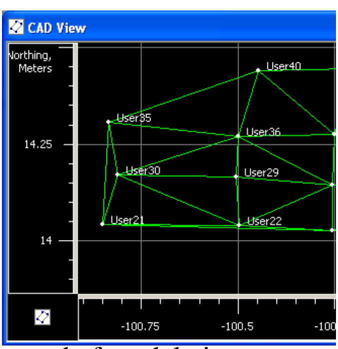
In CAD View



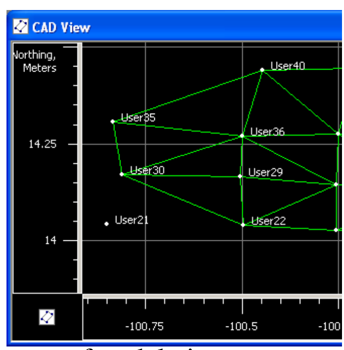
In Points tab

Figure 9-18. Deletion Selected Point from Surface

This point will be displayed in the CAD View window, but does not be included in the Surface



before deletion



after deletion

Figure 9-19. Example of Deletion of the Point from Surface in the CAD View

Deleting a Line from the Surface

Any line that is linework can be deleted. Before deleting a line, show the surface in the CAD View; all objects that the surface contains will display.

To delete a line from the surface, right-click the desired line in the CAD View or *Linework* tab and click **Delete from Surface**.

In CAD View **In Linework tab**

Figure 9-20. Deleting a Line from the Surface

This line will display in the CAD View window, but will not be included in the CAD View for the surface.

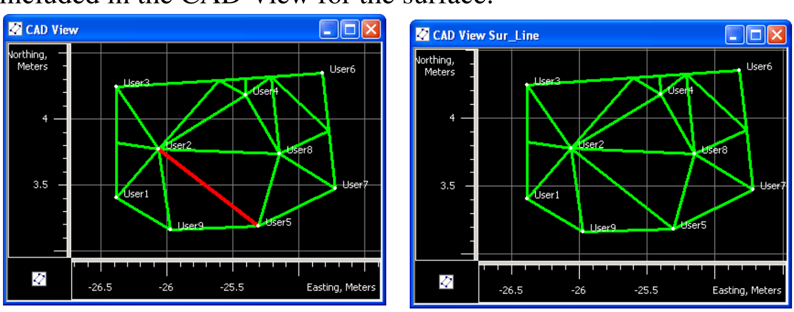


Figure 9-21. Examples of Surface Display in the CAD View

Creating Holes in the Surface

When creating holes in the surface, have the CAD View and the desired surface visible.

1. Create a closed figure inside of surface using the technique for adding a new point and appending this point to a line.

   Note that the hole will not be created if a surface point is located within a closed figure.
2. Select this figure.
3. Right-click and click the desired (other) surface to add the figure.

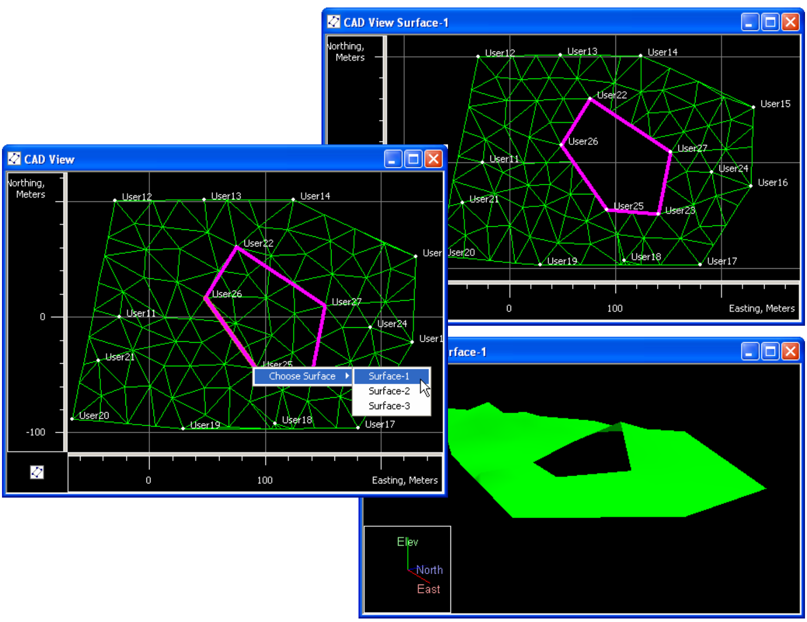


Figure 9-22. Creating a Hole in the Surface

Creating a hole at the edge of the surface is the same as cutting a part of the volume from the surface.

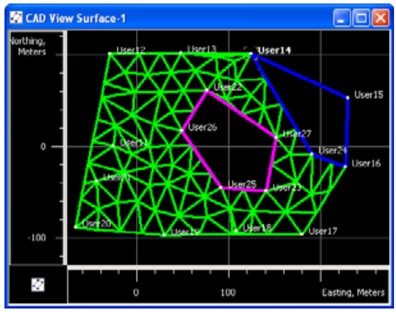


Figure 9-23. Cutting the Surface Using the Hole Function

Setting Breakline Type

Before creating a surface, the user can set in the layer used for the surface the following Breakline types of the line: *Auto*, *Breakline*, *Boundary* and *Exclusion* (Figure 9-23 on page 9-13).

If the *Auto* type is selected for the layer, the triangulation will automatically determinate boundaries, an exclusion, and a breakline using the following rules:

- If the line is closed and does not contain any triangulated points inside, it should be treated as an exclusion.
- If there is no defined boundary, and there is a set of closed lines that together have all triangulated points inside, those lines are the boundaries.
- All the other lines are breaklines.

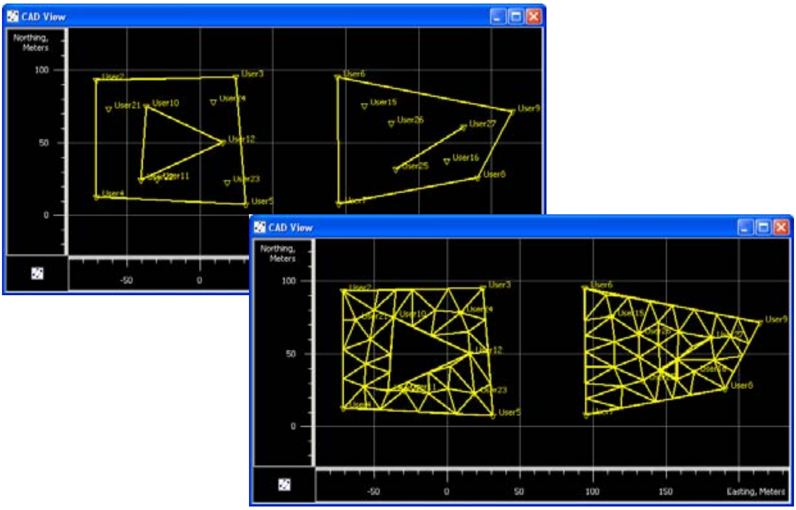


Figure 9-24. Example of Creating Surface

Creating a New Road

A road 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 either *grade* and *parabolas* or *long sections*.
- The cross section can be described using templates (see "Creating X-sections" on page 9-35).

Before creating a new road, do the following, set *Grid* or *Ground* coordinates in the Status bar and create a start point (if necessary) for this road in the current job (see "Adding a New Point" on page 5-15).

1. To create a new road, click **Edit ▸ Add ▸ Road**.
2. In the *Start Coordinates* tab of the ***Add Road*** dialog box, select the start point of the road from the drop-down list (Figure 9-25). The coordinates of the selected start point will display.
3. In the *General* tab of the ***Add Road*** dialog box, enter the following information (Figure 9-25):
   - Enter a name for the road being created.
   - Enter the starting station or chainage for the road.
   - Enter the station interval in meters (by default this parameter equals 100 m).
   - Select the layer in which to store (save) the road.

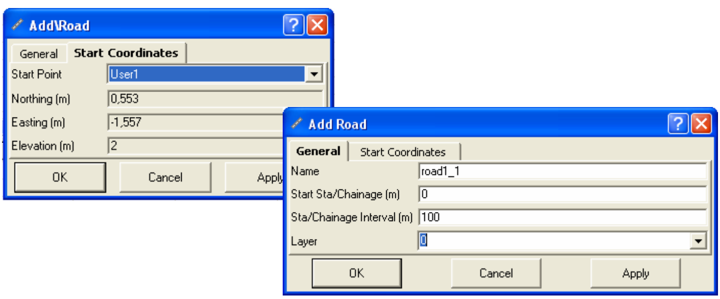


Figure 9-25. Add Road Dialog Box

4. Click **OK**. The left panel of the *Roads* tab displays the name of the road being created; the right panel displays horizontal/vertical alignments and x-section of the road in table and graphic modes.

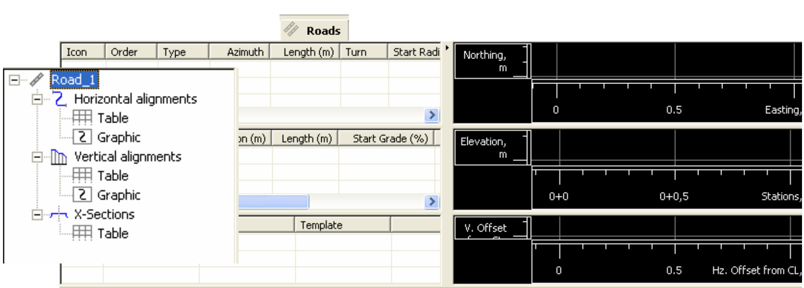


Figure 9-26. Roads Tab, Left and Right Panels

To view only one alignment or x-section in the right panel, select the desired item in the left panel.

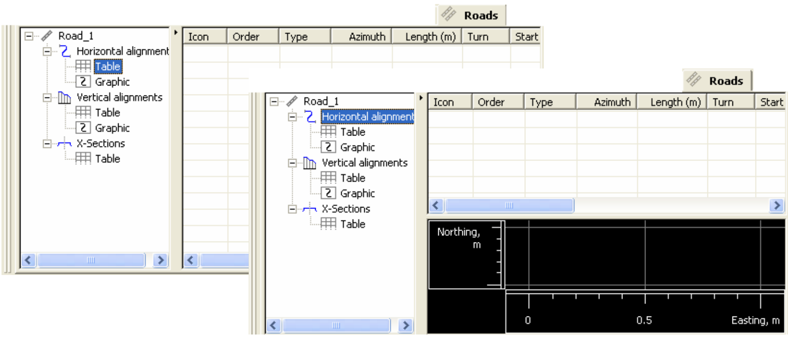


Figure 9-27. Selection of the alignment

Creating a Station Number

A horizontal/vertical alignment consists of a number of elements. Each element (from the second one) starts from the end position of the previous element. These points are called stations. The number of the station can display in two ways. To select the type of the number station, click **Job ▸ Job Configuration** and select the *Display* item and activate the *Roads* tab. Select "*Chainage*" or "*Station*" in the "*Display CL Pos as*" field (station displays by default).

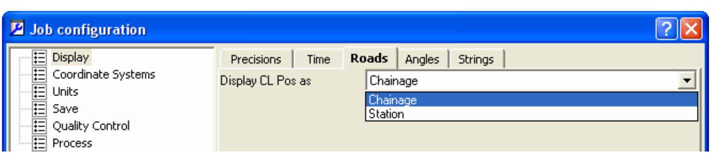


Figure 9-28. Setting the Type of the Station

For "Station" type, the number of the station is a value equal to the ratio of length from the start point of the road to the station interval. This number consists of two parts:

The first part is the integer of $\left(\sum_{i=1}^{n} Length\right) / (StationInterval)$

where "i" is the number of elements in the alignment, "Length" is the length of "i - element", and "Station interval" is equal to 100 meters.

The second part is the remainder from this ratio.

For example: the length of the line is 1288.50 meters; the number of the end station for this line is 12+88.5

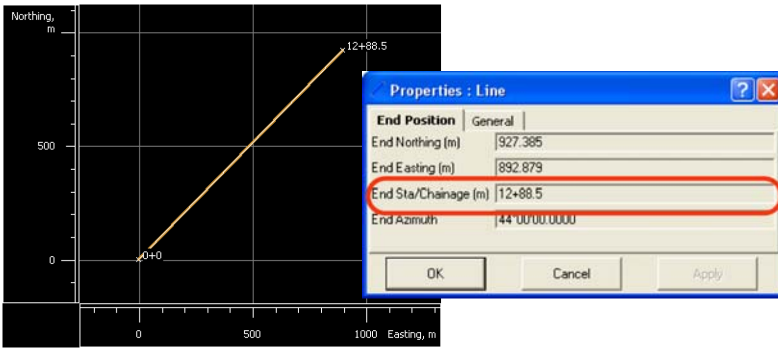


Figure 9-29. Example of using “Station” type

For “Chainage” type, the number of the station is a value equal to the of length from the start point.

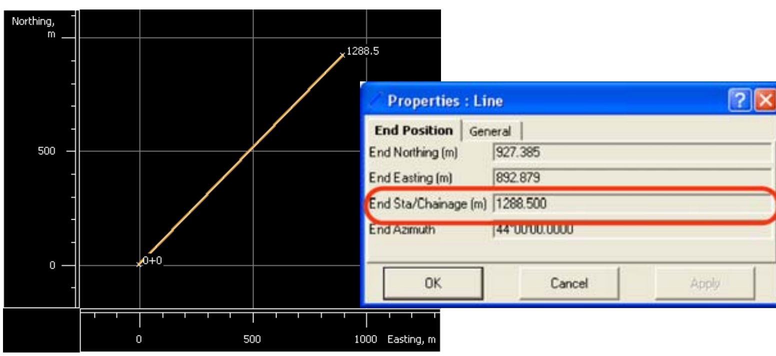


Figure 9-30. Example of using “Chainage” type

A not zeroth name for start station/chainage of the road can be entered to save through numbering of the stations for other roads. The following numbers of the road stations will be generated as the sum of initial not zeroth value and the lengths of elements. The following example shows a horizontal alignment using a zero start station and a not zeroth start station (Figure 9-31 on page 9-18).

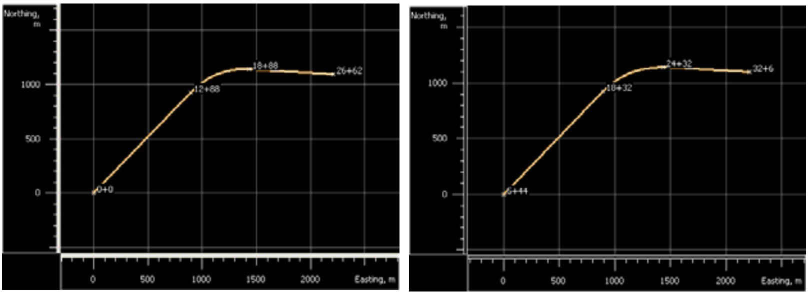


Figure 9-31. Horizontal alignment from zero and not zeroth start station

To change the station number (or chainage number) of the created road, right-click on the name of the road in the left panel and click **Properties**. In the ***Properties*** dialog box, edit the start station/ chainage number.

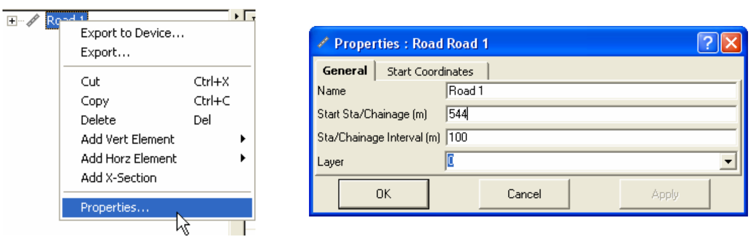


Figure 9-32. Edit the Name and Start Sta/Chainage of the Created Road

Creating Horizontal Alignments

The *Horizontal alignment* table shows the list of horizontal alignment elements, the horizontal alignment plot, and the starting station of each element. The CAD View also displays the horizontal alignment plot.

The pop-up menus in the left and right panels provide access to adding horizontal elements (line, curve, spiral, intersection).

- In the left panel, right-click the road or the horizontal alignment and click **Add Horz Element** (Figure 9-33).

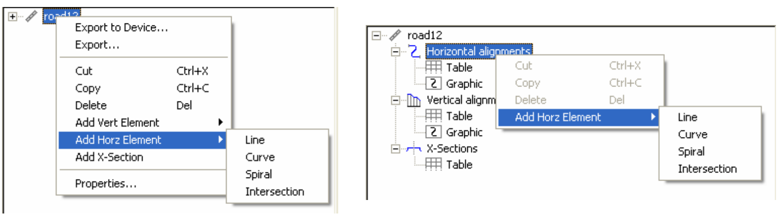


Figure 9-33. Adding Horizontal Element Through the Left Panel

- In the right panel, right-click in the Roads tab or the selected element and click **Add Horz Element** (Figure 9-34).

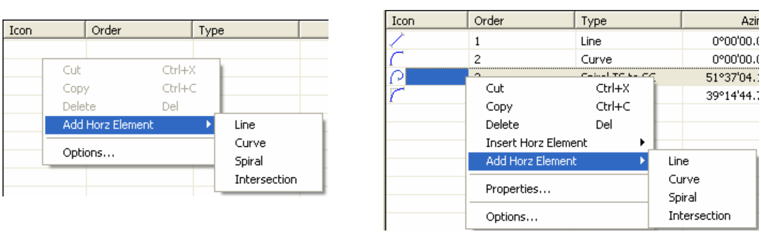


Figure 9-34. Adding Horizontal Element Through the Right Panel

NOTICE

NOTICE

The Insert Horz Element option is the same as the Add Horz Element option, except that a new element will be added before the selected element.

Adding a Line

1. To add a line, click **Add Horz Element** and click **Line** (see “Creating Horizontal Alignments” on page 9-19).
2. In the *General* tab of the ***Add Horz. Element: Line*** dialog box, enter the following parameters for the line:
   - Azimuth - the azimuth of the line (see “Feature Azimuth Setting” on page 9-20).
   - Length - the length of the line element.

   The *End Position* tab will display the calculated coordinates of the end station of the line.

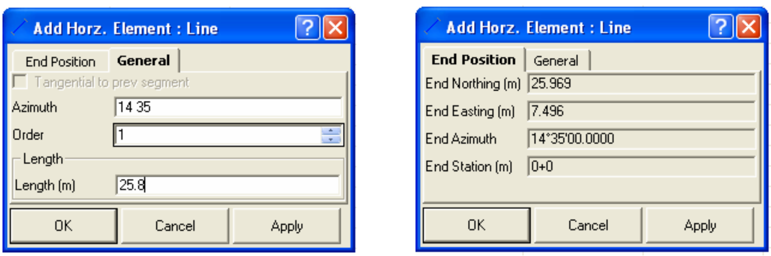


Figure 9-35. Add Horz. Element: Line dialog box. General and End Position Tabs

3. Click **OK**. The Table and Graphic panes of the right panel of the *Road* tab displays the created line.

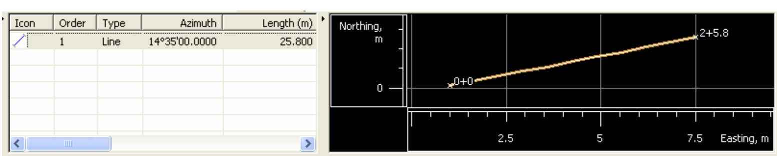


Figure 9-36. Table and Graph Pane for the Created Line

Feature Azimuth Setting

By default, the azimuth is set tangent to the previous element. This field is editable only for the starting element of the road. To change the azimuth of all other elements, de-select the “Tangential to previous segment” field and type the desired value in the *Azimuth* field.

Adding a Curve

1. To add a curve, click **Add Horz Element** and click **Curve** (see "Creating Horizontal Alignments" on page 9-19).
2. In the *General* tab of the ***Add Horiz. Element: Curve*** dialog box, enter the parameters for one of the following groups:
   - Radius/ Deg Chord/Deg Curve - the radius of the curve, or one of the two parameters unambiguously defining the radius: degree of chord, or degree of curve

     Using the degree of chord (DCH) or degree of curve (DCV) parameters, the radius can be calculated as follows:

$$R = \frac{50}{\sin\left(\frac{DCH}{2} \times \frac{\Pi}{180}\right)}, R = \frac{100 \times 180}{\Pi} \times \frac{1}{DCV}$$

   - Length/Chord/Tangent/Mid Ord/External/Delta - the length of the curve element, or one of five parameters unambiguously defining the curve length: chord, tangent, middle ordinate (the distance from the midpoint of a chord to the midpoint of the corresponding curve), external (the distance from the midpoint of the curve to the intersection point of tangents), or delta (the angle between the radii corresponding to the curve).

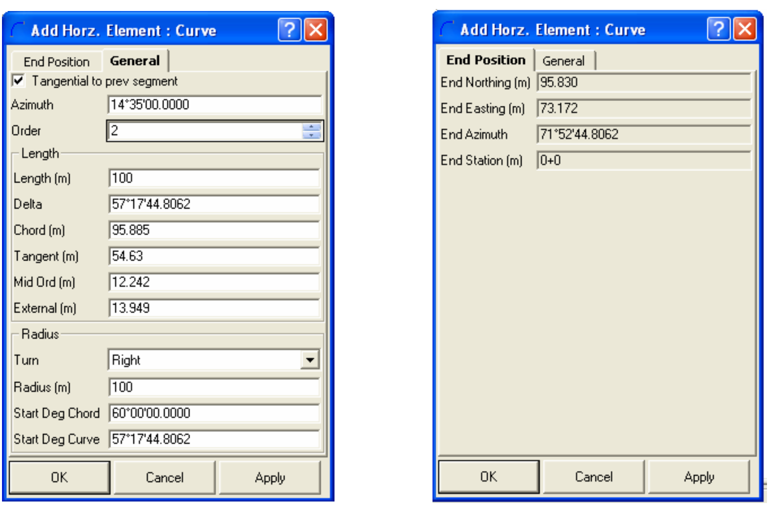


Figure 9-37. Add Horiz. Element: Curve dialog box. General and End Position Tabs

3. Enter the following parameters for the curve (Figure 9-37):
   - *Azimuth* - the azimuth of the tangent (see “Feature Azimuth Setting” on page 9-20).
   - *Turn*- the direction of turn of the curve. The *Right* value stands for clockwise direction, the *Left* value - for counter-clockwise direction.

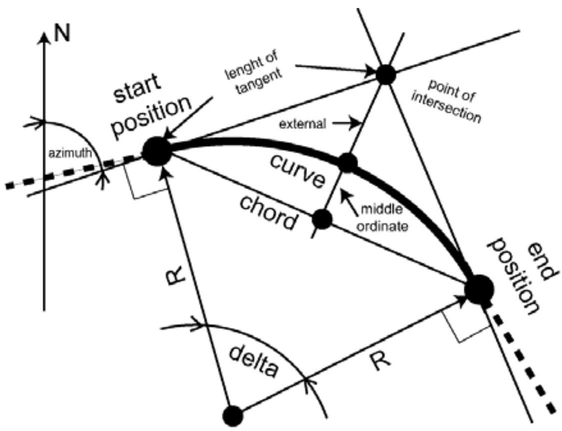
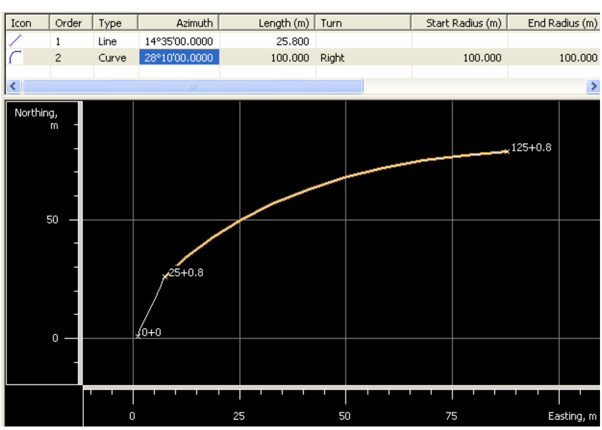


Figure 9-38. Curve Parameters

4. Click **OK** to create (or add) the curve. The Table and Graphic pane of the right panel of the *Roads* tab will display the created curve.

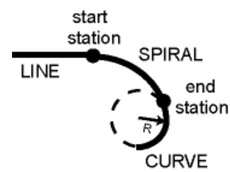
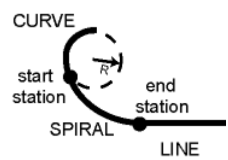
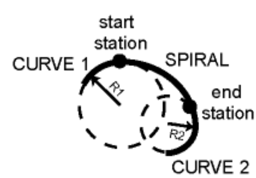


Icon	Order	Type	Azimuth	Length (m)	Turn	Start Radius (m)	End Radius (m)
	1	Line	14°35'00.0000	25.800			
	2	Curve	28°10'00.0000	100.000	Right	100.000	100.000

Figure 9-39. Table and Graph Pane for the Created Curve

Adding a Spiral

1. To add a spiral, click **Add Horz Element** and click **Spiral** (see "Creating Horizontal Alignments" on page 9-19).
2. In the *General* tab of the ***Add Horiz. Element: Spiral*** dialog box, select the direction of the spiral (Figure 9-40 on page 9-24).

A "TS to SC" ("Traverse-Spiral to Spiral-Curve") direction means that the start station of the spiral is the end station of the line, and the end station of the spiral is the start station of the curve (entering to the turn). For "*TS to SC*" spiral, specify one of the parameters from the following group: *End Radius/End Deg Chord/ End Deg Curve:* the end radius of the curve, or one of two parameters unambiguously defining the radius: end degree of chord, or end degree of curve.	
"A CS to ST" ("Curve-Spiral to Spiral-Traverse") direction means that the start station of the spiral is the end station of the curve, and the end station of the spiral is the start station of the line (exiting from the turn). For "*CS to ST*" spiral, specify one of the parameter from the following group: *Start Radius/Start Deg Chord/ Start End Deg Curve*: the start radius of the curve, or one of two parameters unambiguously defining the radius: start degree of chord, or start degree of curve.	
A "CS to SC" ("Curve-Spiral to Spiral-Curve") direction means that the start station of the spiral is the end station of one curve, and the end station of the spiral is the start station of the other curve. For "*CS to SC*" spiral, specify one of the parameter from the two following groups: *Start Radius/Start Deg Chord/ Start End Deg Curve*: the start radius of the curve, or one of two parameters unambiguously defining the radius: start degree of chord, or start degree of curve *End Radius/End Deg Chord/ End Deg Curve*: the end radius of the curve, or one of two parameters unambiguously defining the radius: end degree of chord, or end degree of curve.	

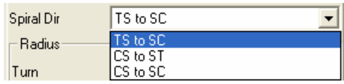


Figure 9-40. Select Spiral Direction

3. Then enter the following parameters of the spiral:
   - *Azimuth* - the azimuth of the tangent (see “Feature Azimuth Setting” on page 9-20).
   - *Length/Sp Const:* the length of the spiral element or the parameter unambiguously defining the length: spiral constant.
   - *Turn*- the direction of turn of the curve. The *Right* value stands for clockwise direction, the *Left* value - for counter-clockwise direction.

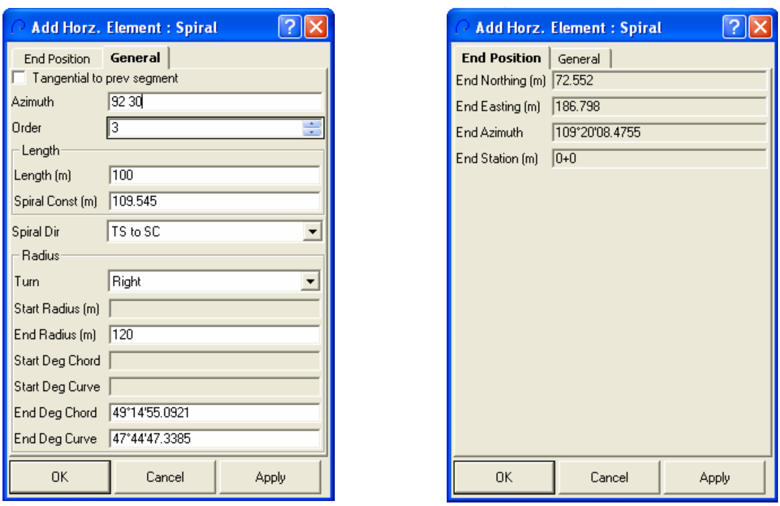
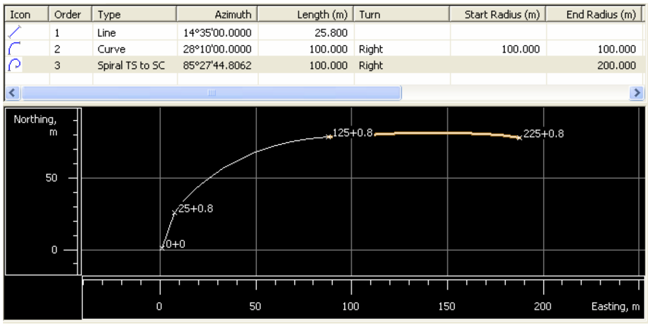


Figure 9-41. Add Horiz. Element: Spiral dialog box. General and End Position Tabs

4. Click **OK** to create (or add) the spiral. The Table and Graphic pane of the right panel of the *Road* tab display the created spiral (Figure 9-42 on page 9-25).



Icon	Order	Type	Azimuth	Length (m)	Turn	Start Radius (m)	End Radius (m)
	1	Line	14°35'00.0000	25.800			
	2	Curve	28°10'00.0000	100.000	Right	100.000	100.000
	3	Spiral TS to SC	85°27'44.8062	100.000	Right		200.000

Figure 9-42. Table and Graph Pane for the Created Spiral

Adding an Intersection

As mentioned above, the horizontal alignment can be described through intersection points. In this case, two tangents are used to draw a compound curve. Three points define the tangents: the end station of the previous elements and two intersection points. In most cases, the compound curve consists of two spirals and one curve (Figure 9-43). To set the compound curve, add the intersection to the horizontal alignment.

- Set the coordinates of the first intersection point, the lengths of both spirals, and the radius of the curve.
- Set the same coordinates of the second intersection points.

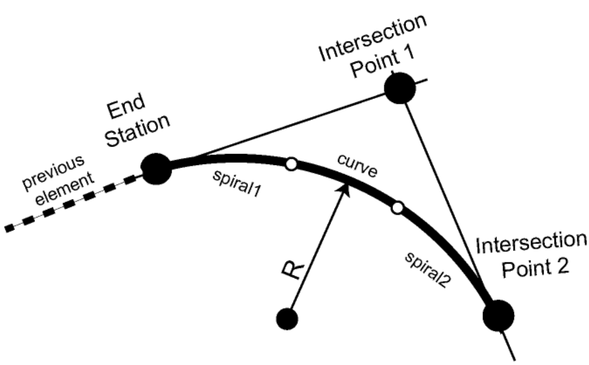
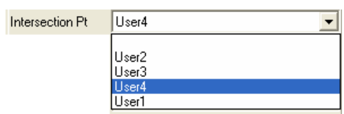


Figure 9-43. The Parameters of a Compound Curve defined by intersection points

If only adding one intersection, Topcon Tools creates a segment joining the end station of the previous element and the intersection point.

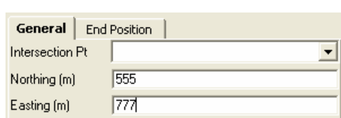
1. To add an intersection, click **Add Horz Element** and click **Intersection** (see “Creating Horizontal Alignments” on page 9-19).
2. In the *General* tab of the ***Add Horiz. Element: Intersection*** dialog box, enter the following parameters:
   - Define the intersection point using one of the following two methods:

     Method 1. Select the intersection point from the drop-down list of the *Intersection Pt* field. This list contains all points from the *Point* tab of the current job:

     Then the *Northing/Easting* field displays the coordinates to the selected point. These coordinates cannot be changed for the selected point.

     Method 2. Enter the desired coordinates in the *Northing/ Easting* field:

   - *Length1(Length2)/Sp Const1(Sp Const2)* - the length of the first and second spirals element or the parameter unambiguously defining the length: spiral constant (see Figure 9-43 on page 9-25).
   - *Radius/ Deg Chord/Deg Curve* - the radius of the curve (Figure 9-43 on page 9-25), or one of the two parameters unambiguously defining the radius: degree of chord, or degree of curve.

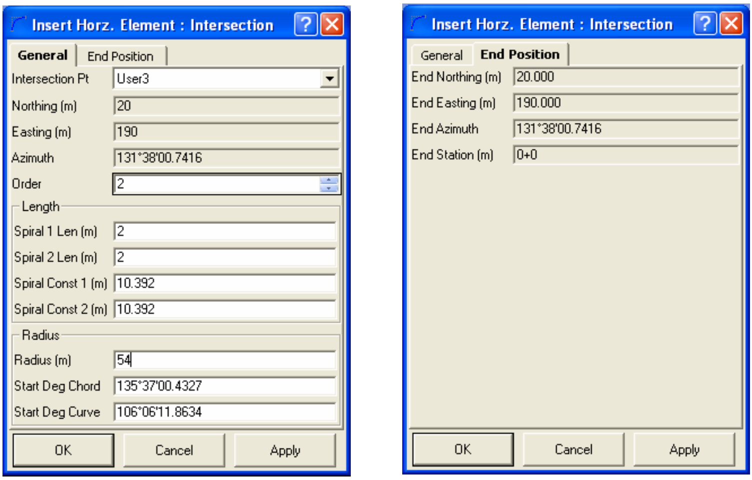
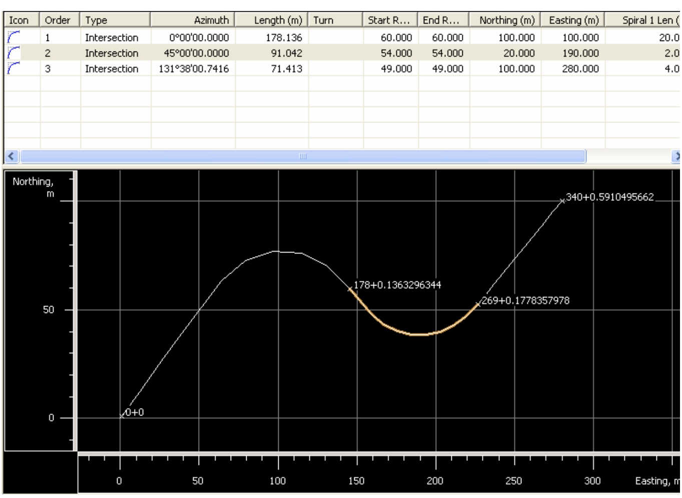


Figure 9-44. Add Horiz. Element:Intersection dialog box. General and End Position Tabs

3. Click **OK** to create the compound curve. The *Table* and *Graphic* pane of the right panel of the *Road* tab displays the created compound curve.



Icon	Order	Type	Azimuth	Length (m)	Turn	Start R...	End R...	Northing (m)	Easting (m)	Spiral 1 Len (
	1	Intersection	0°00'00.0000	178.136		60.000	60.000	100.000	100.000	20.0
	2	Intersection	45°00'00.0000	91.042		54.000	54.000	20.000	190.000	2.0
	3	Intersection	131°38'00.7416	71.413		49.000	49.000	100.000	280.000	4.0

Figure 9-45. Table and Graph Pane for the Created Compound Curve

Creating Vertical Alignments

The *Vertical alignment* table shows a list of vertical alignment elements, the vertical alignment plot, and the starting station of each element.

The pop-up menus in the left and right panels provide access to adding vertical elements (grade, parabola, long section). The new element will be added to the last existing element.

- In the left panel, right-click the road or the vertical alignment and click **Add Vert Element** (Figure 9-46).

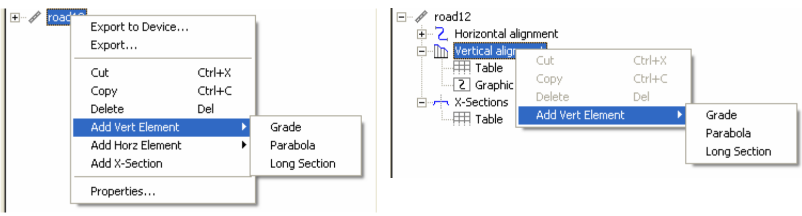


Figure 9-46. Adding Vertical Element Through the Left Panel

- In the right panel, right-click in the Roads tab or the selected element and click **Add Vert Element** (Figure 9-47).

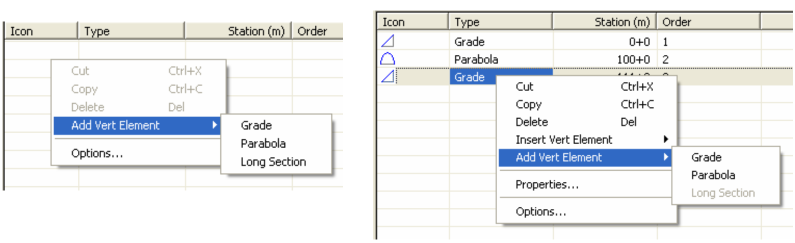


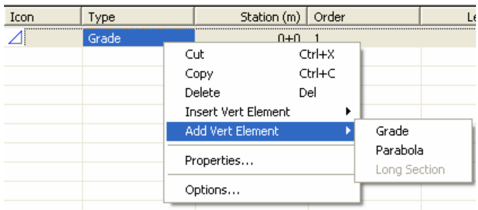
Figure 9-47. Adding Horizontal Element Through the Right Panel

NOTICE

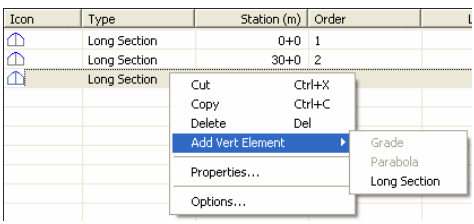
The Insert Vert Element option is only available for Grade and Parabola, and is similar to the Add Vert Element option, except that a the new element will be added before the selected element.

As mentioned above, the vertical alignment is created through grade and parabolas, or long sections. When adding the first element to a horizontal alignment, all vertical elements are available.

- If selecting a grade or parabola as the first element, only a grade or parabola can be the next element added to the vertical alignment.

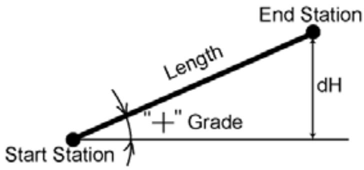


- If selecting a long section as the first element, only a long sections can be the next element of the vertical alignment.

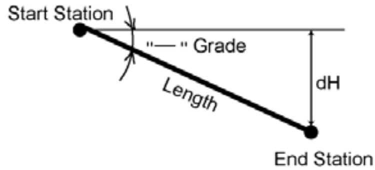


Adding a Grade

1. To add a grade, click **Add Vert Element** and click **Grade** (see "Creating Vertical Alignments" on page 9-28).
2. In the *General* tab of the ***Add Vert. Element: Grade*** dialog box, enter the following parameters for the grade (Figure 9-48 on page 9-30):
   - Length - the length of the grade element.
   - Grade - the ratio of the grade length and delta H (the difference between the elevations at the end station and the start station of the grade element) multiplied at 100%.



If the grade is rising, the value should be set positive



If the grade is falling, the value should be set negative

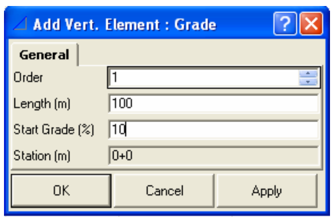


Figure 9-48. Add Vert.Element: Grade dialog box. General Tab

3. Click **OK**. The Table and Graphic panes of the right panel of the *Roads* tab displays the created grade.

Icon	Type	Station (m)	Order	Length (m)	Start Grade (%)	End Grade (%)	Elevation (m)
	Grade	0+0	1	100.000	10.000	10.000	10.000
	Grade	100+0	2	100.000	-10.000	-10.000	0.000

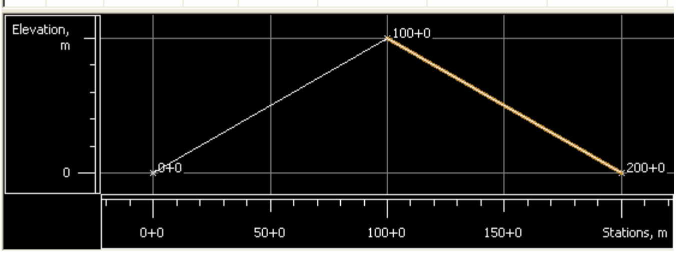
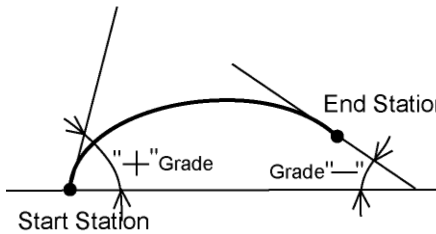


Figure 9-49. Table and Graph Pane for the Created Grades

Adding a Parabola

1. To add a parabola, click **Add Vert Element** and click **Parabola** (see "Creating Vertical Alignments" on page 9-28).
2. In the *General* tab of the ***Add Vert. Element: Parabola*** dialog box, enter the following parameters for the parabola:
   - Length - the length of the grade element.

- Start Grade/ End Grade - the starting and ending grades of the element, in percents. If the grade is rising, the value should be set positive; if the grade is falling, the value should be set negative:



If the value of the start grade is equal to the value of the end grade, the parabola will be transformed to the grade.

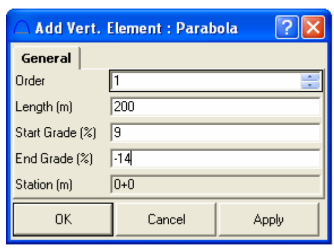


Figure 9-50. Add Vert.Element: Parabola dialog box. General Tab

3. Click **OK**. The Table and Graphic panes of the right panel of the *Roads* tab displays the created parabola.

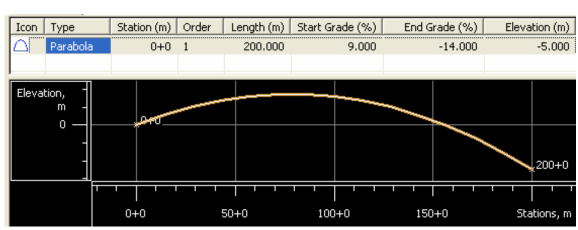


Figure 9-51. Table and Graph Pane for the Created Parabola

Adding a Long Section

As mentioned above, the vertical alignment can be described through a long section. In this case, three points are used to draw a compound curve. To set the compound curve in the vertical plane, add three long sections to the vertical alignment. When creating a complex curve, the heights for long sections 1, 2 and 3, and the length set for long section 2 will be used.

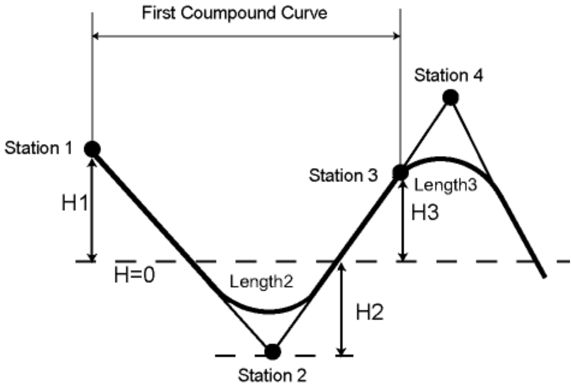


Figure 9-52. The Parameters of a Compound Curve Defined Three Grades

1. To add a long section, click **Add Vert Element** and click **Long Section** (see “Creating Vertical Alignments” on page 9-28).
2. In the *General* tab of the ***Add Vert. Element: Long Section*** dialog box, enter the following parameters for the long section (Figure 9-53 on page 9-33):
    - Sta/ Chainage - the name of the start station / chainage for long section element.
    - Length - the curve length of the long section element. The user can set 0 for start and end element of the long section.
    - Elevation - the elevation on the station using for creating the long section.

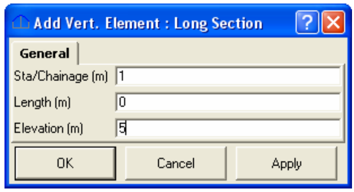


Figure 9-53. Add Vert.Element: Long Section Dialog Box. General Tab

3. Click **OK**. The Table and Graphic panes of the right panel of the *Roads* tab displays the created parabola.
4. Repeat these steps as needed (two more times) to create compound curves.

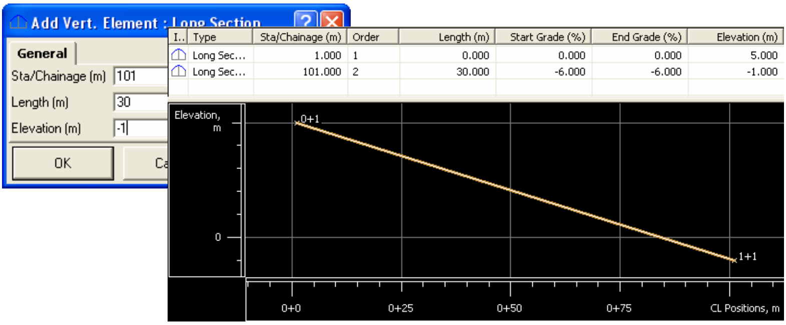
For example, create a vertical curve through three points with elevations +5, -1 and 4 meters, respectively.

Assume the distance between points 1,2 is 100 meters, and the distance between points 2,3 -125 meters. The curve length is 25 meters.

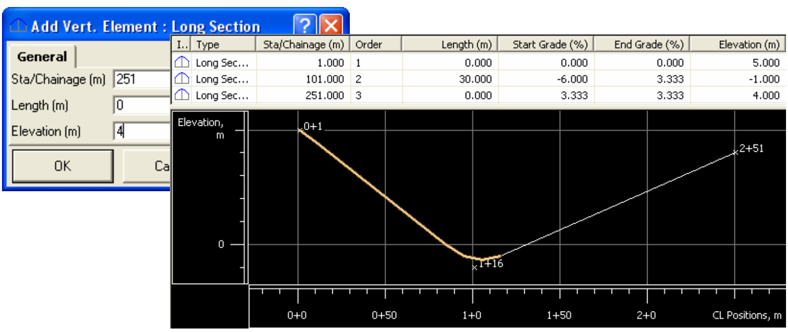
To set corresponding points, enter these parameters in the ***Add Vert. Element: Long Section*** dialog box.

Step 1

Step 2



Step 3



Note, that the distances between the stations of the compound curve form the station name: $ST_n = ST_{n-1} + dD$

where "STn-1" is the name to the previous station and "dD" is the distance between two stations.

The Table and Graphic panes of the right panel of the *Roads* tab displays the compound curve.

Creating X-sections

This section describes creating X-section templates for a road and adding these templates to the center line at the corresponding stations.

Creating Templates for X-section

When planning a road, the cross sections for the road must be established using X-section (cross-section) templates. Topcon Tools uses the following methods for working with cross section templates:

- Create new cross section templates and save them in the current job.
- Import files (SSS Template (*.rd), TDS XSection Template (*.TP5), TopSURV Template (*.trd)) with templates, created in another job or program, to the current job.
- Export any template to the these formats: SSS Template (*.rd), TDS XSection Template (*.TP5), TopSURV Template (*.trd).

1. To create a template for the road section, click **Edit ▸ Add ▸ X-Section Template**.
2. In the *General* tab of the ***Add\ X-Section Template*** dialog box, enter the name of a new template, a cut slope, and a fill slope

   The *Cut Slope* and *Fill Slope* parameters represent the horizontal increment of the slope for a unit of vertical increment. The cut slope is used when the road surface is below the terrain, and the fill slope is used when the road surface is above the terrain. By default, cut slope and fill slope equal 100 unit in percent.

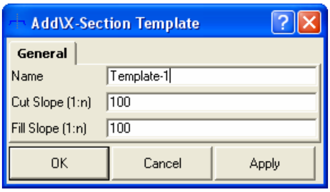


Figure 9-54. Add\X-Section Template Parameters

3. Click **OK** to create the cross section template. The template will display in the Tabular view.
    - The left panel of the X-Section Templates tab displays the name of being created template(s) and values of the cut and fill slopes in percent.
    - The right panel displays the segment(s) of the template in table and graphic mode.

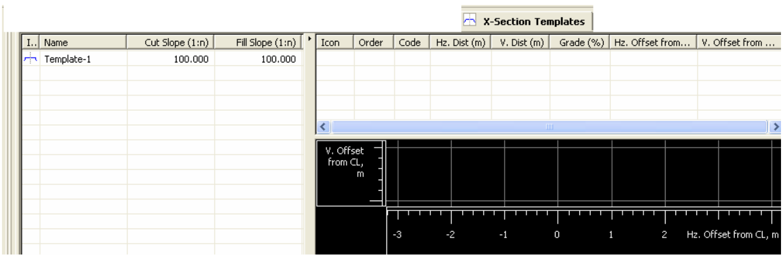


Figure 9-55. Tabular View - X-Section Templates

The right panel of the *X-Section Templates* tab has the following default columns for the segments used for creating the template:

- Icon – the symbol of the segment
- Order – the order of the template segment
- Code – the code of 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
- Grade% – the ratio Hz. Dist and V.DistH multiplied at 100%.

  The user can specify only one parameters: either V.Dist or Grade, and another parameter (Grade or V.Dist) is calculated automatically.
- 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) of the template and are mot editable

- 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) of the template and are mot editable

Adding an X-Section Template to the Current Job

To add the new x-section template to the current job, right-click in the left panel of the X-Section Templates tab and click **Add X-Section Template** (Figure 9-56).

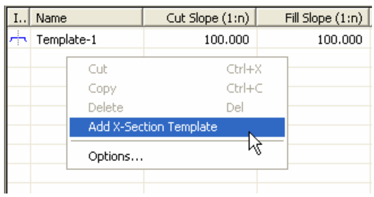


Figure 9-56. Creating New X-Section Template

By default the new template is created with the name “1” and the values of the cut slope and fill slope equal to 100%.

To edit the template’s parameters, right-click the selected template and click **Properties**. Use the ***Properties*** dialog box to edit template name, cut slope, and fill slope.

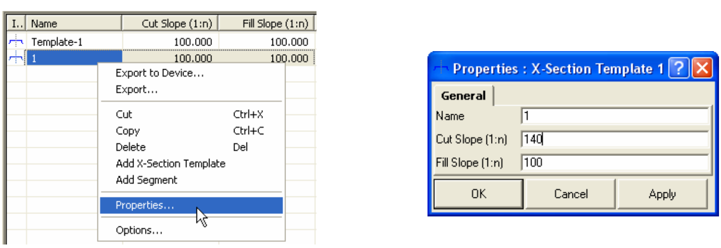


Figure 9-57. Editing the Created Template

Creating a New Segment of the Template

An unlimited number of segments can be created (added to) for the template.

1. To create (or add) a new segment of the template, right-click in the left panel of the X-Section Templates tab and click **Add Segment**.
2. In the *General* tab of the ***Add Segment: X-Section Segment*** dialog box, enter the desired values for Hz.Dist, V.Dist (Grade), Code and Order.

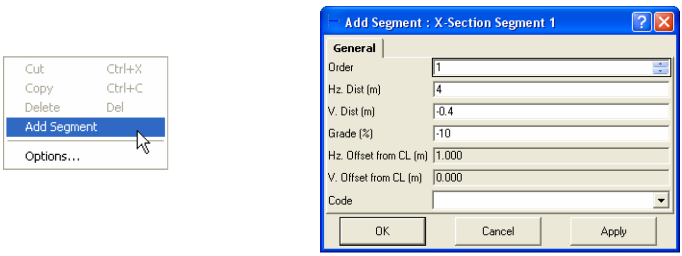


Figure 9-58. Creating a New Segment

3. Click **OK** to create the new segment. The segment will display in the Table and Graphic panes of the right panel of the tab.

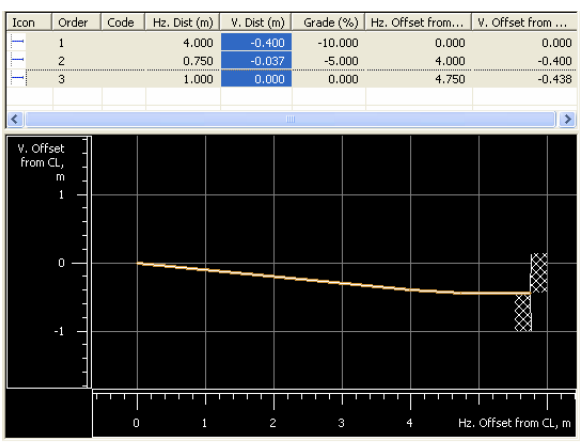


Figure 9-59. Table and Graphic Pane for the Created Segment

Adding X-Sections to the Central Line

The *X-Section* tab contains a list of stations where cross section templates are applied, as well as a general view of the cross section.

An unlimited number of the templates can be added for the road.

The pop-up menus in the left and right panels provide access to adding a new section to the road.

- In the left panel, right-click the road or the x-section and click **Add X-Section** (Figure 9-60).

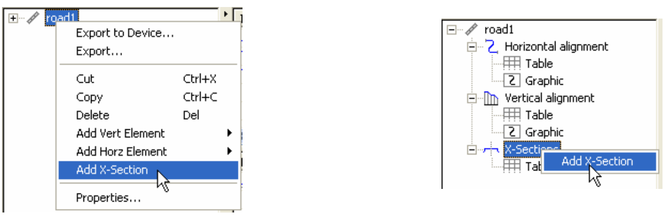


Figure 9-60. Adding X-Section Using Left Panel of the Road tab

- In the right panel, right-click and click **Add X-Section** (Figure 9-61).

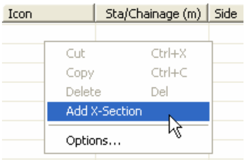


Figure 9-61. Adding X-Section Using Right Panel of the Road tab

1. To add a cross section, navigate to the ***Add X-Section*** dialog box (see above).
2. In the *General* tab of the *Add X-Section* dialog box, set the following parameters (Figure 9-62 on page 9-40):
   - Station - enter the station where the template is to be applied.
   - Side - select the left or right side of the road relative to the central line where this template is to be used.
   - Template - select the name of the template from the list of existing templates in the current job.

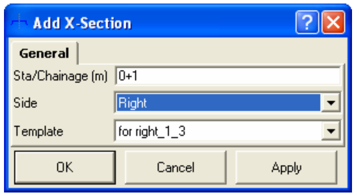


Figure 9-62. Add X-Section

3. Click **OK** to add this template to the central line of the road for the start station. The template will display in the Table and Graphic panes of the right panel of the tab and in CAD View.

   Topcon Tools applies interpolation to cross sections from the first station to either the last station of the road (using only one template (Figure 9-63)) or to the start station of the next template.

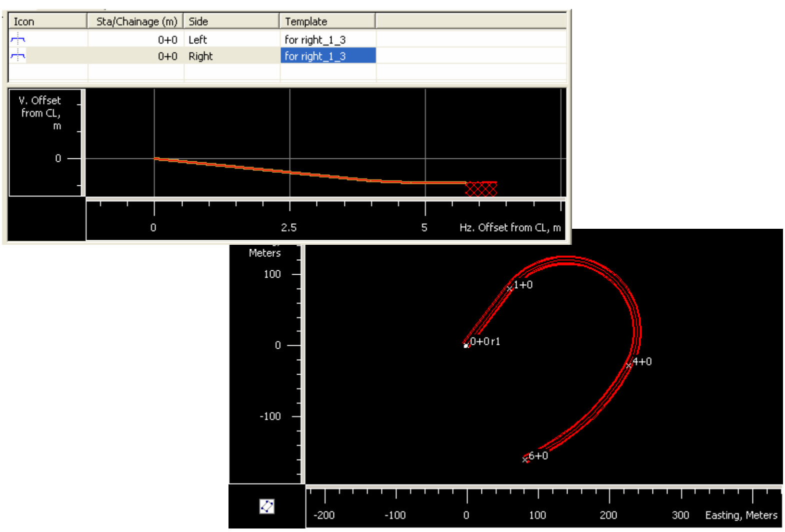


Figure 9-63. Example Using One Template

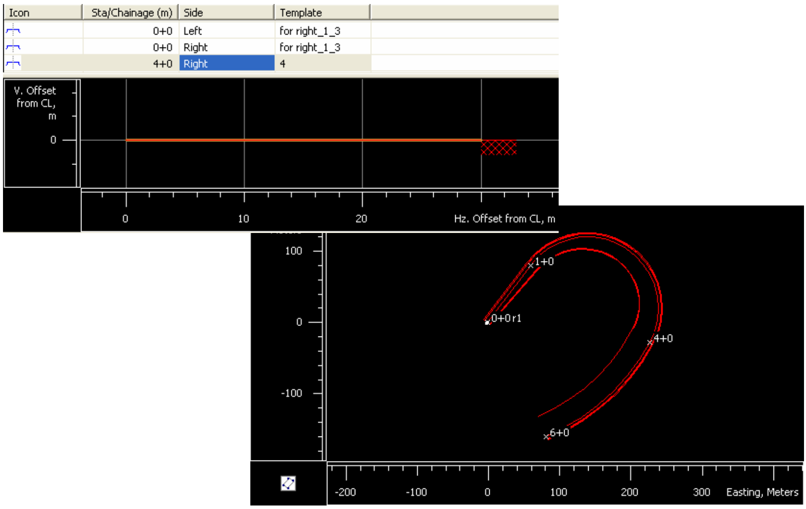


Figure 9-64. Example of Using Two Templates

Calculating an Inverse

The inverse function computes the 3D distance between two points.

1. Click **Cogo ▸ Inverse**.
2. Select the *From* point(s) in the left column and the *To* point(s) in the right column (Figure 9-65 on page 9-42).
   - While clicking, hold the Ctrl key or the Shift key to select multiple points.
   - Or manually type point names, separating multiple names with commas.
   - Or right-click a point(s) in the Map or Tabular view and click either Inverse from or Inverse to.
3. Click **Calculate** (Figure 9-65 on page 9-42).

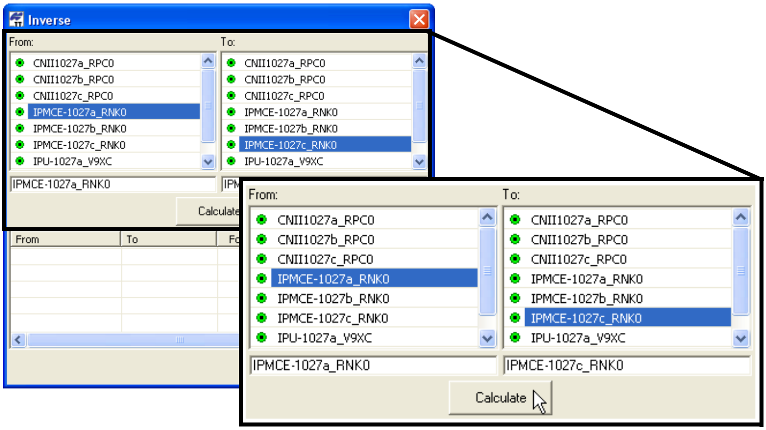


Figure 9-65. Select Points to Determine Inverse

4. View the results in the bottom pane (Figure 9-66 on page 9-43). The available columns depends on the coordinate system of the open project.
   - From and To – the points selected to calculate the distance between
   - Forward Azimuth and Backward Azimuth – the forward and backward horizontal geodesic calculations
   - Geodetic Distance – the shortest distance between the points on an ellipsoid
   - Ground Distance – the total distance between the points on a geodetic plane
   - Distance – the total distance between the points on a plane
   - Hor. Distance – the total horizontal distance between the points on a plane
   - Delta Ell. Ht. – the difference in ellipsoidal height
   - Delta H – the difference in height
5. Repeat as necessary for other point pairs. Inverse calculations will display in the bottom pane (Figure 9-66 on page 9-43).

TIP

Right-click in the bottom pane to view an Inverse Task Report.

6. Click **Close** when done.

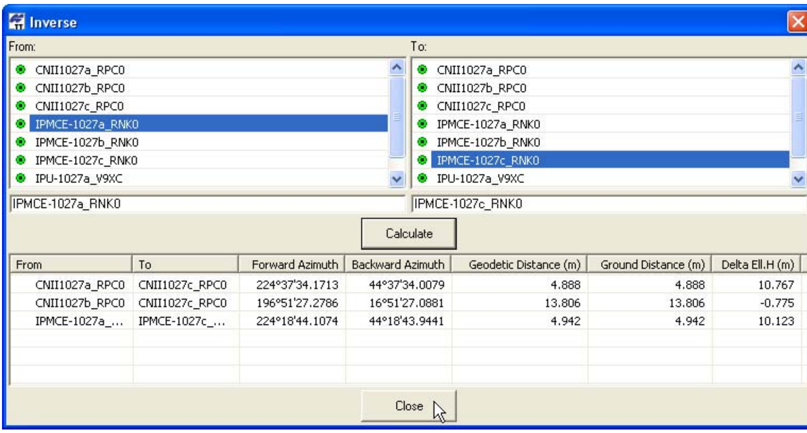


Figure 9-66. Inverse Results

Calculating an Intersection

The intersection option computes the intersection point of the rays and spheres. A ray can be specified by different ways:

- Start and end points
- Start points and azimuth

A ray is extended only from a start point in the direction of an end point or in the direction of an azimuth endlessly. If the ray is defined by two points, there will be the following variants of obtaining / losing of the intersection point (Figure 9-67).

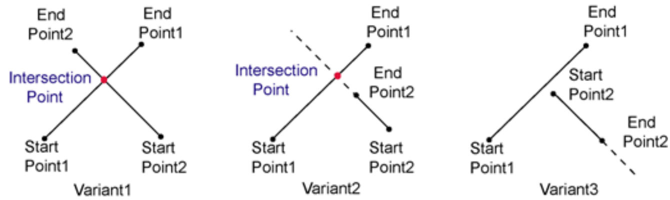


Figure 9-67. The different variants to obtain intersection point when two points specify a ray

If the ray is defined by a start point and an azimuth, there will be the following variants of obtaining/losing of the intersection point (Figure 9-68).

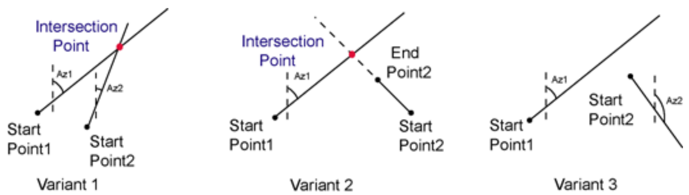


Figure 9-68. The different variants to obtain the intersection point when a ray is defined by a start point and an azimuth

A sphere can be specified by a start point (a center of the sphere) and a distance (a radius of a sphere) (Figure 9-69).

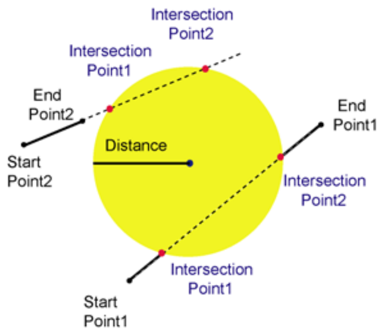


Figure 9-69. The different variants to obtain the intersection point when a sphere is defined by a start point and an distance

To calculate the intersection point, take the following steps:

1. Click **Cogo ▸ Intersection**.
2. Select the way for specify a ray:
   - To specify ray with using a start and end point, highlight a start point in the *Start 1 / Start2* column, select an end point in the *End Point* tab in the *Complete1 / Copmlete2* column.

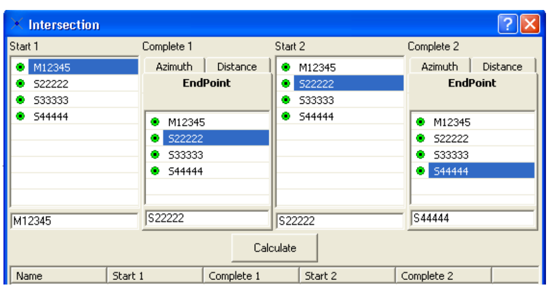
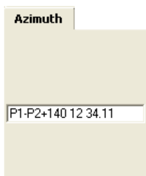


Figure 9-70. The rays are specified start and end points

   - To specify ray with using a start point and an azimuth, highlight a start point in the *Start 1 / Start2* column, set an azimuth in the *Azimuth* tab in the *Complete1 / Copmlete2* column (Figure 9-71 on page 9-46). Enter an azimuth value using one of the following methods.

– According to format for angular units of the current job.

– Using azimuth of a ray, specified by any two points of the current job and any angle offset in the form "P1-P2+140 12 34.11".



Where "P1/P2" is a point name and "140 12 34.11" is a example of angle offset (DD NM SS.sss). A value of the angle can be as positive both negative within the range of 0-360 degrees.

In this case Topcon Tools computes the azimuth between two points, adds to it the angular offset and creates a ray with resulted azimuth from the start point.

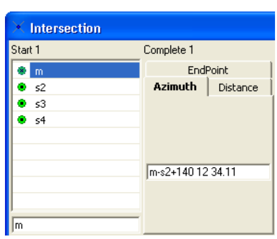
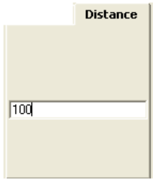


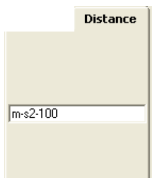
Figure 9-71. The ray are specified a start point and an azimuth

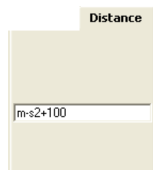
- To specify a sphere with using a start point and a distance (a radius of a sphere), highlight a start point in the *Start 1 / Start2* column, set an distance in the *Distance* tab in the *Complete1 / Copmlete2* column (Figure 9-71 on page 9-46). The user can enter a distance value using one of the following methods:

– According to format for linear units of the current job.



– Using the distance between any two points of the current job and any distance offset in the form “m-s2+100” or “m-s2-100”.





where “m-s2” is a point name and “100” is an example of a distance offset.

In this case Topcon Tools computes the distance between two points, adds to it the distance offset and creates a sphere with resulted radius (a distance) with the start point as a center.

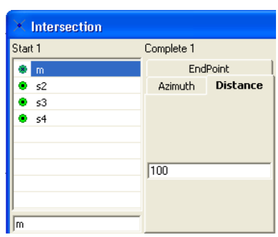


Figure 9-72. The sphere is specified a start point and a distance

3. Click **Calculate.**
4. Topcon Tools calculates the intersection point coordinates and the *Point* Tab displays this point with unique default name (cogo,cogo(2) and etc.). View the results of calculation in the bottom pane.

   – Name - the intersection point name

   – Start1 and Start2 - the start point name of the ray or the sphere

– Complete 1 / Complete 2 - the end point name or the azimuth for the ray or the distance for the sphere

– Latitude/ Longitude/Ell. Height or Northing/Easting/ Elevation - displays the coordinate of the intersection (cogo) point

5. Repeat as necessary for other rays or spheres. The result of the intersection will display in the bottom pane

TIP

Right-click in the bottom pane to view an Intersection Report.

6. Click **Close** when done.

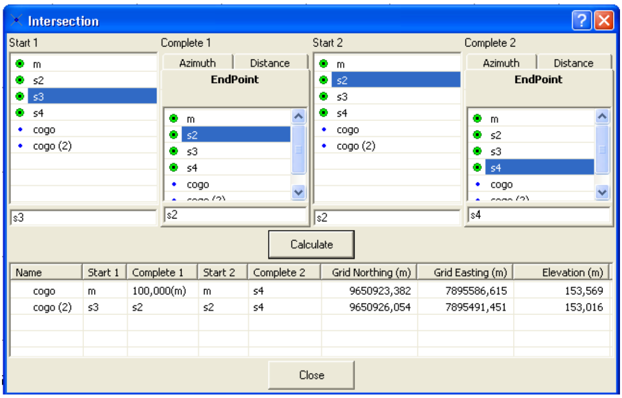


Figure 9-73. Intersection Results

Comparing Surfaces

The Compare Surfaces function allows the user to compute difference between the volumes of two surfaces and the volume of a surface relative to the horizontal plane set at the desired level.

To compare the surfaces, take the following steps:

1. Click **Cogo ▸ Compare Surfaces**.
2. Select the *Design* surface in the left column and the *Existing* surface or a horizontal plane set at the desired level in the right column (Figure 9-74).

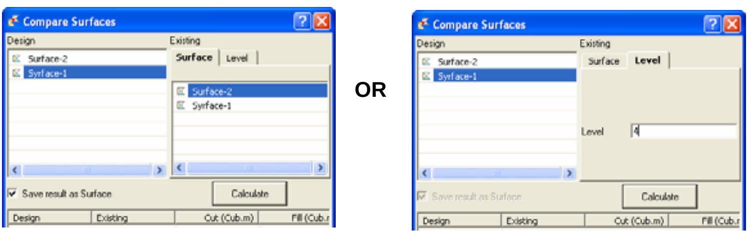


Figure 9-74. Select Surfaces or Surface and Horizontal Plane

3. Click **Calculate**.
4. View the results in the bottom pane (Figure 9-78):
   - Design/Existing - the surface name selected to calculate the difference between
   - Cut / Fill -
     – when comparing two surfaces: the volume for cutting / filling needed for correction of the existing surface for the design surface
     – when comparing surfaces and the horizontal plane the volume for cutting / filling needed for creating of the design surface relative to the desired level
   - Area - the common area of two surfaces or a surface and the horizontal plane

If selecting a surface in the right column, Topcon Tools calculates the difference between the volumes of the two surfaces as shown in the following figure

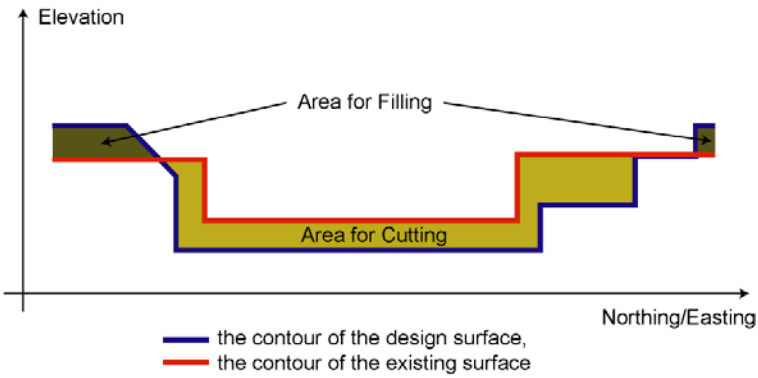
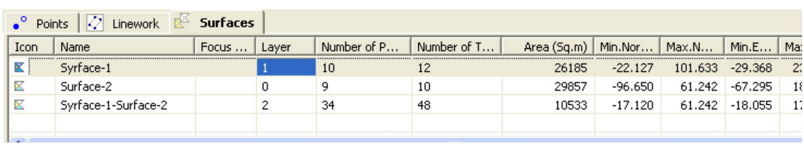


Figure 9-75. Comparing two Surfaces

In this case, the user can save the results of comparing as a new surface. To do it, click in the field “Save result as Surface” and press **Calculate**. Then the Surfaces tab displays the created surface:



Icon	Name	Focus ...	Layer	Number of P...	Number of T...	Area (Sq.m)	Min.Nor...	Max.N...	Min.E...	Ma
	Syrface-1		1	10	12	26185	-22.127	101.633	-29.368	2
	Surface-2		0	9	10	29857	-96.650	61.242	-67.295	1
	Syrface-1-Surface-2		2	34	48	10533	-17.120	61.242	-18.055	1

Figure 9-76. Surfaces Tab Displays the Created Surface

If selecting a level in the right column, Topcon Tools calculates the volumes of the design surfaces relative to the horizontal plane as shown in Figure 9-77

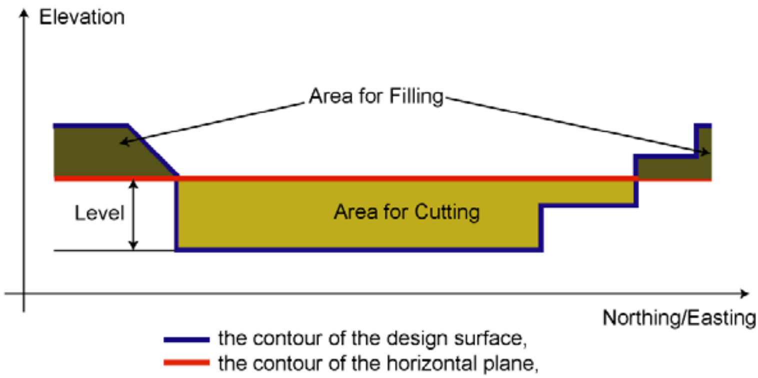


Figure 9-77. Comparing the Surface with a Horizontal Plane at the Desired Level

5. Repeat as necessary for other surface pairs/ plane. The results of the comparison will display in the bottom pane (Figure 9-78).

TIP

Right-click in the bottom pane to view a Comparison Report.

6. Click **Close** when done.

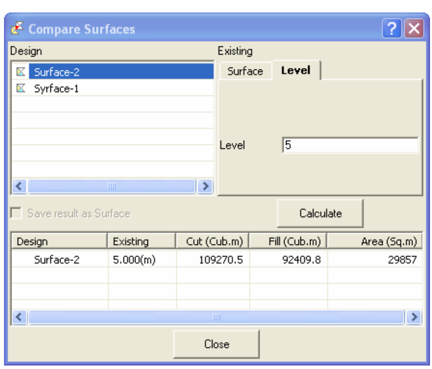


Figure 9-78. Compare Surface Results

Calculating Inverse Point To Line

The Inverse Point to Line function calculates offsets of the point from a line (or ray). These offsets can be calculated, and the ray specified, from any point of the current job using one of the following sets of values:

- start and end points
- start point and azimuth

The ray is extended from the start point in the direction of an end point, or in the direction of the azimuth, endlessly.

Figure 9-79 illustrates the offsets of a point from the ray.

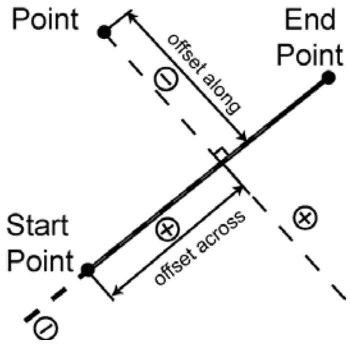


Figure 9-79. Offsets for Point From Ray

1. To calculate the offsets, click **COGO ▸ Inverse Point To Line**.
2. In the Point pane, select the point relative to which the offsets will be calculated.

Figure 9-80. Select Point From Which To Calculate Offsets

3. In the Point From pane, select the point from which to begin the ray.
4. In the Direction pane, select the direction in which to calculate the ray.
   - To use an End Point for the ray (Figure 9-81), select the desired end point.
   - To use an Azimuth for the ray (Figure 9-81), enter one of the following azimuth values:
     – The angle of the azimuth (entered as DD NM SS.sss).
     – Two point names (start and end) and an angle offset using the following format. Using this method, the azimuth will be computed first between the two points, then add the angular offset.

       1-4+12 45 22

       Where "1-4" is the first and second point, and "+12 45 22" is the angle offset (entered as DD NM SS.sss). The angle value can be positive or negative within the range of 0-360 degrees.

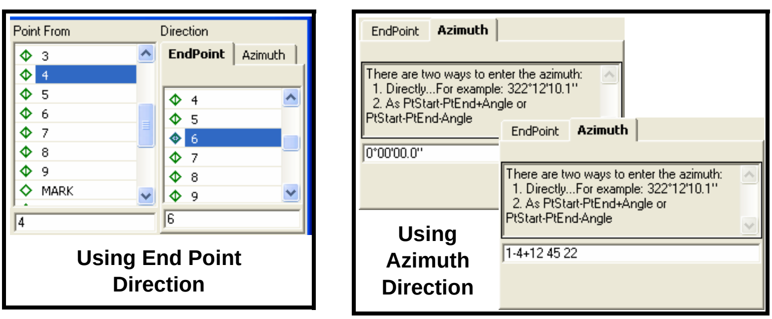


Figure 9-81. Enter the Direction

5. Click **Calculate**. The offset, calculated from the selected point and direction (line or ray), displays in the bottom pane (Figure 9-82 on page 9-54).
   - Name – the point name relative to which the offsets will be calculated.

- Latitude/Longitude/Ell.Height or Grid Northing/Grid Easting/Elevation or Ground Northing/Ground Easting/ Elevation – the coordinates of this point.
- From Point – the name of the start point of the line (or ray).
- Direction – either the name of the line's end point or the value of the azimuth.
- Offset Along – the value of the offset along the selected point from the given line. This value will be positive if the point is located to the right of the given line.
- Offset Across – the value of the offset across the selected point from the given line. The value will be positive if the point is located in the direction of the given line; it will be negative if the point is located in the opposite direction line.
- Offset H – the height difference between the selected point and the start point of the line (ray).

6. Repeat as necessary to calculate the offsets for other points.

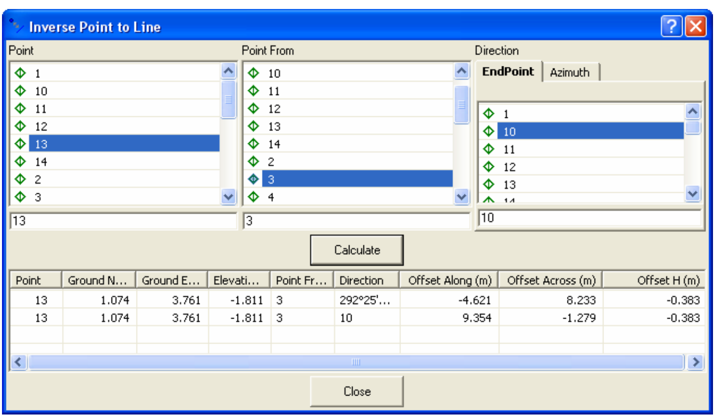


Figure 9-82. Inverse Point To Line Results

TIP

Right-click in the bottom pane to view the Inverse Point To Line Report.

7. Click **Close** when done.

Calculating Point In Direction

The Point in Direction function calculates the coordinates of the point located on a line (or ray). These coordinates can be calculated, after specifying the distance from the start point of the line and direction of this line, using one of the following sets of values:

- start and end points
- start point and azimuth

The ray is extended from the start point in the direction of an end point, or in the direction of the azimuth, endlessly.

To calculate the point coordinates, take the following steps:

1. To calculate point coordinates, click **COGO ▸ Point To Direction**.
2. In the Point From pane, select the point from which to begin the calculation.
3. In the Direction pane, select the direction in which to calculate the ray.
   - To use an End Point for the ray (Figure 9-83 on page 9-56), select the desired end point.
   - To use an Azimuth for the ray (Figure 9-83 on page 9-56), enter one of the following azimuth values:
     – The angle of the azimuth (entered as DD NM SS.sss).
     – Two point names (start and end) and an angle offset using the following format. Using this method, the azimuth will be computed first between the two points, then add the angular offset.

       1-4+12 45 22

       Where “1-4” is the first and second point, and “+12 45 22” is the angle offset (entered as DD NM SS.sss). The angle value can be positive or negative within the range of 0-360 degrees.

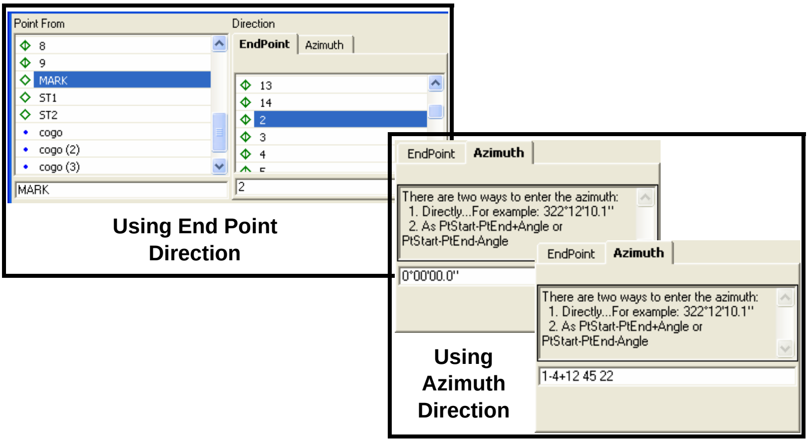


Figure 9-83. Enter the Point From and the Direction

4. Enter the distance from the start point of line to the point that needs coordinates using one of the following methods:
   - Using a linear distance. Enter linear units using the same format as the job (Figure 9-84).
   - Using two current point names (start and end) and an distance offset in the following format (Figure 9-84). Using this method, the distance will be computed first between the two points, then add the distance offset.

     ST1-8+12.2

     Where “ST1-8” is the first and second point, and “+12.2” is the distance offset. The angle value can be positive or negative within the range of 0-360 degrees.

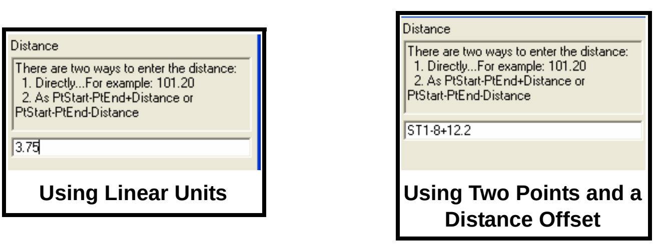


Figure 9-84. Enter Distance From Start Point

5. Click **Calculate**. A new point is created and its coordinates calculated (Figure 9-85). The *Point* tab and *Map View* display this point with a unique default name (cogo, cogo(2), etc.).
   - Name – the name of the created (CoGo) point.
   - Point From – the name of the start point of the line (or ray).
   - Direction – either the name of the line's end point or the value of the azimuth.
   - Distance – the distance from the start point to the CoGo point along the selected line.
   - Latitude/Longitude/Ell.Height or Grid Northing/Grid Easting/Elevation or Ground Northing/Ground Easting/Elevation – the coordinates of the CoGo point. Note that the Ell.Height or Elevation of the CoGo point equal to Ell.Height or Elevation of the start point of the line.
6. Repeat as necessary to calculate the coordinates of other points.
7. Click **Close** when done.

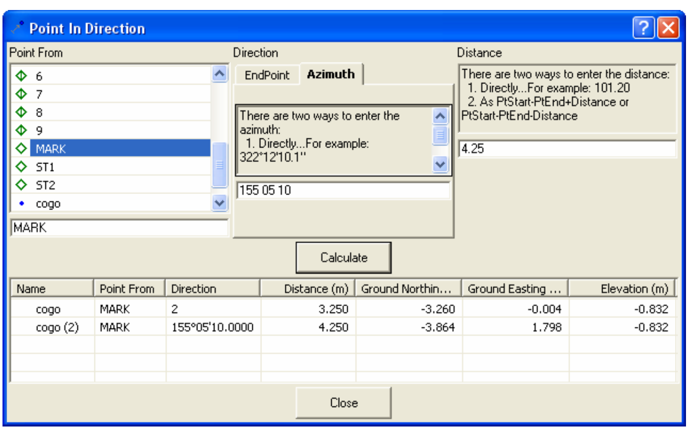


Figure 9-85. Point To Direction Results

TIP

Right-click in the bottom pane to view the Point To Direction Report.

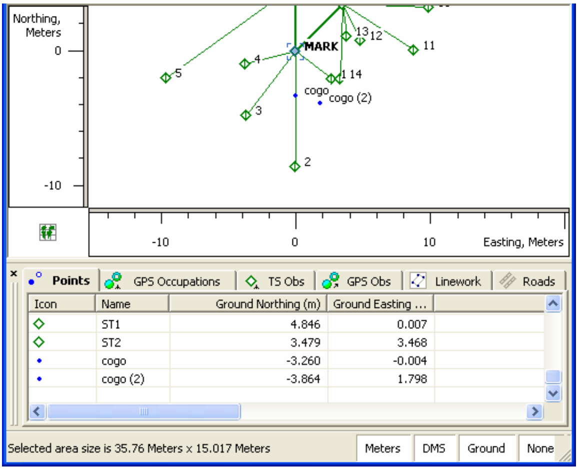
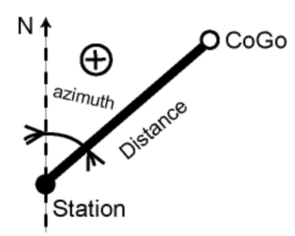
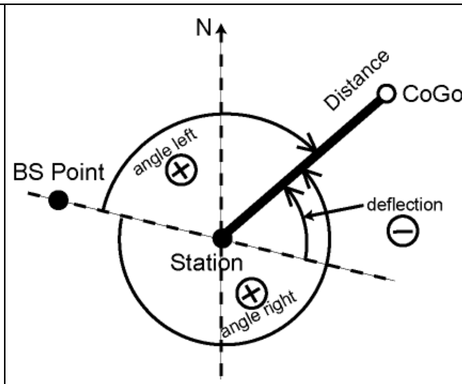
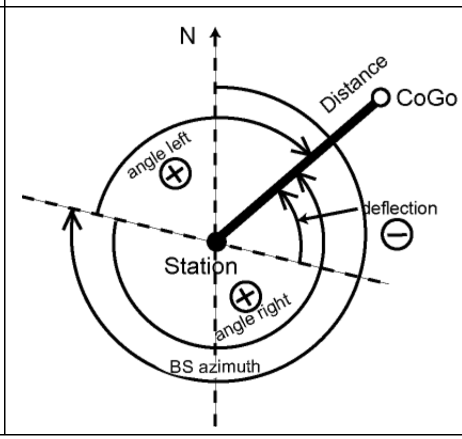


Figure 9-86. Point To Direction Results in Point Tab and Map View

Calculating a Traverse

When calculating traverse point coordinates, the calculation is based on horizontal and vertical distances from the selected point and a direction defined by azimuth, or right, left or deflection angles. Any point from the job can be used as a reference point, and the direction can be defined using one of the following methods:

• azimuth from the station to the traverse point.	

• angle(s) between the line through the station and the BS point and the line through the station and the traverse point.	
• angle(s) between the direction line (ray) through the station and the line through the station and the traverse point.	

From the BS point, any other point from the job can be selected. After calculating the coordinates for the first CoGo point, this point is set automatically as the station for the next calculation.

1. To begin a traverse calculation, click **COGO ▸ Traverse**.
2. In the From Point pane, select the station point from which to begin the calculation.

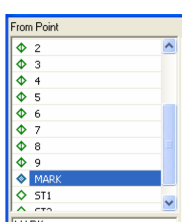


Figure 9-87. Select the Reference Point (Station)

3. Enter the horizontal/vertical distance from the selected station to the traverse point.

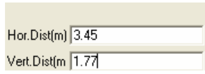


Figure 9-88. Enter Distance From Station to Traverse Point

4. Enter the direction to the traverse point using one of the following methods (Figure 9-89 on page 9-61):
   - Using the azimuth from the station point to the traverse point. Select “Azimuth” and enter the azimuth using the same angular units used in the job.

NOTICE

When using azimuth to define the direction to the CoGo point, a BS point or a BS azimuth cannot be selected.

   - Using any job point as the BS Point. Select either “Angle Right” or “Angle Left”. On the *BS Point* tab, select any other point, then enter the angle value between the line through the station and the BS point and the line through the station and the CoGo point (see the second bullet and figure on page 9-59).

NOTICE

Deflection angles are positive for a clockwise direction.

   - Using angle(s) between the direction line through the station and the line through the station and the traverse point (see the third bullet and figure on page 9-59). Select either “Angle Right” or “Angle Left”. On the *BS Azimuth* tab, enter the azimuth angel using one of the following methods:
     – Using a linear distance. Enter linear units using the same format as the job.
     – Using two current point names (start and end) and an angle offset in the following format. Using this method, the distance will be computed first between the two points, then add the distance offset.

5-9+12 34 22

Where “5-9” is the first and second point, and “+12 34 22” is the angle offset (using the format DD NM SS.sss). The angle value can be positive or negative within the range of 0-360 degrees.

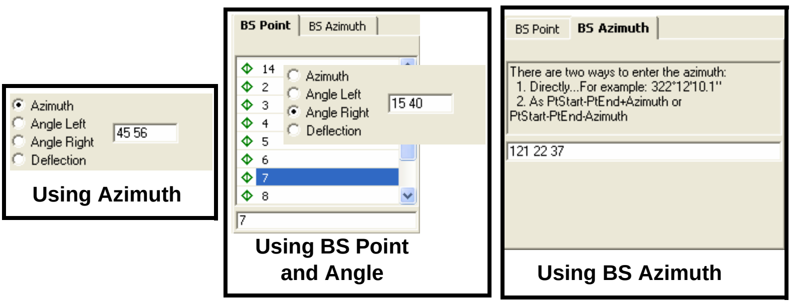


Figure 9-89. Select and Enter Direction to Traverse Point

5. Click **Calculate**. The coordinates of the traverse point are calculated (Figure 9-90) and the *Point* tab and *Map View* displays this point with a unique default name (cogo,cogo(2), and etc.).
   - Name – the traverse point name.
   - Grid Northing/Grid Easting/Elevation or Ground Northing/ Ground Easting/Elevation – the calculated grid/ground coordinates of the traverse point.
   - From Point – the station name.
   - BS Point – the BS point name.
   - Azimuth – the entered or calculated value of the azimuth from the station to the traverse point.
   - Bearing – the calculated value of the bearing from the station to the traverse point.
   - Hor. Dist /Vert. Dist – the horizontal/vertical offset from the station to the traverse point.
   - BS Azimuth – the entered or calculated value of the azimuth of the direction line (ray) through the station.
   - BS Bearing – the calculated value of the bearing of the direction line (ray) through the station.

6. Repeat as necessary to calculate the coordinates of other traverse points.

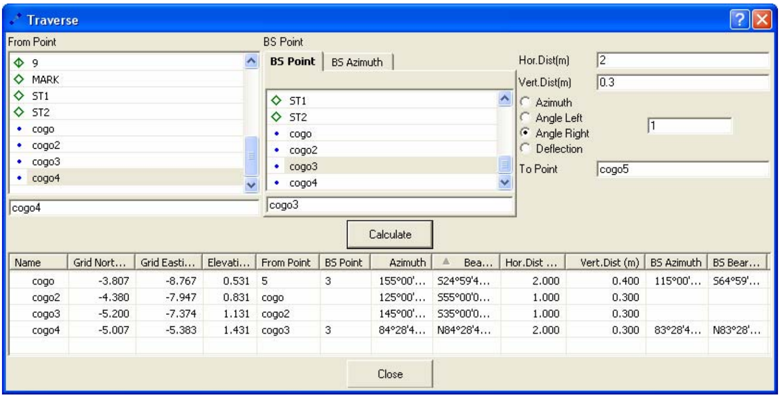


Figure 9-90. Traverse Point Results

TIP

Right-click in the bottom pane to view the Traverse Report.

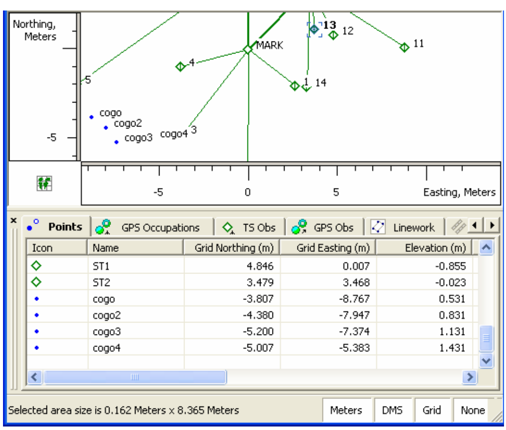


Figure 9-91. Traverse Results in Point Tab and Map View

7. Click **Close** when done.

Image Module

The Image Module can:

- import, view, edit scan session
- import, view stereopairs
- measure a coordinates of any point on the stereopairs

Operating Stereopairs

After importing a TopSURV PC file that contains stereopairs, the *Stereopairs* tab will display. The *Stereopairs* tab displays stereopairs in the orientation view and in the stereo view (see “Stereopairs Tab” on page 4-14 for more information). Using Topcon Tools, you can edit stereopairs, measure the coordinate of the points located on the images, and add the lines to the measured points using the *Stereopairs* tab. To display a stereopair, set *Ground* coordinates in the Status bar.

To edit the stereopairs of the current job, select the *Stereopairs* tab and right-click on the desired stereopairs in the left panel.

Figure 10-1. Pop-up Menu in the Left Panel

The user can do the following using the pop-up menu:

- Cut the selected stereopair.
- Copy the selected stereopair.
- Delete the selected stereopair.

- To reverse the position of the images (the left one for the right one and vice versa).
- Open the window which will display the selected stereopair in its initial form (select “*Orientation View*”).

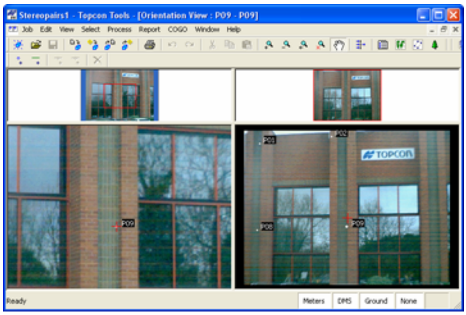


Figure 10-2. View Windows for the Selected Stereopair

- Open the window which will display the selected stereopair in the normalized form (select “*Stereo View*”).

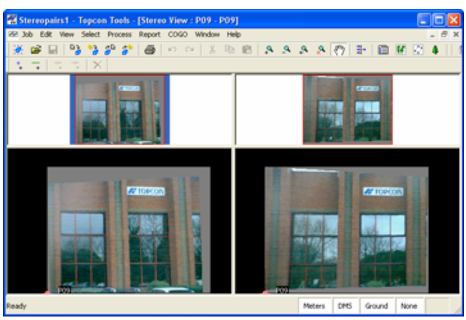


Figure 10-3. Stereo View Window for the Selected Stereopair

The lower part of the right panel can also display the selected stereopair separately in the *Stereo View* and/or *Orientation View* windows. Right-click on any place in the lower part of the right panel and select *Stereo View* or *Orientation View* in the pop-up menu.

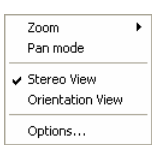


Figure 10-4. Pop-up Menu in Lower Part of the Right Panel

Measuring Coordinates of Points Using Stereopairs

Topcon Tools allows the user to measure the coordinates of any point defined in the left and right images of a stereopair in the *Ground* coordinate using data of external orientation (coordinates of the stations from which photography was made, vertical and horizontal photography angles) and internal orientation (the focus length and the coordinates of the principal point of the camera).

Measuring coordinates of points is possible either in the lower part of the right panel *Stereopairs* tab either in the *Stereo View* or in the *Orientation View* windows. The user can measure the coordinates point at the stereopairs using "*Add Point*" mode.

1. Enable "*Add Point*" mode (click *Add Point* in the Toolbar).
2. With the 'add point' cursor, click the desired point on the first (left or right) image (Figure 10-5). The cursor automatically moves to the second image.

   If the *Stereo View* is set, the epipolar line is displayed on the second image. The point position (set on the first image) must be on this line for the second image.
3. Select and click the desired point on the second image. Enter the name of the created point in the *Add Point* window and click **OK**.

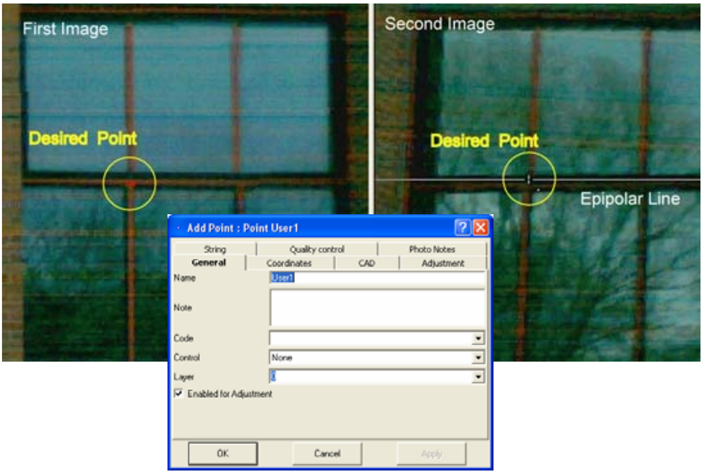


Figure 10-5. Measuring Coordinates of Point Using Stereopairs

4. Topcon Tools will calculate the coordinate this point in the *Ground* coordinate system. The *Points*, *Images* and *Stereopairs* tabs will displays the image measured point.

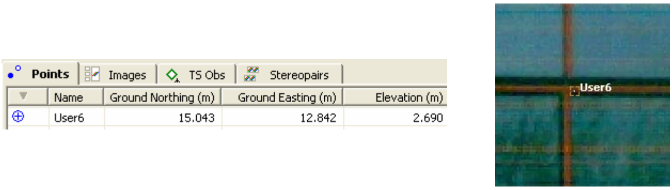


Figure 10-6. Points, Image Tabs Display the Image Measured Point

The *Stereopairs* tab displays the two following points (Figure 10-7):

- Image measurement – the position, that the user selected on the image.
- Image measured point – the position, that Topcon Tools calculated using the data of external and internal orientations.

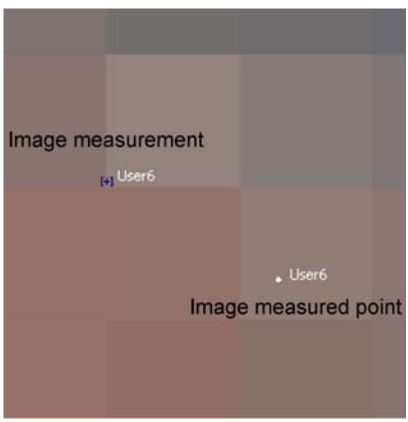


Figure 10-7. Stereopairs Tab Displays the Image Measured Point and Image Measurement Point

Creating Linework using Stereopairs

To add a line to any measured point on the stereopairs, take the following steps:

1. Click *Add Line* in the Toolbar.
2. Using the 'add point' cursor, select the desired point on the first and second images.
3. Repeat the second procedure for any next point. Then Topcon Tools creates the line between these points, and left and right images of the stereopairs display the line.
4. Set the plotting style of the line using the toolbar *Layers* box.

The *Linework* tab and *CAD View* display the lines are created in the *Stereopairs* tab (Figure 10-8).

The vertexes of the created lines have no names and corresponding points are not displayed in the *Points* tab.

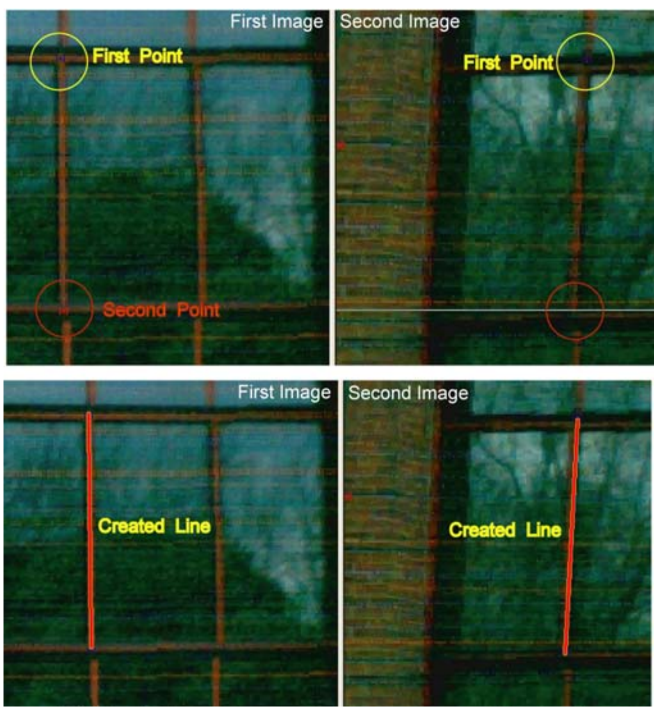


Figure 10-8. Creating Linework

Creating Surface using Stereopairs

To create a surface using points, that was measured on a stereopair, select these points and click **View ▸ Add ▸** *Surface*. Enter a name of the creating surface and click **OK** in the *Add Surface* window. Then the *Stereopairs* tab displays the surface (Figure 10-9).

Figure 10-9. Creating Surface for Measured Points

Cad View and 3D View can display this surface (Figure 10-11 on page 10-7). The user can set the orientation image corresponding of the created surface as a texture for 3D View.

1. Click *Image* Tab.
2. Right-click the desired image in the left panel and select Set as Surface Texture.

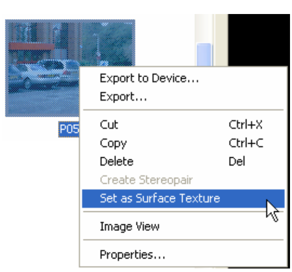


Figure 10-10. Image Tab->Left Panel

The 3D View will display the created surface with the selected texture (Figure 10-11).

Figure 10-11. CAD and 3D View for Surface

Adjustment of Measured Points

To estimate the accuracy of measuring points on stereopairs, the user can perform the adjustment process (click **Process ▸ Adjustment**).

In this case, the adjustment will re-calculate the network containing three points: measured point and two stations, where a Total Station has been set. After adjusting the network, the *Points* tab displays the standard deviation for the each components of the measured points.

Points | Surfaces | Stereopairs | TS Obs | Images

Icon	Name	Groun...	Grou...	Elev...	Std Dev n (m)	Std Dev e (m)	Std Dev u (m)	Std Dev Hz (m)
⊕	User11	4.493	17.291	-1.188	0.019	0.030	0.008	0.036
⊕	User12	3.914	17.780	-1.191	0.019	0.032	0.008	0.037
⊕	User13	3.701	18.184	-1.212	0.019	0.034	0.009	0.039
⊕	User2	3.586	18.445	-1.209	0.019	0.036	0.009	0.040
⊕	User21	5.337	17.977	-0.176	0.022	0.033	0.008	0.040

Figure 10-12. Points Pab-Measured Points

NOTICE

The adjustment does not detect errors of the point setting on the stereopairs and assumes that this error does not exceed ONE pixel.

Editing Scan Session

After importing a TopSURV PC file that contains a scan session, the *Scan Sessions* tab will display. Topcon Tools allows the user to view the scan points with or without attached image and to create a surface using these points.

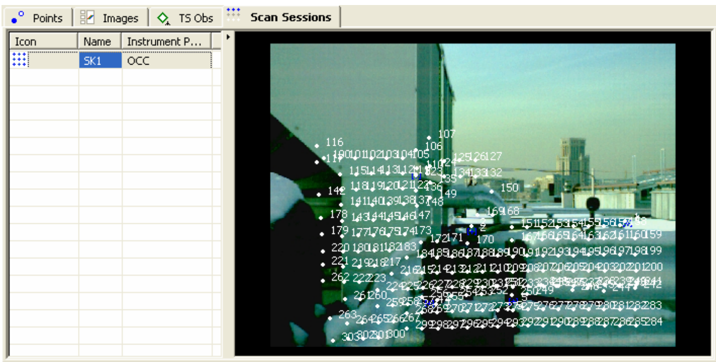


Figure 10-13. Scan Session Tab

To edit the scan session of the current job, select the *Stereopairs* tab and right-click on the desired scan session in the left panel.

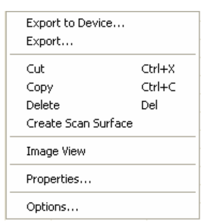


Figure 10-14. Pop-up Menu in the Left Panel

The user can do the following operation using the pop-up menu:

- Cut the selected scan session.
- Copy the selected session.
- Delete the selected session.
- Create a Scan surface. After clicking the option, the *Create Scan Surface* dialog box displays. The instrument point is automatically selected as a focus point for the surface being

created. To create a surface using scan points, enter the name of the surface, select the desired layer and click **OK** (Figure 10-15). The *Image* view displays the created surface.

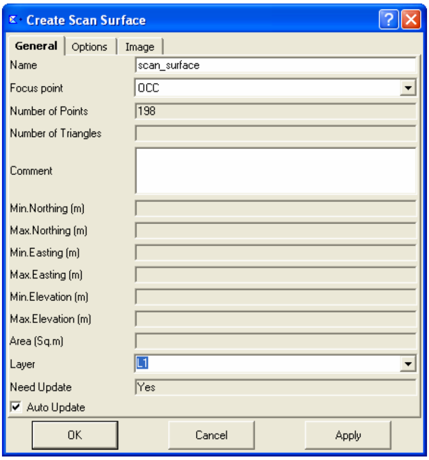


Figure 10-15. Create Scan Surface

- The Image view displays the selected scan session in the vertical plane.

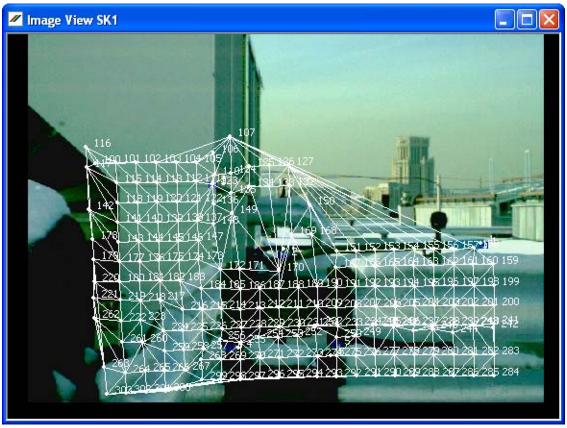


Figure 10-16. Image View of Selected Scan Session

The user can set the image corresponding to the created surface as a texture for 3D View:

1. Click *Image* Tab
2. Right-click the desired image in the left panel and select Set as Surface Texture.

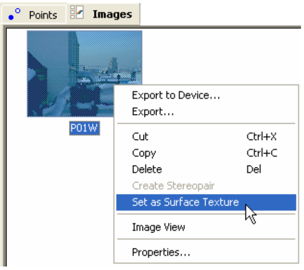


Figure 10-17. Image Tab->Left Panel

Then 3D View will display the created surface with the texture.

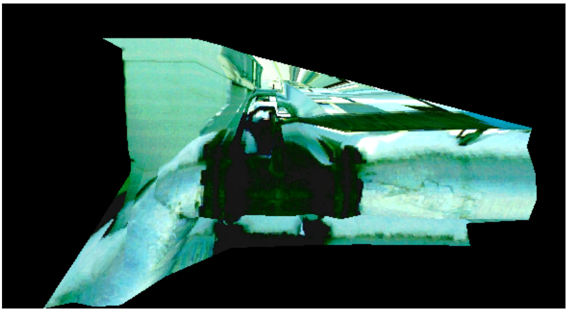


Figure 10-18. 3D View for Surface

Advanced Module

The Advanced Module allows the user to perform addition procedures and to make addition settings in post-processing and adjustment.

Be sure that the Advanced Module is active in Topcon Tools. When active, the Advanced Module appears in the list of active modules (**Help ▸ Access Codes**).

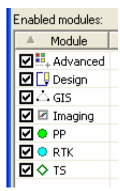


Figure 11-1. Enabled Modules

Advanced Module for Processing

If the Advanced module is activated, the *Process Properties* window for *GPS+ PostProcessing* displays three tabs: *General*, *Engine* and *Troposphere.*

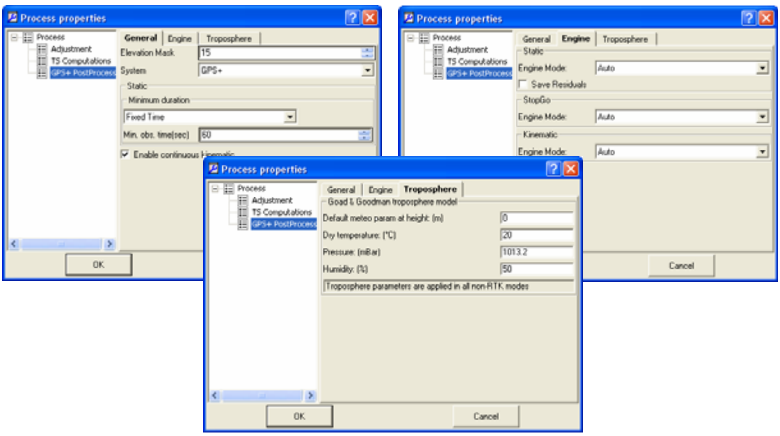


Figure 11-2. Process Properties for GPS-PostProcessing.

General Tab

The *General* tab allows the user to select the following (Figure 11-2):

- the elevation mask
- the navigation system (either GPS and GLONASS or only GPS satellites for calculating the GPS observations of the current job)
- two options in the Minimum Duration field:

    1. If selecting the *Auto* option, Topcon Tools will create a GPS observation for a pair occupations that have a common observation time needed for starting the post-processing. The time depends on the distances between two points, the number of common satellites observed at these point, the type of the receiver (L1/L2 or L1 only and GPS and GLONASS or GPS only), and so on.

2. If selecting Fixed Time, Topcon Tools will create a GPS observation for a pair occupations that have common a observation time more than that set in the *Min. obs. time (sec)* field.

- the “*Enable continuous kinematic*” checkbox to display and process GPS kinematic data.

This tab is similar to the *GPS+ PostProcessing* window in Topcon Tools without *Advanced Module*.

Engine Tab

In the *Engine* tab (Figure 11-2 on page 11-2), the user can select the desired process mode, that is the specific technique used by the engine for static, stop-and-go or kinematic processing. For any solution (Static, StopGo, and Kinematic), the user can select the following modes:

- PP Code Only – Based on using pseudo-ranges only.
- PP L1 Only – Processing single frequency measurements (this is ‘standard’ when using single frequency receivers).
- PP L2 Only – Processing L2 measurements only.
- PP L1&L2 – Processing dual frequency measurements (recommended for shorter baselines). L1 and L2 observables will be treated by the engine as independent data sets (that is, the engine will formulate no mixed combinations from L1 and L2 observables).
- PP L1c – Processing dual frequency measurements collected on longer baselines (> 30 km). An ionosphere-free combination is formulated and processed but integer biases are not fixed.
- PP L1-L2 – Processing a wide-lane combination (this is mainly used on longer baselines and for research purposes).
- PP L1+L2 – Processing a narrow-lane combination (this is mainly used for research purposes).
- L1&L2c – The most powerful processing including both integer ambiguity resolution and the formulation of an ionosphere-free

combination. This is often considered the principal technique for processing dual frequency measurements. Generally, this is used on baselines less than 30 km, but in conditions of low ionosphere activity it may be extended to about 75 km.

- VLBL – Processing very long baselines. This is based on triple differences with ionosphere and troposphere corrections.
- Wide Lane – This can be considered to be a modified L1-L2 mode. There are scenarios where the residual ionosphere is too large for either L1&L2 or L1&L2c to provide fixed solutions, yet the raw data are considered good enough to allow correct estimates of (L1-L2) ambiguities.
- RTK Fixed – Post-processing is performed using RTK engine from TPS receiver.
- RTK L1 Only – Post-processing is performed by RTK engine using only single frequency measurements.
- RTK Code Only – Post-processing is performed by RTK engine using only pseudo-range measurements.

The user can select AUTO for each solution used in Topcon Tools. This option will use the following modes for Static:

- If only single frequency measurements available, AUTO is equivalent to L1 Only.
- If a vector processed is shorter than 10 km, AUTO is equivalent to L1&L2.
- For vectors falling into the 10 km to 30 km bracket, AUTO is equivalent to L1&L2c.
- For the 30 km to 400 km bracket, AUTO coincides with Wide Lane.
- Finally, if a vector is longer than 400 km, AUTO is equivalent to VLBL.

Topcon Tools can save the double difference residual for each static GPS observation of the job. To do this, enable *Save residuals*.

The option AUTO for StopGo and Kinematic will use the modes RTK Fixed.

Troposphere Tab

Topcon Tools will use the troposphere parameters as specified in the corresponding fields of the window (Figure 11-2 on page 11-2).

Note that these parameters will correspond to a point that has the height set in the *Default meteo param at height* field (by default is 0 meters). The user may enter the factual value of the height for the point where was measured the meteo parameters. Then the engine, using the meteo parameters entered for the known (or default) height will calculate the troposphere model for each occupation of the job given the height for the occupation.

Splitting a GPS Occupation

The Advanced module allows one to split any occupation and to merge two occupations of the job.

1. To split an occupation, right-click the desired occupation in the *Occupation* tab and select *Split* in pop-up menu.

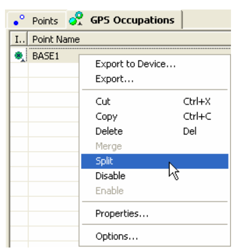


Figure 11-3. Split Occupation

2. The user can divide a occupation by the two options in the Split GPS Occupation window.

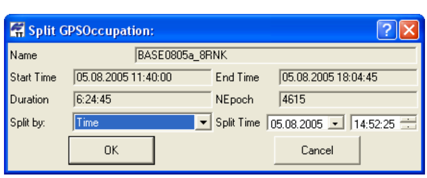


Figure 11-4. Split Occupation Window

- by Time – specify the moment of dividing of the selected occupation in the *Split Time* field. By default, this time is equal the half of the time occupation. Two occupations will be created after clicking **OK**. The *Occupation* tab displays the two occupations instead of the original occupation. The splits will be named “<original occupation name>(Head)” and “<original occupation name>(Tail)” (Figure 11-5).

Points | GPS Occupations

Icon	Point Name	Original Name	Start Time	Stop Time	Duration
	BASE1	BASE1	05.08.2005 11:40:00	05.08.2005 18:04:45	6:24:45

before splitting

Points | GPS Occupations

Icon	Point Name	Original Name	Start Time	Stop Time	Duration
	BASE1	BASE1_Head	05.08.2005 11:40:00	05.08.2005 14:52:25	3:12:25
	BASE1	BASE1_Tail	05.08.2005 14:52:25	05.08.2005 18:04:45	3:12:20

after splitting

Figure 11-5. Example of Dividing of Occupation by Time

- by Hour – divide any occupation by hour, where in the common case each created occupation from the original occupation will have a duration equal to 1 hour. The start / stop time of these occupations (except the first and finish occupations) will be equal to the full hour. The first occupation will stop in the full hour, the last occupation will start in the full hour.

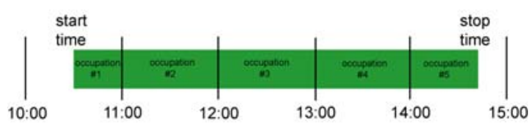


Figure 11-6. Rule of Dividing of Occupation by Hour

Several occupations will be created after clicking **OK** (Figure 11-7 on page 11-7). The *Occupation* tab displays these occupations instead of the original occupation. The first occupation will be named “<original occupation name>(Head)” and the next occupations will be named as “<original occupation name>(Tail_n)”, where n - number of the tail occupations.

Points | GPS Occupations

I..	Point Name	Original Name	Start Time	Stop Time	Duration
	BASE1	BASE1	05.08.2005 11:...	05.08.2005 18:...	6:24:45

before splitting

Points | GPS Occupations

I..	Point Name	Original ...	Start Time	Stop Time	Duration
	BASE1	BASE1_Head	05.08.2005 11:40:00	05.08.2005 12:00:00	0:20:00
	BASE1	BASE1_Tail_1	05.08.2005 12:00:00	05.08.2005 13:00:00	1:00:00
	BASE1	BASE1_Tail_2	05.08.2005 13:00:00	05.08.2005 14:00:00	1:00:00
	BASE1	BASE1_Tail_3	05.08.2005 14:00:00	05.08.2005 15:00:00	1:00:00
	BASE1	BASE1_Tail_4	05.08.2005 15:00:00	05.08.2005 16:00:00	1:00:00
	BASE1	BASE1_Tail_5	05.08.2005 16:00:00	05.08.2005 17:00:00	1:00:00
	BASE1	BASE1_Tail_6	05.08.2005 17:00:00	05.08.2005 18:00:00	1:00:00
	BASE1	BASE1_Tail_7	05.08.2005 18:00:00	05.08.2005 18:04:45	0:04:45

after splitting

Figure 11-7. Example of Dividing of Occupation by Hour

The ‘Merge’ operation uses the following rules:

1. Only two occupations can be merged at a time.
2. Two static occupations can be merged if they correspond to the same points.
3. Two kinematic occupations can be merged only if they belong to the same Stop and Go file.
4. Occupations with different recording intervals (also known as “epoch intervals”) cannot be merged.
5. Occupations with different antenna parameters and/or serial numbers cannot be merged.
6. Occupations where different antenna types were used cannot be merged.
7. Occupations where different receiver models were used cannot be merged.
8. Occupations cannot be merged if one of them contains single-frequency data and the other dual-frequency data.

Viewing/Saving GPS Residuals

If the checkbox '*Save residuals*' is checked for static solution, Topcon Tools will create residuals for all enabled GPS observations in the job after processing GPS observations. To view the residuals diagram for a static GPS observation, double-click it and select '*Residual View*' from the pop-up menu (Figure 11-8).

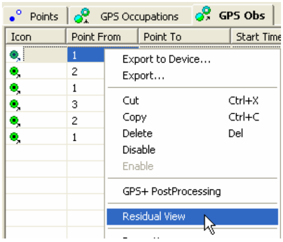


Figure 11-8. View Residuals

Then the *Residual View* dialog box displays diagrams of the residuals resulting from GPS-observation computation for every double difference satellite pair used in processing.

- The X-axis stands for duration of GPS-observation.
- The Y-axis stands for residuals in carrier cycles for all measurement types which were collected in the two occupations.

Diagrams are represented in different colors. Each plot has its own color. The legend shows the list of all satellite pairs with corresponding colors. Use the selection boxes to hide/display pairs.

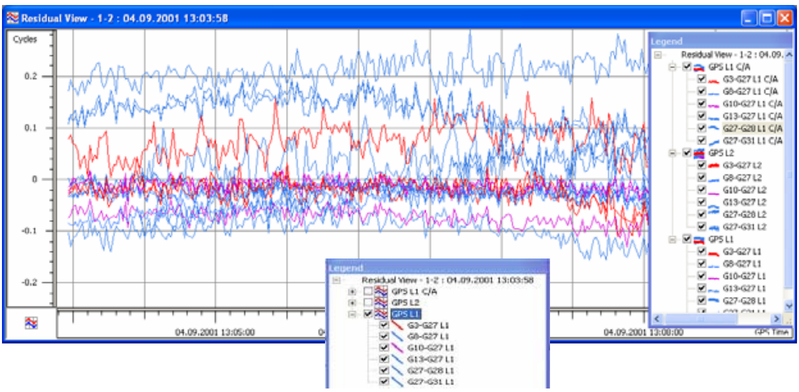


Figure 11-9. Residual View for Selected GPS-Observation

To view individual or all plots, right-click on the plot.

- To display double difference residuals, select Show Only <name of pair> (Figure 11-10).
- To display all, select Show All.
- To disable all measurement of a satellite, select Disable <satellite number>.

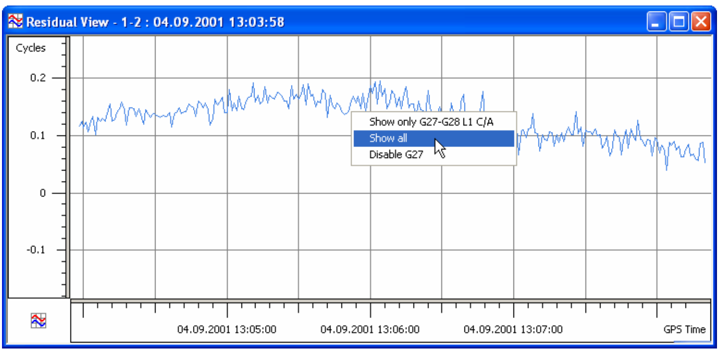


Figure 11-10. Viewing Only One Plot

Measurements from a satellite for a selected time interval can be disabled from/enabled for processing.

- To disable some measurements of a satellite, drag a square around a plot to select the desired interval of the measurements of the corresponding satellite. Right-click and select Disable.
- To enable disabled data, right-click and select Enable.

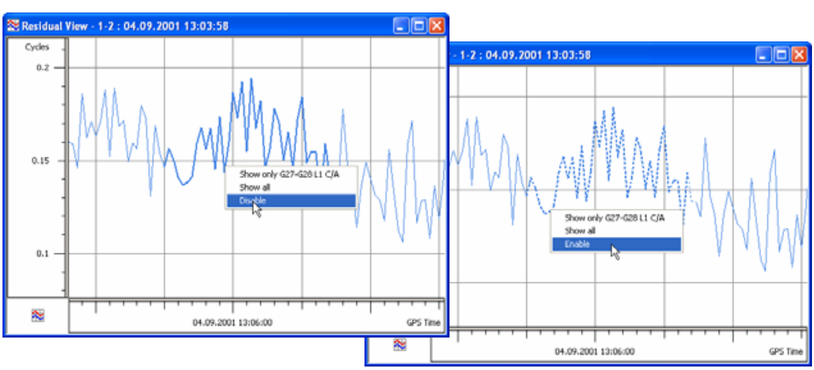


Figure 11-11. Disable/Enable Satellite Measurements

Raw measurements of the first satellite in the name of the residuals plot can be disabled/enabled. To disable data for the second satellite in the pair, change the relative satellite and redraw the residual plot.

1. Right-click in the Residuals View and select Set GPS Relative.
2. Set the first satellite that will be sued as “relative” for plotting residuals.
3. Disable the desired satellite.

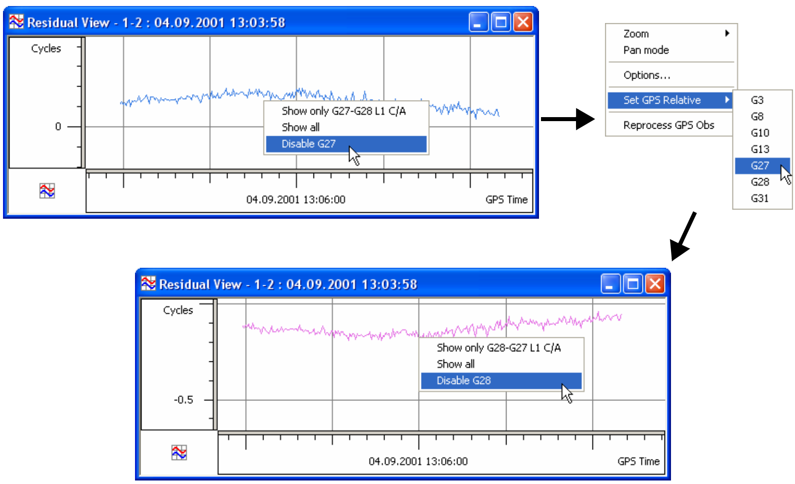


Figure 11-12. Changing Relative Satellite

To re-process the GPS observation, right-click an observation and select Reprocess GPS obs (Figure 11-13).

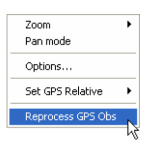


Figure 11-13. Re-process GPS Observation

Computing the Position of the Camera's Perspective Center

Topcon Tools can compute the position of the camera's perspective center in the moment of exposure. For this computation Topcon Tools uses the following information:

- Coordinates of the antenna phase center, obtained by processing the flight trajectory with the option '*Enable Continuous Kinematic*' in Topcon Tools.
- Camera exposure time recorded in the *.tps file.
- Offsets from the camera perspective center to the antenna phase center.

After processing the following occupation, the kinematic engine of Topcon Tools calculates the coordinates of the aircraft GPS antenna at each epoch. As a general rule, the event exposure time does not coincide with the receiver measurement time ("epoch") (Figure 11-14).

- a static occupation collected by the receiver on a ground point
- a kinematic occupation collected by the receiver on the board of the aircraft

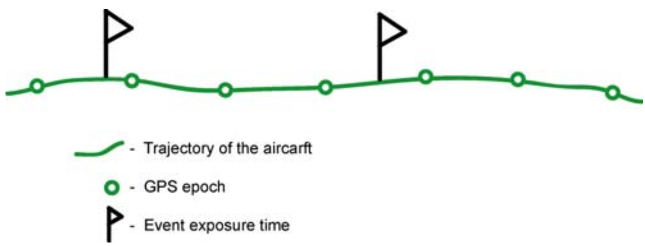


Figure 11-14. Events and GPS Epoch

For photogrammetry purposes, information about coordinates of the camera's perspective center is used. If the coordinates of the aircraft GPS antenna are known and the offsets (Offset Dist, Offset Ht, Offset Across) between the camera's center and the antenna phase center are measured, it is possible to calculate the coordinates of the camera's perspective center (Figure 11-15 on page 11-12).

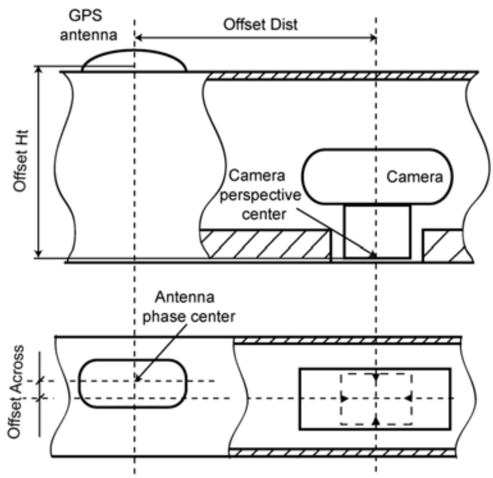
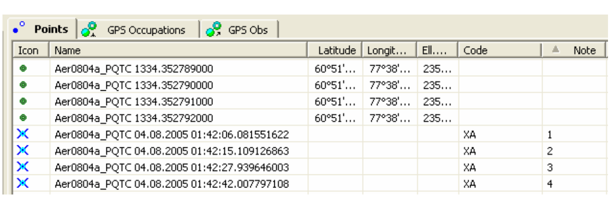


Figure 11-15. GPS Antenna and Photo Camera mounted on an Aircraft

Topcon Tools first interpolates the coordinates of the antenna phase center to the event exposure times and then calculates, by reducing the position of the antenna to the position of the camera, the coordinates of the camera's perspective center at the time of exposure.

To synchronize the operation of GPS receiver and camera, the camera electric pulse (TTL level) is applied to the input of the receiver's external event detector. TPS receivers have two event detectors to receive event signals and "record" them into the current log file (*.tps format). The first detector handles XA event signals and puts corresponding XA event records in the receiver's log file. The other event detector processes XB event signals exactly in the same manner. If at least one XA event record and/or one XB event record is found in the raw data file (*.tps) imported to Topcon Tools, the Points tab will display the points corresponding to the time of exposure (event points).


Points | GPS Occupations | GPS Obs

Icon	Name	Latitude	Longit...	Ell....	Code	Note
	Aer0804a_PQTC 1334.352789000	60°51'...	77°38'...	235...		
	Aer0804a_PQTC 1334.352790000	60°51'...	77°38'...	235...		
	Aer0804a_PQTC 1334.352791000	60°51'...	77°38'...	235...		
	Aer0804a_PQTC 1334.352792000	60°51'...	77°38'...	235...		
	Aer0804a_PQTC 04.08.2005 01:42:06.081551622				XA	1
	Aer0804a_PQTC 04.08.2005 01:42:15.109126863				XA	2
	Aer0804a_PQTC 04.08.2005 01:42:27.939646003				XA	3
	Aer0804a_PQTC 04.08.2005 01:42:42.007797108				XA	4

Figure 11-16. Point Tab Displays Event Points

The name of these points is created from the name of the kinematic occupation, the date and the time of exposure.

The *Code* column displays the name of the event detector that received this pulse (XA or XB). The *Note* column displays the event order.

As for the values of the offsets between the camera's center and the antenna phase center the user can enter them in the *Offset* tab of the *Properties Occupation* window (Figure 11-17).

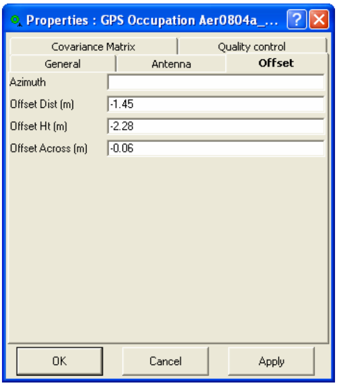


Figure 11-17. GPS Occupations Properties – Offset Tab

The *Offset Dist* is measured along the "building axis" of the aircraft from the antenna phase center to the camera's perspective center (Figure 11-18).

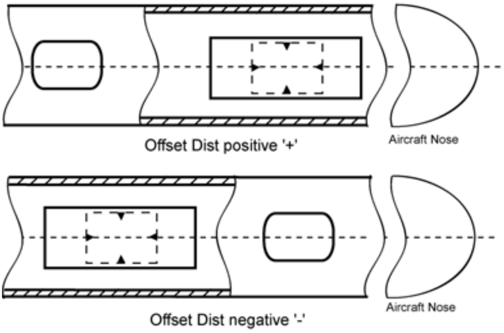


Figure 11-18. Signs of Offset Dist

The *Offset Across* is measured across the “building axis” of the aircraft towards the aircraft’s wings from the antenna phase center to the camera’s perspective center (Figure 11-19).

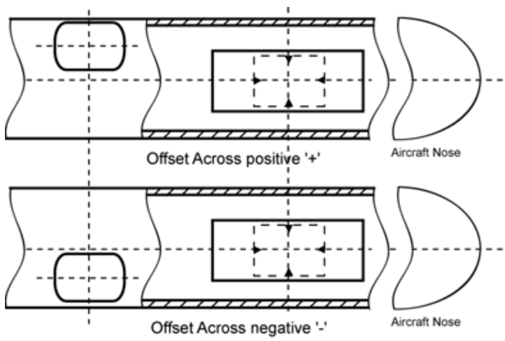


Figure 11-19. Signs of Offset Across

The *Offset Ht* is measured along the vertical axis going through the top of the aircraft’s fuselage from the antenna phase center to the camera’s perspective center.

The coordinates of the camera’s perspective center are automatically calculated after processing the trajectory. The *Points* tab, *Map View* (Figure 11-20) and *Cad View* display these points.

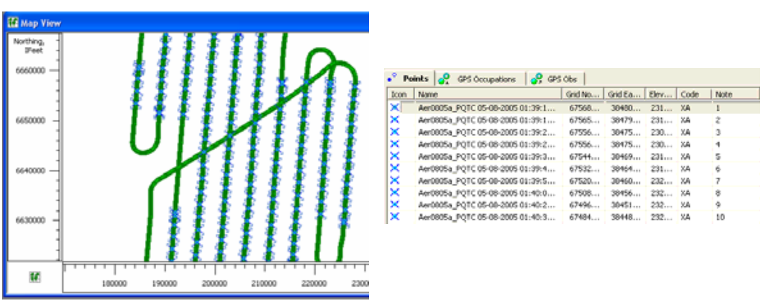


Figure 11-20. Map View and Points Tab Display Event Points

To create a report for these points, select the event points, right-click and select Report (Figure 11-21).

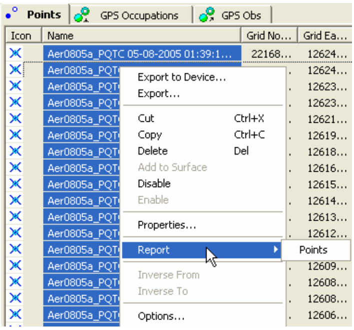


Figure 11-21. Creating Report for Event Points

Advanced Module for Adjustment

If the Advanced module is activated, the *Process Properties* window for *Adjustment* displays the following additional options (Figure 11-22):

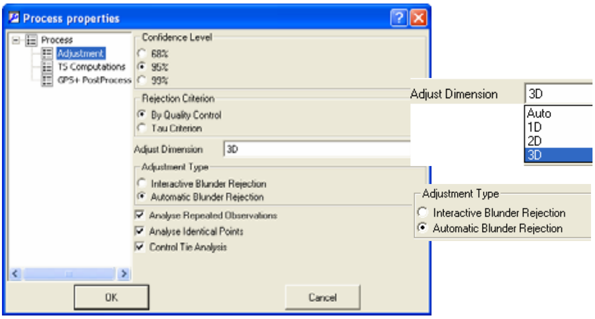


Figure 11-22. Process Properties Window -> Adjustment

- selecting dimension for adjustment:
  - 1D: the adjustment is performed ONLY in the vertical plane.
  - 2D: the adjustment is performed ONLY in the horizontal plane.

– 3D: the adjustment is performed in the both vertical and horizontal planes.

– AUTO: the adjustment will run in 1D, 2D or 3D mode for each component depending on the presence of control points.

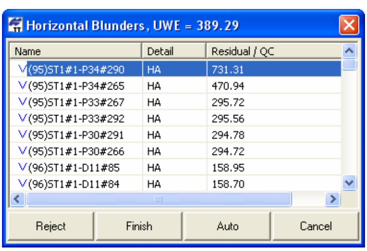
- selecting the adjustment type:

  – Automatic Blunder Rejection mode. This mode allows deleting the By Quality Control and Tay Criterion network components from the adjustment.

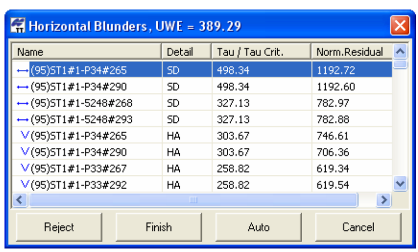
  By Quality Control with residuals larger than the values set for the current job. By Tay Criterion with a Tau value larger than $Tau_{critical}$).

  This option is used by default in the adjustment without advanced mode.

  – Interactive Blunder Rejection mode. In this mode, if the network has blunders (observations that failed to pass the Quality Control or Tau Criterion tests), the network adjustment process will be interrupted and the list of blunders will display.



Rejection '*By Quality Control*'



Rejection by '*Tay Criterion*'

The adjustment process can be stopped, continued, altered, or restarted after making changes to the data.

– Click **Cancel** to stop analyzing blunders and adjustment of the network

– Click **Finish** to continue the adjustment of the network without making any changes

– Select a component of the network and click **Reject** to delete it from the adjustment process and restart the blunder analysis. Blunders rejected on the previous step are also displayed. To restore the deleted component, select this component and click **Unreject**:

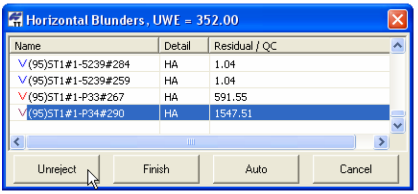


Figure 11-23. Unreject Blunders

– Click **Auto** to reject the component automatically with the maximum value of residual or Tau/Tau Crit from adjustment and restart the blunder analysis.

- To assign weights to control points, enter these values in the *Adjustment* tab of the *Properties* window.

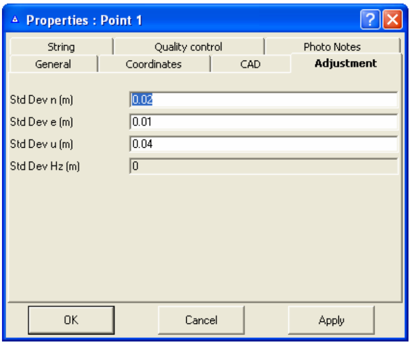


Figure 11-24. Properties Window – Adjustment Tab

Control points with non-zero weights will be adjusted as weighted, but their coordinates and Std Deviations are left unchanged.

Notes:

Installing the Global Geoid

Topcon Tools comes with a set of commonly used geoids. Some geoid models come on the Topcon Tools CD or are downloaded from the TPS web site. For other or local geoids, contact your regional Topcon dealer or Topcon Support.

To install the global geoid EGM96, which comes on the Topcon Tools CD or can be downloaded from the TPS website, you must add the two required binary files to the geoid list.

With the Global Geoid installed, Topcon Tools can slow down, especially on older computers.

TIP

Use Topcon Link to convert the Global Geoid into a regional geoid. Remember to select the correct territory where occupations have been collected when creating the .gff file.

The global geoid EGM96 comes as two binary files: EGM96.glc and CORRCOEF.gla.

1. To install the global geoid, follow the steps described in “Add a Geoid” on page 2-17.

2. On the ***Open*** dialog box, select the Global Geoid Files format and the EGM96.glc file (Figure A-1), then click **Open**.

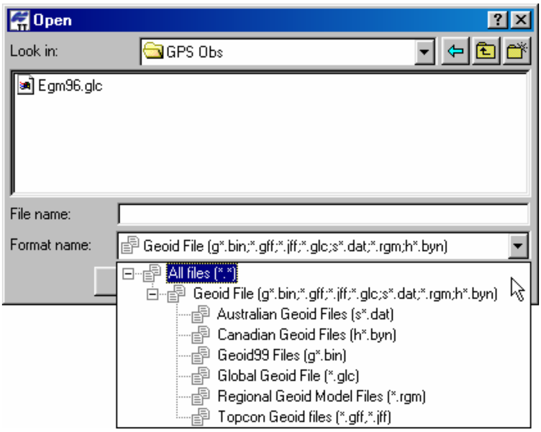


Figure A-1. Geoid File Format Selection

3. Select the CORRCOEF.gla file and click **Open** (Figure A-2).

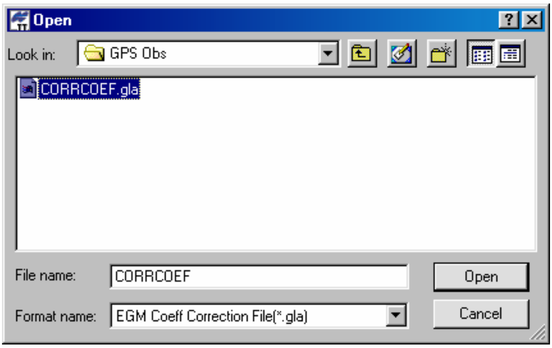


Figure A-2. Correction File Selection

4. To check the installation, right-click the global geoid on the ***Geoids List*** dialog box and click **Properties** on the pop-up menu. The ***Properties*** dialog box displays the selected geoid's information (Figure A-3).

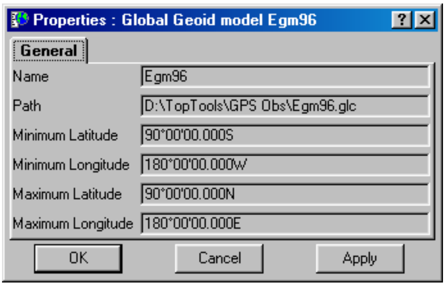


Figure A-3. Global Geoid Model Properties

Notes:

Hot Keys

The following table lists hot keys, also known as keyboard shortcuts, used in Topcon Tools.

Table B-1. Topcon Tools Hot Keys

Press This...	To Perform This...	Press This...	To Perform This...
Ctrl+C	Copy	Ctrl+E	Enable
Ctrl+V	Paste	Ctrl+D	Disable
Ctrl+X	Cut	Ctrl+Enter	Properties
Ctrl+Y	Redo	Ctrl+F	Filters
Ctr+Z	Undo	Ctrl+T	Tabular View
Ctrl+N	New File (Job)	Ctrl+M	Map View
Ctrl+O	Open File (Job)	Ctrl+U	Occupation View
Ctrl+P	Print	Ctrl+L	Localization
Ctrl+S	Save File (Job)	Ctrl+1	Adjustment report
Ctrl+A	Select All (in active window)	Ctrl+2	GPS Observations report
Del	Delete	Ctrl+3	Points report
Ctrl+Backspace	Zoom back	Ctrl+4	QC report
=	Restore all (zoom to extents of job)	Ctrl+5	TS Observations report
Alt+Backspace	Undo	Ctrl+Alt+M	Map View options
Shift+Del	Cut	Ctrl+Alt+U	Occupation View options
Ctrl+Insert	Copy	Ctrl+Alt+T	Tabular View options
Shift+Insert	Paste	Ctrl+Alt+P	Process Properties
F1	Help	F2	Edit current cell (in table)
Ctrl+F2	Job Configuration	F3	Import

Table B-1. Topcon Tools Hot Keys (Continued)

Press This...	To Perform This...	Press This...	To Perform This...
Shift+F3	Import From Device	F4	Export
F4+Ctrl	Export To Device	F7	GPS+ PostProcessing
F8	Adjustment	Shift+F8	Localization
F9	Report Configuration	F12	Customize toolbar
Ctrl+Shift+N	Select none (deselect current selection)	Ctrl+Shift+I	Insert selection
Ctrl+Shift+P	Select point	Ctrl+Shift+T	Select TS Occupation
Ctrl+Shift+G	Select GPS Occupation	Ctrl+Shift+M	Select TS Obs
Ctrl+Shift+O	Select GPS Obs	Home	Move graphical view to the far left
Left/Right arrows	Pan graphical view left/right	End	Move graphical view to the far right
Up/Down arrows	Pan graphical view up/down	+/-	Zoom in/out
Page Up/Page Down	Pan graphical view up/down by page		

Symbols Used in Tabs and on Views

NOTICE

Symbols are marked red if the data did not pass the Quality Control test. To identify why the test failed for the data, click Properties on the pop-up menu and select the Quality Control tab.

Points Tab Symbols

Table C-1 contains symbols that Topcon Tools uses to represent different information in the *Points* tab.

Symbols of points are marked red if the point did not pass Quality Control test. To identify why the test failed for the point, click Properties on the pop-up menu and select the Quality Control tab.

Table C-1. Points Tab Symbols

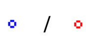
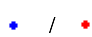
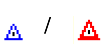
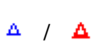
Symbols passed/not passed Quality Control test	Description
	Manual point (the point added to the job with using the command **Edit ▸ Add ▸ Point**)
	Unknown point (the non-control point imported to the job from a coordinate file)
	Fixed Both Both coordinates point
	Fixed Horizontal Horizontal control

Table C-1. Points Tab Symbols (Continued)

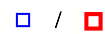
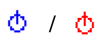
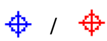
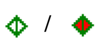
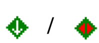
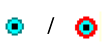
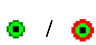
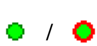
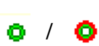
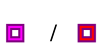
Symbols passed/not passed Quality Control test	**Description**
	Fixed Vertical Vertical control
	Stakeout point
	Design point
	Point coordinates calculated by means of COGO
	Adjusted point
	TS station
	TS point
	TS BackSight point
	RTK base point
	Topo Point (the point collected during a static RTK measurement)
	Auto Topo Point (the point collected during a kinematic RTK measurement)
	GPS post-processing static point
	GPS post-processing static point in the stop&go measurements
	GPS post-processing kinematic point
	Tape Measurement point

Table C-1. Points Tab Symbols (Continued)

Symbols passed/not passed Quality Control test	Description
 / 	GPS offset point
 / 	PTL (point to line) offset point
 / 	Traverse point (for digital level observation)
 / 	Level point (for digital level observation)
	Unprocessed GPS PP points (static and kinematic)
	Scan point
	Event point
	Image measure point

Table C-2 contains messages in the *Quality Control (QC)* tab corresponding to the red symbols in the *Point* tab and a brief description for each message.

Table C-2. Messages in the Quality Control Tab for the Point Tab

Message in QC Tab	Description for a message
‘Control Point is not linked with network’	A control point not used in adjustment.(for example: control points used in calculation of the localization parameters and not used in adjustment)
‘This point is very close to point ‘*NAME*’. They are probably identical’	In this case the distance between these points is less a *Horizontal Precision /Vertical Precision* settings for the job (**Job ▸ Job configuration ▸ Quality Control ▸** *Point Precision* tab). These several measurements probably belong to one point.

Table C-2. Messages in the Quality Control Tab for the Point Tab (Continued)

Message in QC Tab	Description for a message
‘Failed to match the desired precision’	In this case *Horizontal Precision /Vertical Precision* for this point are worse than the value in the settings for the job (**Job ▶ Job configuration ▶ Quality Control ▶** *Point Precision* tab).
‘Some GPS occupations' autonomous positions are too far away from point. They are probably misnamed’	There are several occupations for this point and the difference between the coordinates of the occupations is more than 30 meters. In this case the user have to change the site name for the suspect occupation.
‘Control Tie Test failed’	The differences between the fixed coordinates as Compare Both/Compare Horizontal/Compare Vertical and adjusted coordinates for a point are worse than the value in the settings for the job (**Job ▶ Job configuration ▶ Quality Control ▶** *Point Precision* tab).

GPS Occupation Tab Symbols

Table C-3 contains symbols that Topcon Tools uses to represent different information in the *GPS Occupation* tab.

Table C-3. GPS Occupations Tab Symbols

Symbols passed/not passed Quality Control test	Description
	RTK base station occupation
 / 	Topo occupation (the static occupation in the RTK survey)
 / 	Auto Topo Occupation (the kinematic occupation in the RTK survey)
 / 	GPS post-processing base station occupation

Table C-3. GPS Occupations Tab Symbols (Continued)

Symbols passed/not passed Quality Control test	Description
 / 	GPS post-processing static occupation in the stop&go measurements
	GPS post-processing kinematic occupation

Table C-4 contains messages in the *Quality Control (QC)* tab corresponding to the red symbols in the GPS Occupations tab and a brief description for each message.

Table C-4. Messages in the Quality Control Tab for the GPS Occupation Tab

Message in QC Tab	Description for a message
‘No ephemeris’	There is only observation data for this GPS post-processing occupation (for RINEX data format). The user have to download the navigation data.
‘Occupation's autonomous position is too far away from point. It is probably misnamed’	This occupation does not belong to the specified point, because these coordinates are by more than 30 meters different from the coordinates of the other occupations corresponding to the point. In this case the user have to change the site name for the suspect occupation.

TS Obs Tab Symbols

Table C-5 contains symbols that Topcon Tools uses to represent different information in the *TS Obs* tab.

Table C-5. TS Obs Tab Symbols

Symbols passed/not passed Quality Control test	Description
	TS station
 / 	SideShot (SS) measurement

Table C-5. TS Obs Tab Symbols (Continued)

Symbols passed/not passed Quality Control test	Description
 / 	ForeSight(FS) measurement
 / 	BackSight (BS) measurement
 / 	BackSightBearing (BKB) point measurement
 / 	Horizontal Resection/Vertical Resection/Resection observation

Table C-6 contains messages in the *Quality Control (QC)* tab corresponding to the red symbols in the *TS Obs* tab and a brief description for each message.

Table C-6. Messages in the Quality Control Tab for the TS Obs Tab

Message in QC Tab	Description for a message
'Outlier by Horizontal Angle' **'Outlier by Vertical Angle'** **'Outlier by Distance'**	In the family of **repeated** (more than 2) TS observations a bad component (Horizontal/ Vertical Angle or Distance) is found. The bad component is a component of TS observations, which is different from corresponding repeated vectors components by more than the value in the settings for the job (**Job ▸ Job configuration ▸ Quality Control ▸** *TS Obs Precision* tab). This test is executed in the process of the net adjustment, and the outlier (bad) component of TS observation found will not be used in the adjustment of this net.
'Rejected by Distance' **'Rejected by Vertical Angle'** **'Rejected by Horizontal Angle'**	After the net has been adjusted, a bad component is found (*Horizontal/Vertical Angle, Distance*). In this case, the bad component is a component of TS observations which has precision worse than the value in the settings for the job (**Job ▸ Job configuration ▸ Quality Control ▸** *TS Obs Precision* tab). After testing, the outlier (bad) component of TS observation found will not be used in the adjustment of this net.

GPS Obs Tab Symbols

Table C-7 contains symbols that Topcon Tools uses to represent different information in the *GPS Obs* tab.

Table C-7. GPS Obs Tab Symbols

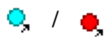
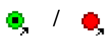
Symbols passed/not passed Quality Control test	Description
	RTK baseline from the base station to a Topo point
	RTK baseline from the base station to an Auto Topo point
	Processed GPS post-processing static vector
	Processed GPS post-processing kinematic vector
	Unprocessed GPS post-processing static vector
	Unprocessed GPS post-processing kinematic vector

Table C-8 contains messages in the *Quality Control (QC)* tab corresponding to the red symbols in the *GPS Obs* tab and a brief description for each message.

Table C-8. Messages in the Quality Control Tab for the GPS Obs Tab

Message in QC Tab	Description for a message
'Failed to match the desired precision'	In this case *Horizontal Precision/Vertical Precision* for RTK and GPS post-processing vector are worse than the value in the settings for the job (**Job ▶ Job configuration ▶ Quality Control ▶** *GPS Obs Precision* tab).
'Failed to process'	The GPS post-processing vector could not be processed due to the absence of navigation data for corresponding observation data. The user have to download the navigation data

Table C-8. Messages in the Quality Control Tab for the GPS Obs Tab

Message in QC Tab	Description for a message
'Float solution'	The GPS post-processing vector is processed but integer biases are not fixed.
'Rejected by Plane' **'Rejected by Height'**	After the net has been adjusted, a bad component is found (*Plane or Height*). In this case, the bad component is a component of GPS observation (vector) which has precision worse than the value in the settings for the job (**Job** ▶ **Job configuration** ▶ **Quality Control** ▶ *GPS Obs Precision* tab). After testing, the outlier (bad) component of vector found will not be used in the adjustment of this net.

Tape Dimensions Tab Symbols

Table C-9 contains symbols that Topcon Tools uses to represent different information in the *Tape Dimensions* tab.

Table C-9. Tape Dimension Tab Symbols

Symbols	Description
	Start reference line
	Tape measurement

DL Obs Tab Symbols

Table C-10 contains symbols that Topcon Tools uses to represent different information in the *DL Obs* tab.

Table C-10. TS Obs Tab Symbols

Symbols passed/not passed Quality Control test	Description
	Leveling job
 / 	BackSight level measurement
 / 	ForeSight level measurement
 / 	SideShot level measurement

Table C-11 contains messages in the *Adjustment Status* column corresponding to the red symbols in the *DL Obs* tab and a brief description for each message.

Table C-11. Messages in the Quality Control Tab for the TS Obs Tab

Message in QC Tab	Description for a message
'Rejected by Height'	After the net has been adjusted, a level measure with bad elevation is found. In this case, the level measure has precision worse than the value in the settings for the job (**Job ▸ Job configuration ▸ Quality Control ▸** *TS Obs Precision* tab). After testing, the pair of the points (BS and FS) of DL observation found will not be used in the adjustment of this net.

Map View Symbols

Table C-12 contains point's symbols that Topcon Tools uses to represent different information in the Map View.

Table C-12. Map View Symbols

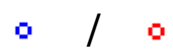
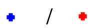
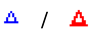
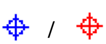
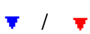
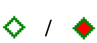
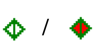
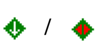
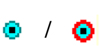
Point's symbols passed/not passed Quality Control test	Description
	Manual point (the point added to the job with using the command **Edit ▸ Add ▸ Point**)
	Unknown point (the non-control point imported to the job from a coordinate file)
	Fixed Both/Compare Both coordinates point
	Fixed Horizontal/Compare Horizontal control
	Fixed Vertical/Compare Vertical control
	Stakeout point
	Design point
	Point coordinates calculated by means of COGO
	Adjusted point
	TS occupation
	TS Sideshot point
	TS BackSight point
	RTK base point

Table C-12. Map View Symbols (Continued)

Point's symbols passed/not passed Quality Control test	Description
 / 	Topo Point (the point collected during a static RTK measurement)
 / 	Auto Topo Point (the point collected during a kinematic RTK measurement)
 / 	GPS post-processing static point
 / 	GPS post-processing static point in the stop&go measurements
 / 	GPS post-processing kinematic point
 / 	Tape Measurement point
 / 	GPS offset point
 / 	PTL (point to line) offset point
 / 	Turning point (for digital level measurements)
 / 	Level point (for digital level measurements)

Table C-13 contains line's symbols that Topcon Tools uses to represent different information in the Map View.

Table C-13. Map View Symbols

Line's symbols passed/not passed Quality Control test	Description
/	TS measurement (measurement line from the station to the point)
/	RTK baseline from the base station to a Topo point

Table C-13. Map View Symbols (Continued)

Line's symbols passed/not passed Quality Control test	Description
/	Processed GPS post-processing baseline from the base station to a static point
	Unprocessed GPS post-processing baseline from the base station to a static point
	Tape measurement
- - - - -	Kinematic trajectory for RTK Autotopo points and for post - processing kinematic points
	Multiple Observation (for repeated measurements0

Topcon Link Getting Started Guide

Topcon Link is an import/export utility that aids in the transportation of data between Topcon instruments and a computer. Topcon Link is available on the Topcon Tools CD, the TopSURV CD, and the Topcon GPS website.

TIP

For details on installing Topcon Link, refer to the *Topcon Link Reference Manual* or the Topcon Tools online help. For further details on using Topcon Link, refer to the online help for Topcon Link or the *Topcon Link Reference Manual*.

The following sections provide quick steps to being using Topcon Link. This getting started guide is organized into the following sections:

- Total Stations
- TPS Receivers
- TopSURV PC Job

Each section describes typical functions for working with files from these sources in Topcon Link.

Using Topcon Link with Total Stations

The following pages describe the typical process for creating, editing, exporting, importing, and calculating data between Topcon Link and Total Stations. The example applied below uses the GPT 3005W total station and the GTS-7 Points file format.

Before beginning the field job with the Total Station, perform the following functions:

- ☐ Create a control points file.
- ☐ Edit the file in Topcon Link and save it as a GTS-7 Points file (or the file for the Total Station).
- ☐ Export this file to the GPT 3005W (or the Total Station).

After completing the field job with the Total Station, perform the following functions:

- ☐ Import the raw data into Topcon Link.
- ☐ Edit the file and calculate the coordinate points.
- ☐ Convert the raw data file to an XML file (or another format in preparation for post processing).

Creating a Control Points File

1. Using a text editor (such as, Microsoft Notepad), create a control points file for export to a Total Station.

   Use the format “Name of Point, Northing, Easting, Height” when entering data to make the file compatible with Topcon Link.
2. Save the file as “Control_data1.csv”.

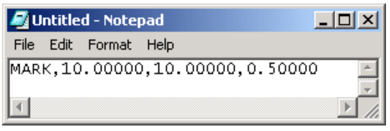


Figure D-1. Create a Control Points File

Editing a Control Data File

1. Open Topcon Link and click **Open** on the toolbar.
2. Select the *Format name* as Name,N,E,Z,Code (*.csv).
3. Navigate to and select the "Control_data1.csv" file and click **Open**.

   The file opens in Topcon Link (Figure D-2).

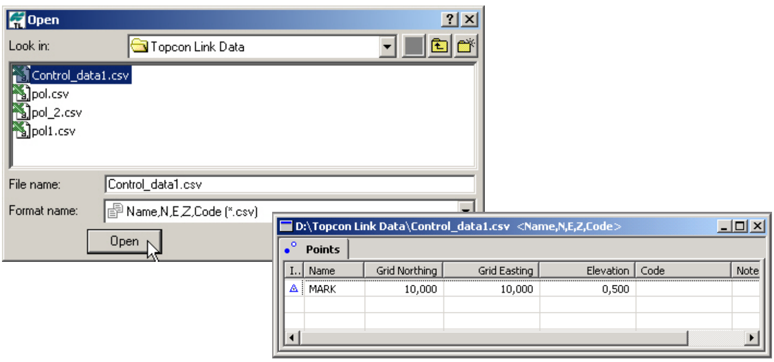


Figure D-2. Select Format Name and File

Add a Point

1. To add a new point to the open file, click **Add point** on the toolbar.
2. Enter the point's *Name* and *Coordinates*, and click **Ok** (Figure D-3).

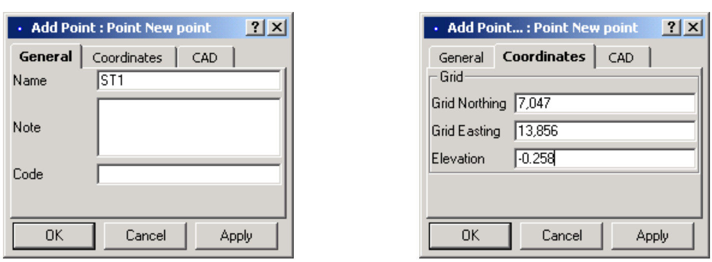


Figure D-3. Add Point – Enter Name and Coordinates

Save the File to the GTS-7 Points Format

1. Click **File ▸ Save As**.
2. Select the “GTS-7 Points” format as the *Format name*.
3. Enter a *File name* and click **Save** (Figure D-4).

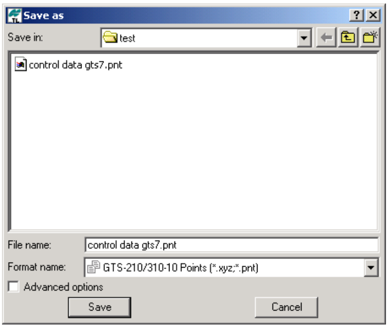


Figure D-4. Save File for Total Stations

Exporting Control Data Files

1. Connect the Total Station and computer. Refer to the total station’s documentation for details.
2. Open Topcon Link and click **Export to device** on the toolbar.
3. In the left panel, navigate to the location of the file to export.
4. In the right panel, select “Topcon Total Station” from the Look in drop-down list. Click **Add New Station** in the right panel (Figure D-5).

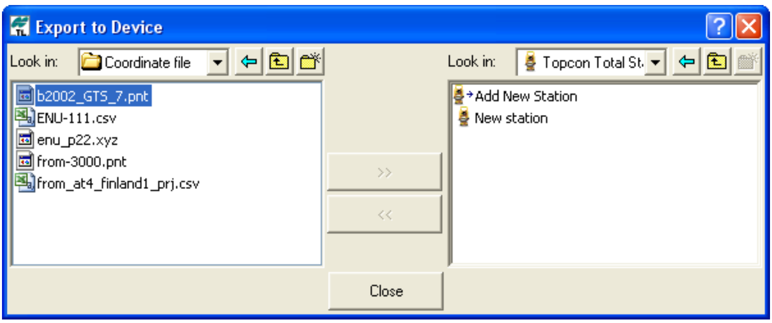


Figure D-5. Add New Station

5. Set the following information (Figure D-6):
   - *General* tab – enter a name and select the model for the total station; select the port through which the total station and computer are connected.
   - *Advanced* tab – select communication parameters identical to those set in the Total Station (in this example, the GPT3005W): Baud Rate (9600), Data Bits (CHAR. - 8), Parity (NONE), Stop Bits (1), and Protocol (when you receive data in *GTS-7 Points* format use **ONE-WAY**).
6. Click **OK** to create the new station.

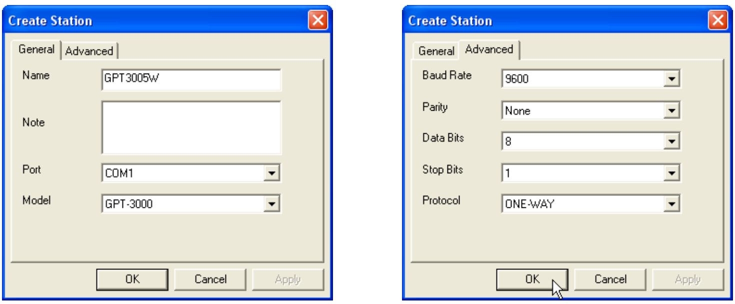


Figure D-6. Set Properties for Connection to GPT3005W TS

7. Follow the steps shown in the *Upload File(s) to Total Station* dialog box to prepare the Total Station for importing the GTS-7 Points file. Table D-1 summarizes these steps for the GPT 3005W.

Table D-1. Preparing the TS for Data Transfer

Procedure	TS Screen Illustration
1. Turn on the total station. 2. Press the MENU button. 3. Press the **F3** button for Memory Manager.	MENU 1/3 F1:DATA COLLECT F2:LAYOUT F3:MEMORY MGR. P↓
4. Press the **F4** button twice to page down. 5. Press the **F1** button for data transfer. 6. Press the **F2** button for other formats.	MEMORY MGR. 3/3 F1:DATA TRANSFER F2:INI DATA TRANSFER F1:GTS FORMAT F2:SSS FORMAT

Table D-1. Preparing the TS for Data Transfer (Continued)

Procedure	TS Screen Illustration
7. Press the **F2** button to load data. 8. Press the **F1** button and enter the name of the file to load. 9. Press **F4** to enter.	DATA TRANSFER F1:SEND DATA F2:LOAD DATA F3:COMM. PARAMETERS COORD. FILE NAME FN:__________ INPUT --- --- ENTER
10. Press **F3** to load the data.	LOAD COORD. DATA >OK ? --- --- [YES] [NO] LOAD COORD. DATA < Wating Data! > STOP

When the transfer process begins, the *Upload File(s) to Total Station* dialog box displays a “Performing the transfer...” message.

11. Wait while the exported file is saved in the total station.
12. After a successful export, Topcon Link will display a “successful export” message and the Total Station will return to the Data Transfer menu (Figure D-7).

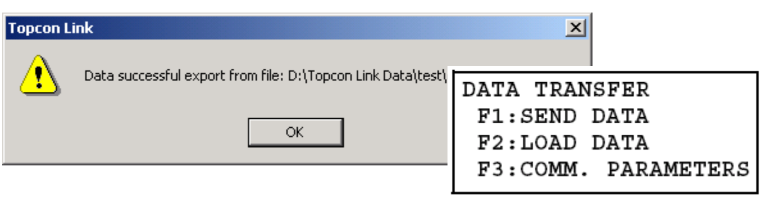


Figure D-7. Successful Export to the Total Station

Importing Raw Data Files

After finishing the field job, import measurement data from the Total Station to Topcon Link. Measurement data in the example below was collected in GTS-7 Raw file format using a GPT 3005W.

1. Click **Import from Device** on the toolbar.

2. In the left panel, double-click the *My Computer* icon and double-click the *Topcon Total Stations* icon. Double-click the total station connected to the computer.

   Topcon Link applies the communication parameters defined earlier in the Export to device process.
3. In the right panel, navigate to and select the folder in which to save the imported data.
4. Select the file to import (file.txt) in the left panel and click the **move right** (>>) button.

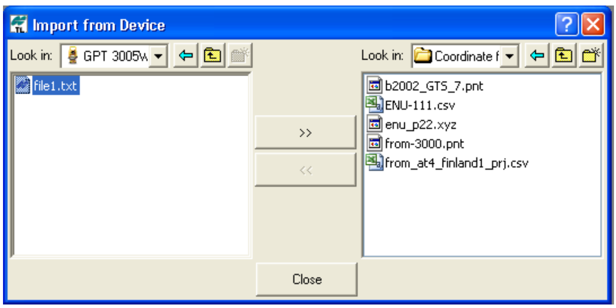


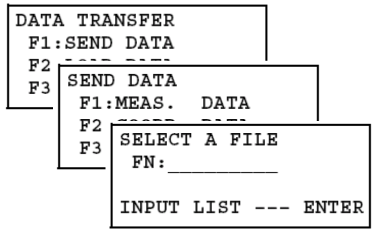
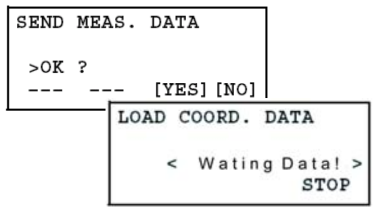
Figure D-8. Select Total Station and File

5. Follow the instructions listed in the *Download File From Total Station* field. Table D-2 summarizes these steps for the GPT 3003W.

Table D-2. Preparing the TS for Data Transfer

Procedure	TS Screen Illustrations
1. Turn on the total station. 2. Press the MENU button. 3. Press the **F3** button for Memory Manager.	MENU 1/3 F1:DATA COLLECT F2:LAYOUT F3:MEMORY MGR. P↓
4. Press the **F4** button twice to page down. 5. Press the **F1** button for data transfer. 6. Press the **F2** button for other formats.	MEMORY MGR. 3/3 F1:DATA TRANSFER F2:INI DATA TRANSFER F1:GTS FORMAT F2:SSS FORMAT

Table D-2. Preparing the TS for Data Transfer (Continued)

Procedure	TS Screen Illustrations
7. Press the **F1** button to send data. 8. Select the type of data to send. For this example, press the **F1** button. 9. Press the **F1** button and enter the name of the file to send. 10. Press **F4** to enter.	
11. Click **Next** on the *Import from Device* dialog box. 12. Press the **F3** button to send the data.	

When the transfer process begins, the *Upload File(s) to Total Station* dialog box displays a “Downloading...” message.

13. Wait while the exported file is saved to the computer.
14. After a successful import Total Station will return to the Data Transfer menu.

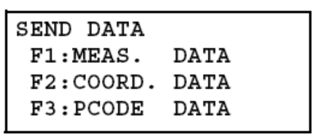


Figure D-9. Data Transfer Menu

Opening, Viewing, and Editing Raw Data Files

The examples in this section use the following survey project (Figure D-10 on page D-9). Measurements were conducted from the three stations (ST1, ST2 and MARK). The coordinates of ST1 and MARK are known and stored in the coordinate file exported to the Total Station. Measurements to ST2 were done from the stations MARK and ST1.The coordinates of ST2 were obtained from MARK.

On each station, the measurements were performed to obtain unknown points. When measuring, the vertical angle were within 45 degrees.

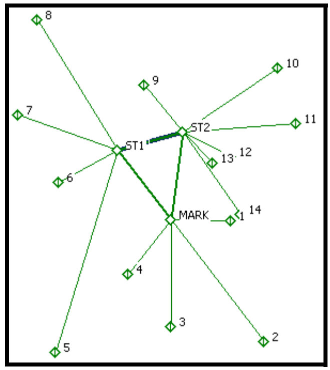


Figure D-10. Survey Project Used

To open the raw data file:

1. Click **File ▸ Open File**.
2. Select or enter the name of the file imported from the TS; for example, “02_04_05_GTS-7.raw”.
3. Select the *Format name* and view the *Advanced options*.
4. Select the following advanced options (Figure D-11):
    - Projection field – “none”
    - Coordinate order – “Northing,Easting,Height”
    - Vertical angle is – “Horizontal level”

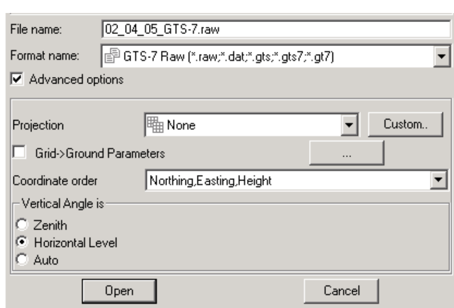
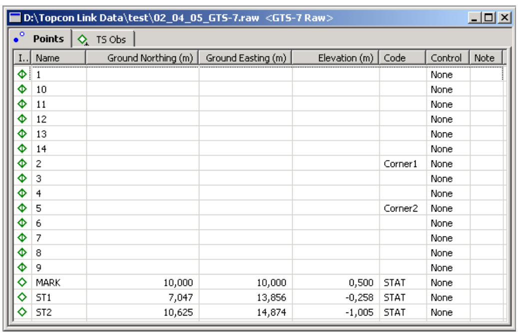


Figure D-11. Open Raw Data File

For a Raw Data files, the information displays in the following tabs:

- The *Points* tab lists all points and stations in the file (Figure D-12).
  - – Point icon:
  - – Station icon:

  For the GTS-7 Raw file format, the *Ground Northing*, *Ground Easting*, *Elevation* coordinates display only for stations.

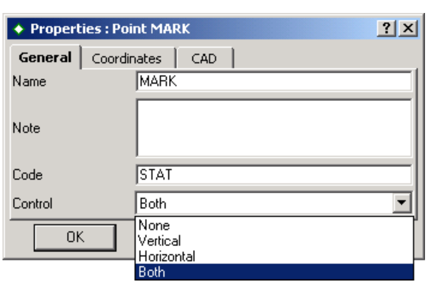


I..	Name	Ground Northing (m)	Ground Easting (m)	Elevation (m)	Code	Control	Note
	1					None	
	10					None	
	11					None	
	12					None	
	13					None	
	14					None	
	2				Corner1	None	
	3					None	
	4					None	
	5				Corner2	None	
	6					None	
	7					None	
	8					None	
	9					None	
	MARK	10,000	10,000	0,500	STAT	None	
	ST1	7,047	13,856	-0,258	STAT	None	
	ST2	10,625	14,874	-1,005	STAT	None	

Figure D-12. Points Tab

The following data processing and adjustments will be performed from MARK. To adjust the plane and vertical coordinates of the station, take the following steps (Figure D-13):

1. Right-click the point and click **Properties**.
2. On the *General* tab, select the *Control* as “Both”.
3. Click **Ok**. The icon for the station will change to a “Fixed point” icon (Figure D-13).



Fixed point Icon

Figure D-13. Set Control for Point; Fixed Point Icon

- The *TS Obs* tab (Figure D-14) has two panels.

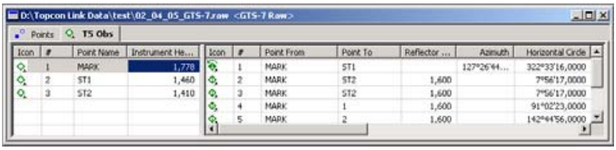


Figure D-14. TS Obs Tab

– The left panel contains information on the station/points with known positions where the Total Station was placed.

To edit the instrument height for MARK (Figure D-15):

1. Click-pause-click the station's height
2. Type a new height value
3. Press **Enter** on the keyboard.

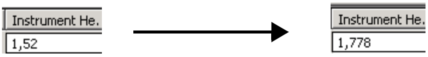


Figure D-15. Editing an Instrument Height

– The right panel contains information on the points relevant to the station selected in the left panel. These points have unknown positions where the Reflector was placed.

To edit the azimuth to BKB point (Point From Mark – Point To ST2) (Figure D-16):

1. Click in the *Point to* column and select "no name" from the drop-down list.
2. Click-pause-click a *Azimuth* column and edit the value azimuth.
3. Press **Enter**.

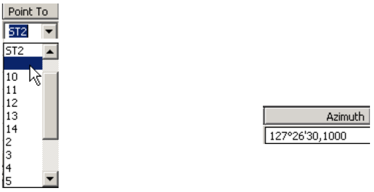


Figure D-16. Editing the Azimuth

To change the type of point 5 (Point From Mark – Point To2) from SS to FS (Figure D-17):

1. Double-click in the *Type* column of the point and select the *FS* type.
2. Press **Enter**.

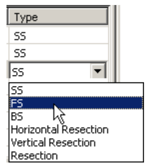


Figure D-17. Editing Point Type

NOTICE

NOTICE

When editing data (point coordinates, control, antenna/ instrument/reflector heights, point types, BKB azimuths, offsets), press the Calculate Coordinate button to recompute coordinates.

Computing and Adjusting Points Coordinates

By default, Topcon Link obtains coordinates without adjusting them. But it is possible to compute the positions by performing adjustment of points.

1. To select a network adjustment, click **Process** ▸ **Process Properties**.
2. Click the *Compute Coordinates* tab and select an adjustment type (Least Squares for this example of a network). Click **OK** (Figure D-18 on page D-13).

   Refer to the *Topcon Link Reference Manual* for a description of each adjustment type.

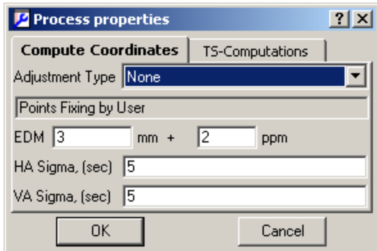
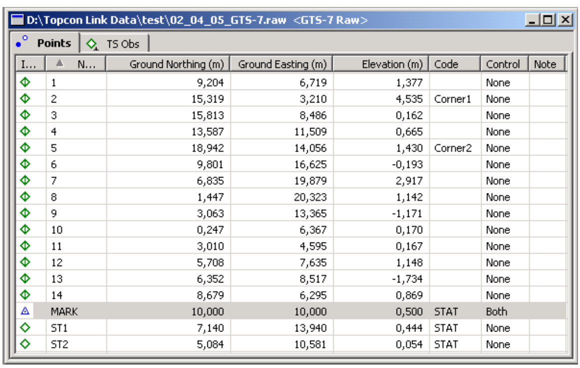


Figure D-18. Process Properties – Compute Coordinates Tab

3. Click **Compute coordinates of points** on the toolbar. The *Points* tab displays the adjusted coordinates (Figure D-19).



I...	N...	Ground Northing (m)	Ground Easting (m)	Elevation (m)	Code	Control	Note
	1	9,204	6,719	1,377		None	
	2	15,319	3,210	4,535	Corner1	None	
	3	15,813	8,486	0,162		None	
	4	13,587	11,509	0,665		None	
	5	18,942	14,056	1,430	Corner2	None	
	6	9,801	16,625	-0,193		None	
	7	6,835	19,879	2,917		None	
	8	1,447	20,323	1,142		None	
	9	3,063	13,365	-1,171		None	
	10	0,247	6,367	0,170		None	
	11	3,010	4,595	0,167		None	
	12	5,708	7,635	1,148		None	
	13	6,352	8,517	-1,734		None	
	14	8,679	6,295	0,869		None	
	MARK	10,000	10,000	0,500	STAT	Both	
	ST1	7,140	13,940	0,444	STAT	None	
	ST2	5,084	10,581	0,054	STAT	None	

Figure D-19. Adjusted Coordinates

4. Click **Save** on the toolbar to save the coordinates obtained.

Converting Raw Data Files to Design Format

1. Click **Save as** on the toolbar. Select the DXF format from the Design group and enter the file name ‘MGIS’ (Figure D-20).

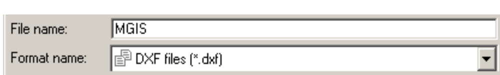


Figure D-20. Select DXF File Format

2. Click **Save** to convert the Raw Data file to the DXF format.

Using Topcon Link with GPS Receivers

The following pages describe the typical process for importing data to Topcon Link from a GPS receiver and converting the data files to another format (the example below uses the RINEX file format).

After completing the field job with the GPS receiver, perform the following functions:

- ☐ Connect the computer and TPS GPS receiver. Refer to the receiver's documentation for details.
- ☐ Import the raw data into Topcon Link.
- ☐ Convert the raw data file to a RINEX file (or another format in preparation for post processing).

Importing GPS Receiver Files

The import process is also shown in Figure D-21 on page D-15.

1. Connect the receiver and computer. Refer to the receiver's documentation for details.
2. Open Topcon Link and click **Import from device** on the toolbar.
3. In the right panel, navigate to and select the folder in which to save the imported data.
4. In the left panel, double-click the *My Computer* icon and double-click the *Topcon Receivers* icon. Topcon Link will search for connected receivers.
5. Double-click the desired receiver to view collected raw data files.
6. Select the file(s) to import and click the **move right** (**>>**) button.

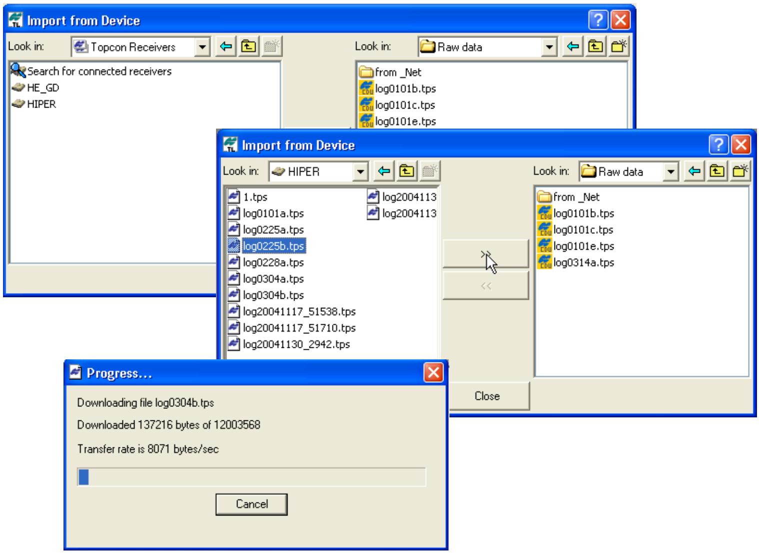


Figure D-21. Import Files from Receiver

Converting Raw Data Files to RINEX Format

1. Click the **Convert** icon on the toolbar; the ***Convert File*** dialog box displays (Figure D-22).

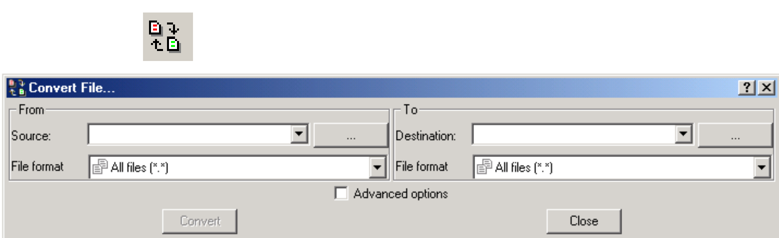


Figure D-22. Click Convert Icon

2. In the *From* panel, select the *File format* of the raw data file (Figure D-23).

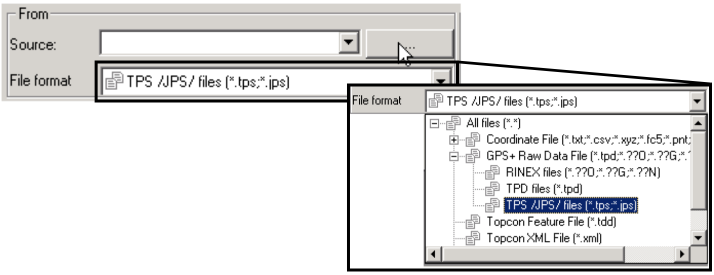


Figure D-23. Select Raw Data File Format

3. Click the **Browse** (“**...**”). Select the file to import and click **Open** (Figure D-24).

   The full path of the file displays in the Source field (Figure D-24).

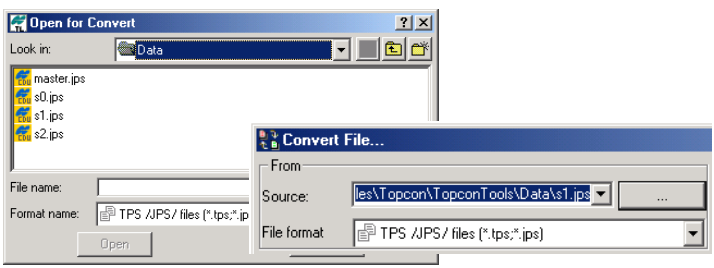


Figure D-24. Select Files to Convert

4. In the right panel, click the **Browse** (“**...**”) button.
5. Create a folder in which to store the file, select the RINEX format and enter the name of the file (for example, “standard”).
6. Click **Select**. The full path of the file displays in the *Destination* field (Figure D-25).

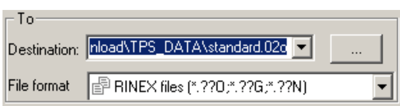


Figure D-25. Destination for Converted File

7. Click **Convert** to begin converting the selected file into RINEX.

Using Topcon Link with TopSURV Files

The following pages describe the typical process for importing, editing, calculating, and reporting TopSURV data in Topcon Link. The example applied below performs simple viewing and editing process after importing TopSURV data.

Before importing data from TopSURV, perform the following actions:

- ☐ Install Microsoft® ActiveSync® onto the computer.
- ☐ Connect the TopSURV controller and computer using Microsoft ActiveSync.

After importing data from TopSURV, perform the following functions:

- ☐ Import TopSURV data (*.tsv file) into Topcon Link.
- ☐ View points coordinates in WGS-84 and a local system.
- ☐ Edit the antenna height and measurement method.
- ☐ View the vectors.
- ☐ Edit a new control point into localization.
- ☐ Recalculate the points coordinates
- ☐ Report coordinates in a local system.

Importing TopSURV Jobs

TPS controllers store data in the *.tsv file format. When importing *.tsv files, use only Topcon Link to guarantee against data loss. Topcon Link transforms the *.tsv file to a *.tlsv file that can be read on a computer.

1. Connect the computer and controller using a serial cable or Bluetooth® wireless technology and Microsoft ActiveSync.
2. Open Topcon Link and click **Import from device** on the toolbar.

3. In the right panel, navigate to and select the folder in which to save the imported data.
4. In the left panel, double-click the *My Computer* icon and double-click the *Mobile Device* icon. Topcon Link will search for a connected controller.
5. In the left panel, navigate to the folder where the desired *.tsv file(s) is saved in the controller.
6. Select the file(s) to import and click the **move right** (**>>**) button.

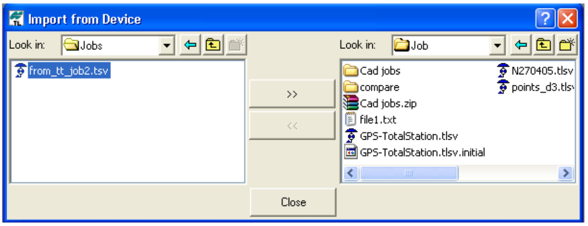


Figure D-26. Import TopSURV File

During the import, Topcon Link will convert the *.tsv file to a computer-friendly TopSURV PC Job (*.tlsv file).

Opening, Viewing, and Editing TopSURV GPS Files

The examples used in the following pages are from the GPS RTK project shown in Figure D-27 on page D-19.

Measurements were conducted from the base station ‘Pion1’ in RTK survey mode using mmGPS+ configuration ‘My mmGPS+ RTK and PP’ in TopSURV. Four measured points have coordinates in the local system.

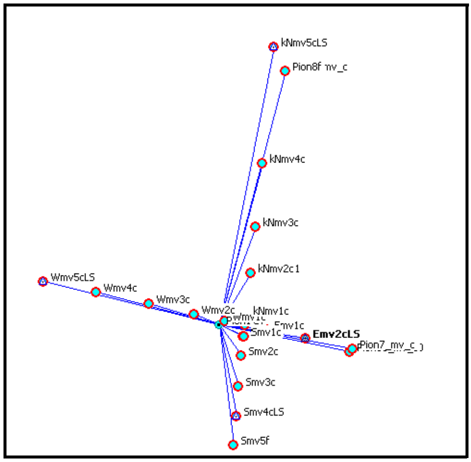
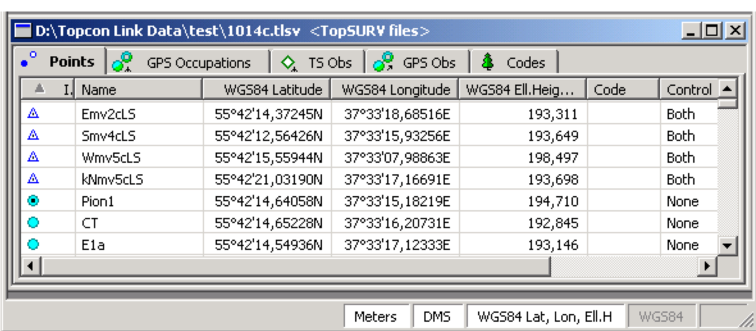


Figure D-27. GPS RTK Project Used

To open an imported TopSURV PC Job...

1. Click **File ▸ Open File**.
2. Enter the name of the TopSURV file (1014C.tlsv).
3. Select the “TopSURV PC Job” format name.

The TopSURV PC Job displays information in the five tabs (Figure D-28).



I.	Name	WGS84 Latitude	WGS84 Longitude	WGS84 Ell.Heig...	Code	Control
	Emv2cLS	55°42'14,37245N	37°33'18,68516E	193,311		Both
	Smv4cLS	55°42'12,56426N	37°33'15,93256E	193,649		Both
	Wmv5cLS	55°42'15,55944N	37°33'07,98863E	198,497		Both
	kNmv5cLS	55°42'21,03190N	37°33'17,16691E	193,698		Both
	Pion1	55°42'14,64058N	37°33'15,18219E	194,710		None
	CT	55°42'14,65228N	37°33'16,20731E	192,845		None
	E1a	55°42'14,54936N	37°33'17,12333E	193,146		None

Figure D-28. Points Tabs

View Points Coordinates

The *Points* tab (Figure D-28) lists all points stored in the file.

TopSURV calculated the localization parameters for the example used here after the operator determined four pairs of points with coordinates in the Local System and WGS-84. All points of this file have coordinates in two systems.

To view the points coordinates in the local system, double-click the *coordinates* box on the Status Bar and select 'Grid' (Figure D-29).

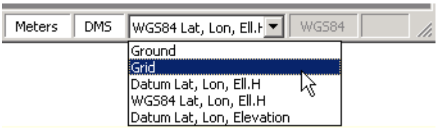


Figure D-29. Status Bar – Coordinate Type List

Edit Antenna Height and Measurement Method

1. To edit GPS antenna height, click the *GPS Occupations* tab, right-click the point 'PION1' and click **Properties**.
2. Click the *Antenna* tab and enter the new antenna height value (for example, 1.555m). Change the method of measurement for antenna height from slant to vertical (Figure D-30).
3. Click **Ok**.

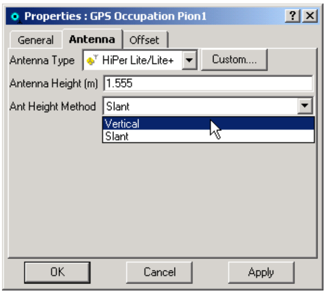


Figure D-30. Edit Antenna Properties

NOTICE

When editing data (point coordinates, antenna heights, antenna types, antenna height measurement methods), the point coordinates must be recomputed.

Compute Coordinates

To calculate (or re-calculate with new settings) coordinates, click the **Compute coordinates of points** icon on the toolbar (Figure D-31). The updated coordinates display in the *Points* tab.

Figure D-31. Compute Coordinates

View Vectors

The *GPS Obs* tab displays information about vectors contained in the TopSURV GPS file.

1. To display the vector components and their errors, right-click the vector and click **Properties**.

   The horizontal and vertical precisions and components in XYZ and NEH coordinate systems of the vector will be displayed in the *Observation* tab of the ***Properties*** dialog box (Figure D-32).
2. Click **OK** to exit.

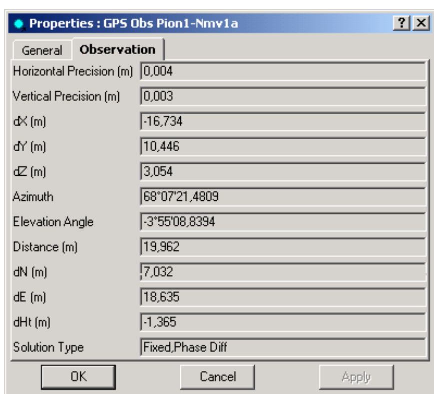


Figure D-32. Horizontal and Vertical Accuracies

Add New Control Point into Localization Parameters

Before edit localization parameters add a new control point in the local system into the file. Make sure that the coordinate type box of the status bar is sets to '*Grid*'.

1. To add a new point to the file, click **Add point** on the toolbar.
2. Enter a point's *Name* (Wmv2aLS) and *Coordinates* in the Local System (Figure D-33). Click **OK**.

   For this example, this point corresponds to point 'Wmv2a' in WGS-84.

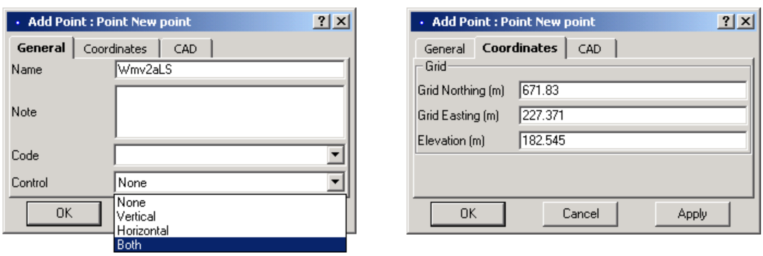


Figure D-33. Add Point Dialog Box - General and Coordinates Tabs

3. To edit localization parameters, click **Perform a localization** on the toolbar. On the *Localization* dialog box, click **Add point**.
4. Select the point 'Wmv2a' from the drop-down list in *WGS Point* column (Figure D-34).
5. Select the point 'Wmv2aLS' from the drop-down list in *Local Point* column (Figure D-34).
6. Since this point will be used only in horizontal localization, select 'Horizontal" to change the point's status (Figure D-34).

   The new localization parameters will calculate automatically.

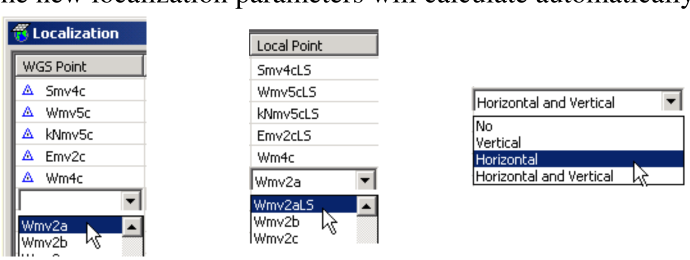


Figure D-34. Localize Point

Save the File

To save all changes in the file click **Save** on the toolbar (Figure D-35).

Figure D-35. Save File

Topcon Link creates a backup of the original file with an additional extension (*.initial; for example, 1014C.tlsv.initial). This backup file remains in the same folder as the *.tlsv file (1014C.tlsv). Any further changes will be made to the *.tlsv file.

Converting a TopSURV file to a Coordinate File

This section describes converting the active TopSURV '1014C.tlsv' database file to the 'Name,N,E,Z,Code' coordinates file format.

1. Click **Save As** on the toolbar. Select the 'Name,N,E,Z,Code' format and enter the name of the created file '1014C.tlsv' (Figure D-36).

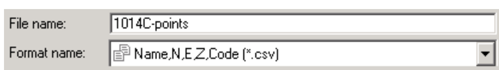


Figure D-36. Select the Coordinate File Format

2. Click **Advanced options**. Enter the parameters required after the conversion (Figure D-37):
   - Select 'Localization' for the *Projection* type.
   - Select the *Linear Unit* for horizontal and vertical positions.

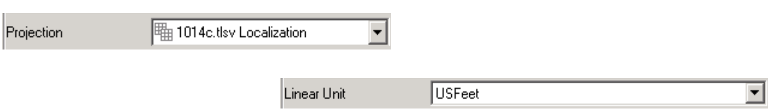


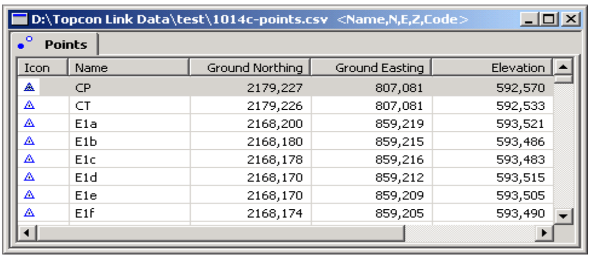
Figure D-37. Select Advance Options

3. Click **Save** to convert the TopSURV file to a coordinate file.

Viewing Converted Files

1. Click **Open** on the toolbar.
2. Select coordinate file format, select the file ‘1014C_Points.csv’, and click **Open**.

   The file’s content displays in the Topcon Link work area (Figure D-38).


D:\Topcon Link Data\test\1014c-points.csv <Name,N,E,Z,Code>

Points

Icon	Name	Ground Northing	Ground Easting	Elevation
	CP	2179,227	807,081	592,570
	CT	2179,226	807,081	592,533
	E1a	2168,200	859,219	593,521
	E1b	2168,180	859,215	593,486
	E1c	2168,178	859,216	593,483
	E1d	2168,170	859,212	593,515
	E1e	2168,170	859,209	593,505
	E1f	2168,174	859,205	593,490

Figure D-38. Converted File’s Content

Connectors

Serial C-RS232C Connector

This cable is used to connect the TPS receiver (ports A and D) with a computer. Figure E-1 shows the receiver's connector.

Figure E-1. C-RS232C Receiver Connector

Table E-1 gives specifications for this connector.

Table E-1. RS232 Connector Specifications

Number	Signal Name	Dir	Details
1	Power_OUT	P	Power Output (I<0.2 A)
2	GND	-	Signal ground
3	CTS	I	Clear to send
4	RTS	O	Request to send
5	RXD	I	Receive data
6	TXD	O	Transmit data
7	-	-	Not used

Connector types are SEALED RECEPTACLE, 7- pin W.W. FISCHER, INC, p/n DBEU 102 A056. Table E-2 gives the pin equivalents for the connectors.

Table E-2. Connector Pin Equivalents

TPS Receiver	DB9 Female
1	-
2	5
3	7
4	8
5	3
6	2
7	1

Receiver COM Port Status

The following RS232C interface options (Table E-3) are default communication settings for the receiver application program.

Table E-3. Default Receiver COM Port Settings

Communication Option	Default Setting
Port input mode	CMD for GRIL or Command for PC-CDU; the port is in command mode. In this mode, the port recognizes the commands sent by the user.
Hardware handshaking	OFF
Serial port baud rate	115200 baud
Stop bits	1
Parity	N (no parity)
Data bits	8

Index

D

E

F

G

I

J

K

L

M

N

O

P

Q

R

U

V

W

X

Notes:

Notes:

Topcon Positioning Systems, Inc.
7400 National Drive, Livermore, CA 94551
800·443·4567 www.topcon.com

ISO 9001:2000
FM 68448

Topcon Tools Reference Manual

P/N: 7010-0612 Rev G 05/06 500