



SURVEY PRODUCT: Topcon Link™

TOPCON



Topcon Link™

Topcon Data
Compatibility Software

Reference Manual



Topcon Link Reference Manual

Part Number 7040-0026

Rev C

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Preface

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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.
<i>Topo</i>	Indicates the name of a dialog box or screen.
<i>Notes</i>	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.

Introduction

Topcon Link™ can be used to:

- Import files from Topcon Conventional Total Stations, Robotic Total Stations, a TPS Controller, and TPS GPS+ receivers to a computer.
- View and edit coordinate and raw data files.
- Reorganize coordinate and raw data files to files of the following formats:

Table 1-1. Topcon Link File Formats

<ul style="list-style-type: none"> -TopSURV -GIS (DXF, LandXML, Shape) -Topcon TS Raw formats (GTS-6, GTS-7, GTS-7+, FC-5, GTS-210/310) -Topcon TS Coordinate formats (GTS-7, FC-5, GTS-210/310-10, GTS-210/310-12) -Char-delimited Coordinate formats (Name,Lat,Lon,Ht,Code; Name,N,E,Z,Code; Name,E,N,Z,Code; Custom) 	<ul style="list-style-type: none"> -TSV ASCII Coordinate format -TDS Coordinate format (CR5) -RINEX -TPS receiver data format (TPD) -Topcon XML -Topcon Geoid file -Topcon GPS vector format -Feature file
--	--

- Create (make ready) and export coordinate files from a computer to a TPS Controller and/or a Total Station.

Installing Topcon Link

Topcon Link software comes on a CD to install on a computer.

1. Insert the Topcon Link CD into the CD-ROM drive. The InstallShield® Wizard starts up.
2. Click **Next** on Topcon Link install Wizard dialog box to start the installation process.
3. Press **Yes** on the License Agreement dialog box (Figure 1-1). Clicking No terminates the installation.

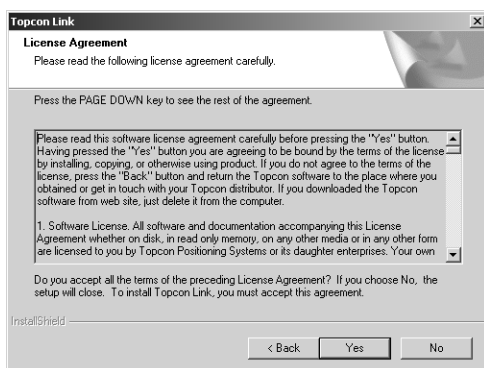


Figure 1-1. License Agreement

4. On the Customer Information dialog box, enter the User and Company names, then click **Next** (Figure 1-2).

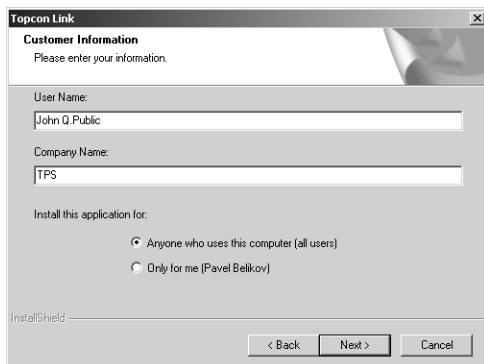


Figure 1-2. Enter Customer Information

- On the Choose Destination Location dialog box, click **Browse** to select the folder or type a new folder name in which to install the Topcon Link. Click **Next** (Figure 1-3).

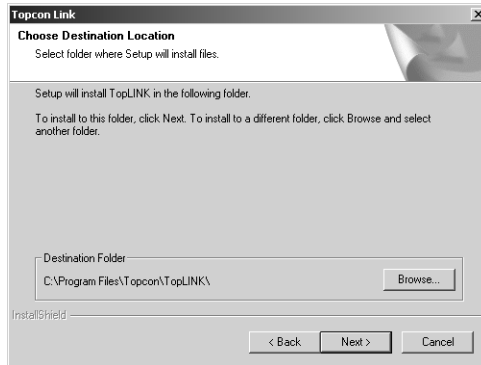


Figure 1-3. Choose Destination Location

- On the *Select Program Folder* dialog box, select a current folder or type a new program folder name for Topcon Link (Figure 1-4). Then click **Next**.

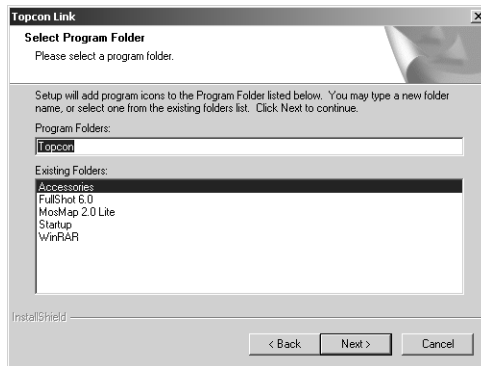


Figure 1-4. Select Program Folder

The installation process starts.

7. Click **Finish** to exit the installation (Figure 1-5).

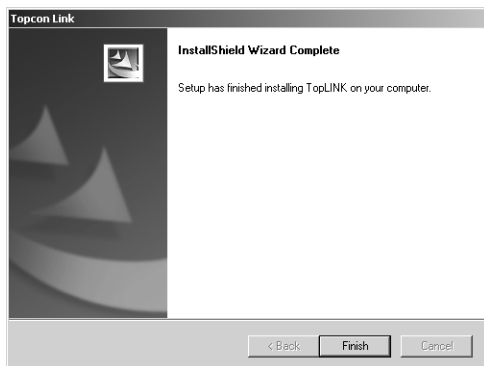


Figure 1-5. Installation Complete

8. Create a Topcon Link shortcut (Figure 1-6) on the computer desktop from which to quickly start the program.



Figure 1-6. Topcon Link Shortcut

Starting Topcon Link

To start Topcon Link, do one of the following:

- Click **Start->Programs->Topcon->Topcon Link**.
- Double-click the Topcon Link desktop shortcut.

The Topcon Link main window displays (see “Main Window” on page 1-5).

Getting Acquainted

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

Main Window

The main window (Figure 1-7 on page 1-5) has the following components:

- Title bar – contains path information for job files.
- System buttons – the minimize, maximize, and close window buttons.
- Menu bar – contains drop-down menus for the various Topcon Tools functions.
- Toolbar – contains shortcut buttons to frequently used options.
- Work area – the area within which dialog boxes, job file information, and pop-up menus display.
- Status bar – displays informative messages about Topcon Tools and various files.
- File information – when a job file opens, displays applicable linear unit, angular unit, type of coordinate system, and coordinate system information.

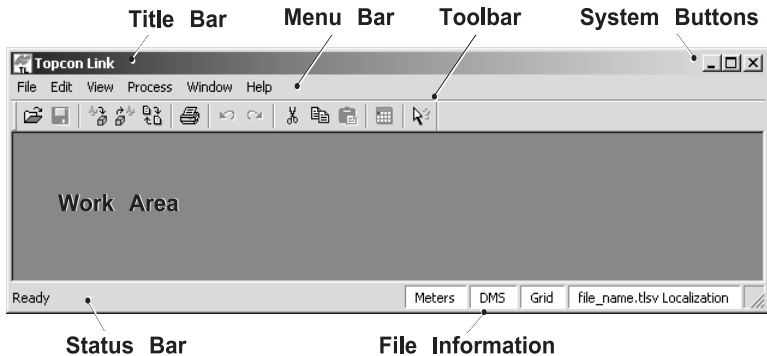


Figure 1-7. Main Window Components

Menu Bar

The menu bar provides access to most options available using Topcon Tools in six, clickable drop-down menus.

File Menu

The File menu (Figure 1-8):

- opens, saves, and closes a file;
- imports and exports data;
- converts a file from one format to another;
- prints information from an active file;
- displays job file configuration parameters;
- displays recently accessed files.



Figure 1-8. File Menu

Edit Menu

The Edit menu (Figure 1-9):

- allows a redo or undo of the last operation, or discards all changes;
- cuts, copies, pastes, or deletes information;
- displays the Properties dialog box.

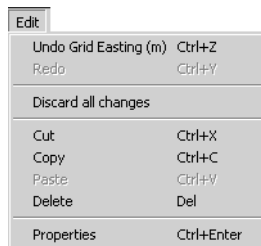


Figure 1-9. Edit Menu

View Menu

The View menu (Figure 1-10) provides access to viewing and hiding the Toolbar and Status bar.

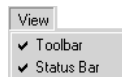


Figure 1-10. View Menu

Process Menu

The Process menu (Figure 1-11):

- computes coordinate;
- sets processing properties.

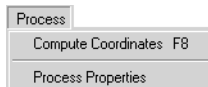


Figure 1-11. Process Menu

Window Menu

The Window menu (Figure 1-12):

- closes the current or all open windows;
- arranges open windows in a cascade (stacked) or tile (adjacent) views;
- arranges icons;
- indicates the current window.



Figure 1-12. Window Menu

Help Menu

The Help menu (Figure 1-13):

- provides context sensitive help and a help file;
- gives Topcon Link version and build date information.

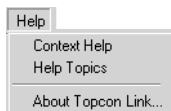


Figure 1-13. Help Menu

Toolbar

The Toolbar for Topcon Link (Figure 1-14) contains buttons for frequently used functions.



Figure 1-14. Toolbar

Upon startup, the Toolbar displays beneath the menu bar.

- To display or hide the Toolbar, click **View->Toolbar**. A check mark indicates the Toolbar is visible.
- To move the Toolbar menu, click the bar to the left of the Open icon, then drag the Toolbar to a new location and release the mouse button.

Table 1-2 lists and describes the various Toolbar icons.

Table 1-2. Toolbar Icon Functions














Icon	Description
	Open – Opens a file. 1. Click the button to display the Open dialog box. 2. Select the name of file and/or select a path or folder on the hard disk drive, local area network, or store media. 3. Click Open .
	Save – Saves files to the current directory.
	Import File from Device – Collects the observed files from TPS GPS+ receivers, TPS controller, and Conventional or Robotic Total Stations. 1. Click the button to display the Import file from device dialog box. 2. Select the device and click Next . See “Importing Files” on page 2-1 for more details.
	Export to Device – Exports data from files to a TPS controller or a Conventional or Robotic Total Station, and an Option Authorization File (OAF) to a TPS receiver. 1. Click the button to display the Export to Device dialog box. 2. Select the device and click Next . See “Exporting Files” on page 2-15 for more details.

Table 1-2. Toolbar Icon Functions

Icon	Description
	Convert Files – Displays the Convert File dialog box. See “Converting Files” on page 3-1 for more details.
	Cut – Removes the marked area or text from the page, placing it on the Windows® clipboard.
	Copy – Copies text from the page, placing it on the Windows clipboard.
	Paste – Places selected text on the Windows clipboard.
	Undo – Reverses the results.
	Redo – Returns the results.
	Compute Coordinates of Points – Computes (calculates) the coordinates of the points of the current file.
	Print – Prints the current window or table.
	About Topcon Tools – Displays the About Topcon Tools dialog box.

T ransferring Files

This chapter describes importing and exporting, or transferring, files between devices and a computer using Topcon Link.

Importing Files

The following sections describe importing data files from a device, such as a Conventional/Robotic Total Station, a TPS GPS+ Receiver, or TPS Controller, to a computer.

- To import files, do one of the following:
 - Click **File->Import from Device** (Figure 2-1).

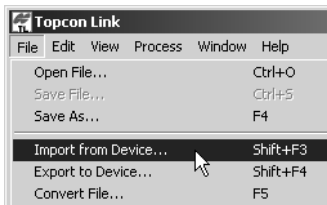


Figure 2-1. File->Import From Device

- Press **F7**.
- Click the **Import** button on the Toolbar (Figure 2-2).



Figure 2-2. Import From Device – Toolbar Button

The **Import from Device** dialog box displays (Figure 2-3). This dialog box consists of two panels.

- The upper panel displays icons of the four types of devices that provide raw data files for importing to Topcon Link. Initially, the previously chosen device is selected.
- The lower panel displays specific instructions for getting a device ready to import files.

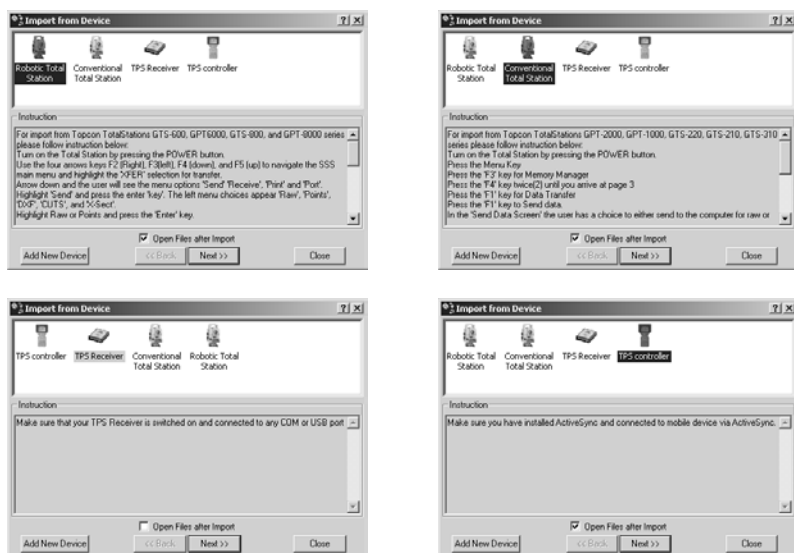


Figure 2-3. Import From Device

- To open the imported file after completing the Import process, click and enable *Open Files After Import*.
- Right-clicking any device icon displays a pop-up menu from which you can (Figure 2-4 on page 2-3):
 - Add a new device.
 - Cut, copy, or delete a chosen device.
 - Change an icon's image.
 - Set/change communication parameters.

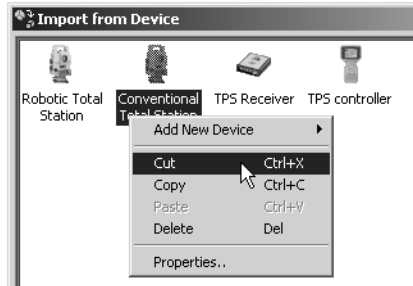


Figure 2-4. Device Pop-up Menu

Adding Devices

1. To include a new device to the Import From Device list, right-click within the upper panel, click Add New Device from the pop-menu, then select the desired device type (Figure 2-5).

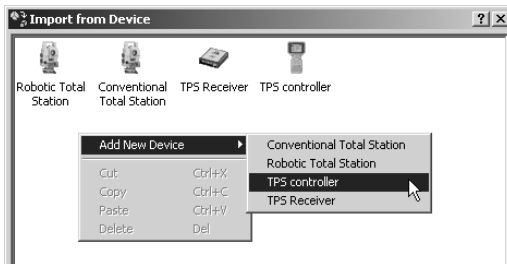


Figure 2-5. Import From Device – Pop-up Menu

2. On the *Properties* dialog box, enter the device name, comment, computer port, Total Station model (if applicable), and connection parameters (Figure 2-6 on page 2-4).

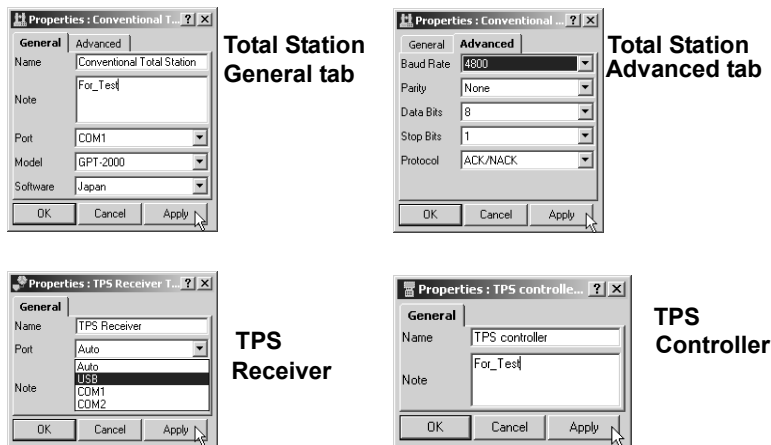


Figure 2-6. Properties Screens for Devices

3. Click **Apply** on each tab, then **OK** to set the properties of the new device and close the *Properties* dialog box.

Importing TPS Receiver Files

To import data from a TPS GPS+ receiver, follow the procedure below.

Set Communication Parameters

On the *Import from Device* dialog box set the correct communication parameters.

1. For the Topcon Link and TPS GPS+ receiver connection, right-click the TPS GPS+ receiver icon.
2. Click **Properties** on the pop-up menu.
3. Select the computer port (serial or USB) the receiver is connected to (Figure 2-7 on page 2-5).

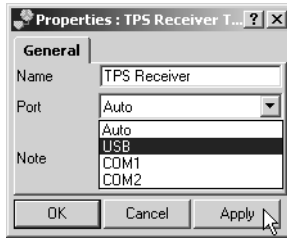


Figure 2-7. Select COM Port

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

Select Files to Import

5. Click **Next** on the *Import from Device* dialog box.
6. In the left panel, select the desired file(s) (hold the **Shift** key to select multiple files) (Figure 2-8).

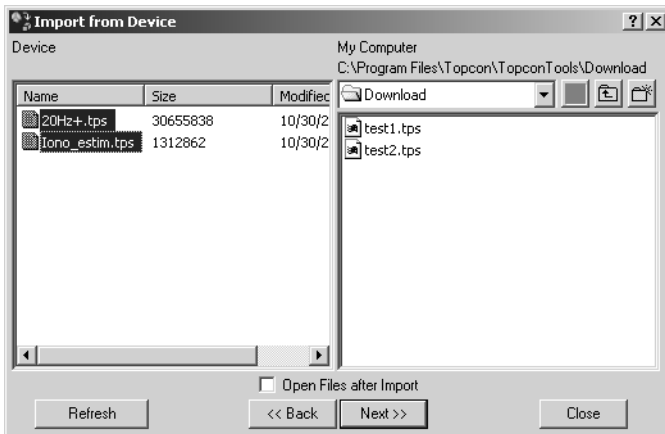


Figure 2-8. Select Files to Import

7. In the right panel, navigate to and select, or create, the folder in which to save the files.

- Click **Next**. The Status bar displays the import progress (Figure 2-9).

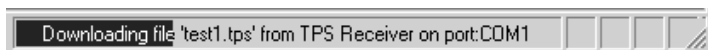


Figure 2-9. Import Progress

If the receiver is switched off, or a COM or USB Port was selected incorrectly, the following dialog box displays (Figure 2-10).

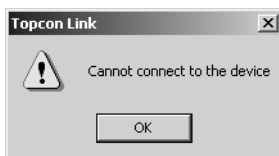


Figure 2-10. Cannot Connect Error Message

Click **OK**, and check the receiver's connections. Then repeat the process.

Importing TPS Controller Files

To import data from a TPS Controller to Topcon Link, 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 the connection between the computer and TPS Controller, do the following:

- Using an RS-232 interface cable, connect the TPS Controller to the serial interface port on the computer.
- Switch on the TPS Controller and computer.
- Start Microsoft ActiveSync.
- Click **Next** on the *Get Connected* dialog box (Figure 2-11 on page 2-7).

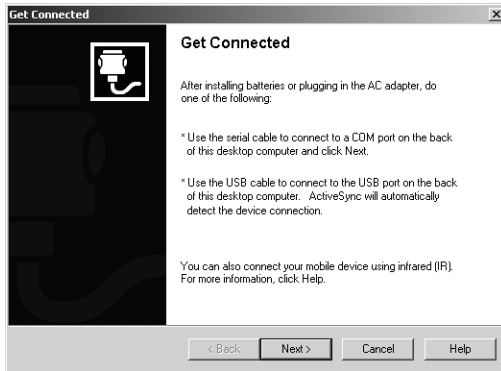


Figure 2-11. ActiveSync – Get Connected

The computer establishes a connection with the TPS Controller. If the TPS Controller is switched on, and the correct COM Port selected, the following dialog box displays (Figure 2-12).

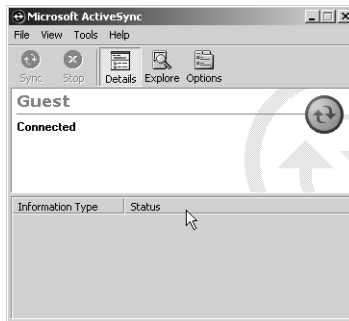


Figure 2-12. PC and Controller Connected

The system tray also displays a green circle, indicating a successful TPS controller-to-computer connection (Figure 2-13).



Figure 2-13. Connection Established



NOTICE

*TPS Controllers keep *.tsv files as database format files; this format cannot be stored on a computer. When importing these files from a TPS Controller to a computer, Topcon Link converts them to an accessible file format (*.tlsx) before saving. Topcon Link must be used to convert the correct *.tlsx files to the desired format.*



CAUTION

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

Microsoft ActiveSync Settings

If the computer has only one COM Port:

1. Start Microsoft ActiveSync.
2. Click **File->Connection Settings** (Figure 2-14).

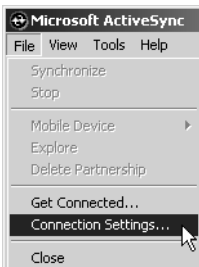


Figure 2-14. File->Connection Settings

3. On the **Connection Settings** dialog box, click and enable the following parameters (Figure 2-15):
 - Allow network (Ethernet) and Remote Access Service (RAS) server connection with this desktop computer
 - Show status icon in Task bar

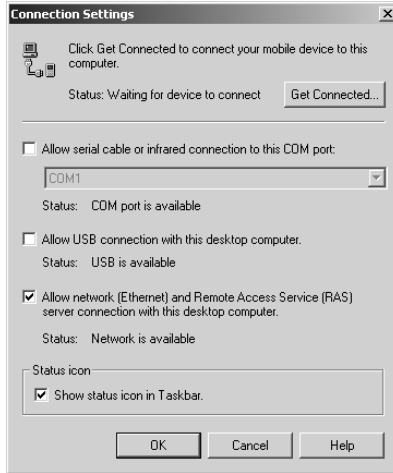


Figure 2-15. Connection Settings

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. On the Connection Settings dialog box, set the following parameters (Figure 2-16 on page 2-10):
 - Click and enable the “Allow serial cable or infrared connection to this COM port”

- Select the desired COM port from the drop-down list (usually COM 1)

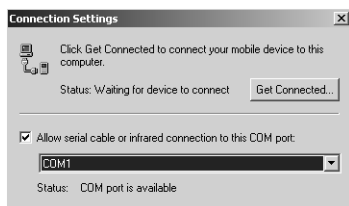


Figure 2-16. Click Get Connected

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.

Import TPS Controller Files

1. Click the **Import from Device** icon. On the Import from Device dialog box, select the TPS Controller icon and press **Next** (Figure 2-17).



Figure 2-17. Select TPS Controller

2. On the next Import from Device dialog box, select the desired *.tsv file in the left panel (Figure 2-18).

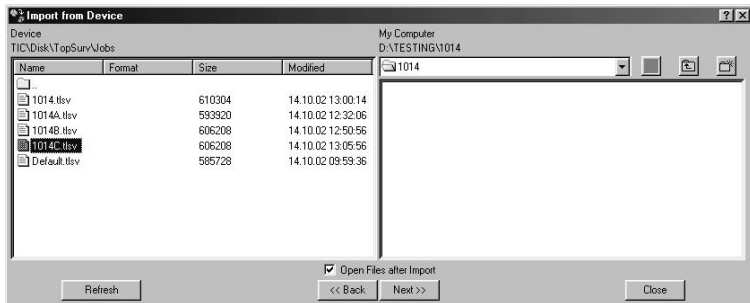


Figure 2-18. Select Files

3. In the right panel, select a folder in which to save the file. Create a new folder if needed.
4. Press **Next**. The Status bar displays the import progress (Figure 2-19).



Figure 2-19. Import Progress

Importing Total Station Files

The following sections describe importing data files from a Topcon Conventional or Robotic Total Station to a computer.

1. On the **Import from Device** dialog box, right-click a Conventional/Robotic Total Station icon and click **Properties** on the pop-up menu (Figure 2-20).

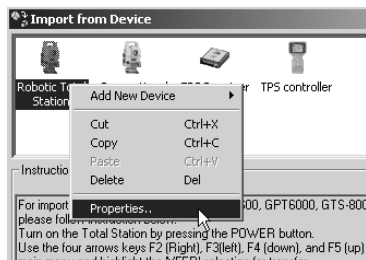


Figure 2-20. Right-Click Total Station

2. On the **Properties** dialog box, click the **General** tab and set the following information (Figure 2-21), then click **Apply**:
 - Select the model of a total station.
 - Enter any applicable notes.
 - Select the computer serial port the Total Station is connected to.

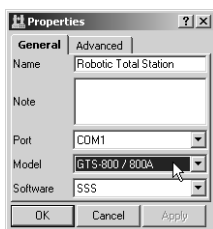


Figure 2-21. Properties – General Tab

- Click *Advanced* and set the Baud Rate, Data Bits, Parity, Stop Bits, and Protocol (Figure 2-22). Click **OK** to apply the information and close the dialog box.



Figure 2-22. Properties – Advanced Tab

- Follow all the steps given in the *Instruction* panel on the *Import from Device* dialog box (Figure 2-23) to prepare the Total Station for importing files. Select the file to import.

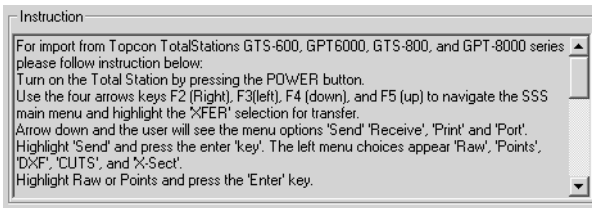


Figure 2-23. Total Station Instructions – Preparing for Import

- Click **Next** on the *Import from Device* dialog box. The Status bar displays the import progress (Figure 2-24).



Figure 2-24. Import Progress

If the data file was successfully imported from the total station to the computer the following window displays (Figure 2-25).

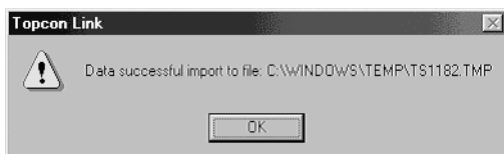


Figure 2-25. Successful Import

6. Click **OK**.
7. On the *Save file imported from Total Station to* dialog box, define a folder for the file, select the file type and enter a file name (Figure 2-26).

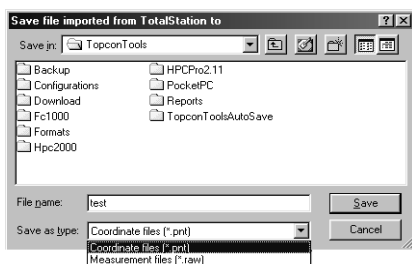


Figure 2-26. Save Imported File

8. Click **Save**.

If the total station is switched off, not ready for data transfer, or the communication parameters are incorrect, the following window displays (Figure 2-27).

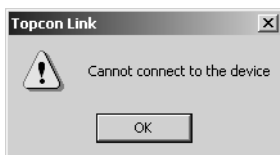


Figure 2-27. Cannot Connect Error Message

Check the device's connections, and repeat the process.

Exporting Files

The following sections describe exporting from a computer:

- an Option Authorization File (OAF) to a TPS GPS+ Receiver;
 - Coordinate data files to a Conventional/Robotic Total Station;
 - Any type of file to a TPS Controller.
1. To import files, do one of the following:
 - Click **File->Export to Device** (Figure 2-1).

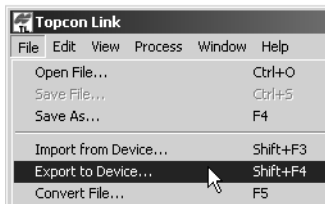


Figure 2-28. File->Export to Device

- Press **F8**.
- Click the **Export** button on the Toolbar (Figure 2-2).



Figure 2-29. Export To Device – Toolbar Button

This dialog box consists of two panels (Figure 2-30 on page 2-16):

- The upper panel displays icons of the four types of devices that provide data files. Initially, the previously chosen device is selected.
- The lower panel displays specific instructions for getting a device ready to export files.

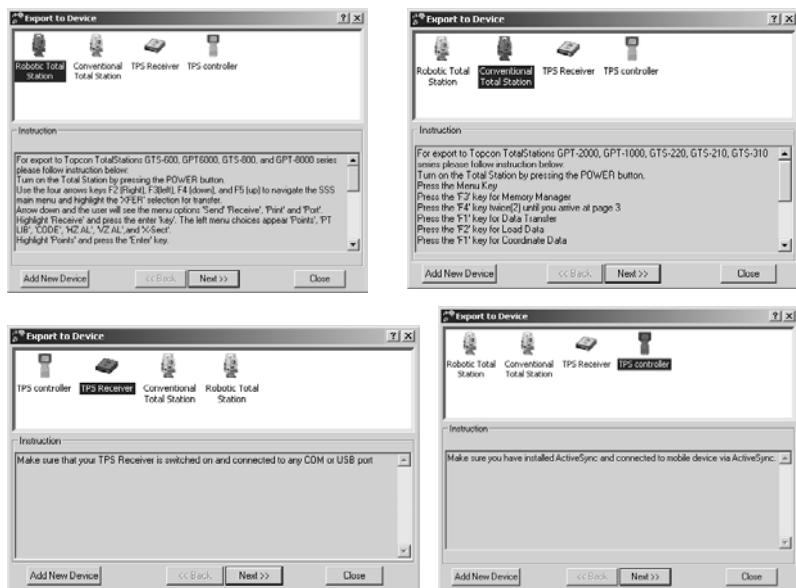


Figure 2-30. Export To Device

Exporting Files to Total Stations

The following procedure describes exporting coordinate files from a computer to any listed model total station.

1. On the *Import from Device* dialog box, right-click a Conventional/Robotic Total Station icon and click **Properties** on the pop-up menu (Figure 2-31).

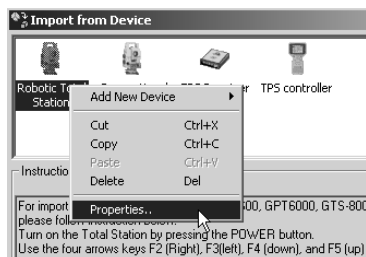


Figure 2-31. Right-click a Total Station

2. On the **Properties** dialog box, click the *General* tab and set the following information (Figure 2-32), then click **Apply**:
 - Select the model of a total station.
 - Enter any applicable notes.
 - Select the computer serial port the Total Station is connected to.

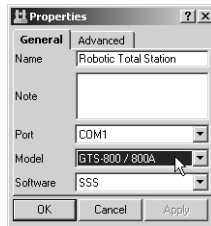


Figure 2-32. Properties – General Tab

3. Click *Advanced* and set the Baud Rate, Data Bits, Parity, Stop Bits, and Protocol (Figure 2-33). Click **OK** to apply the information and close the dialog box.



Figure 2-33. Properties – Advanced Tab

- Follow all the steps given in the *Instruction* panel on the *Export to Device* dialog box (Figure 2-34) to prepare the Total Station for exporting files.

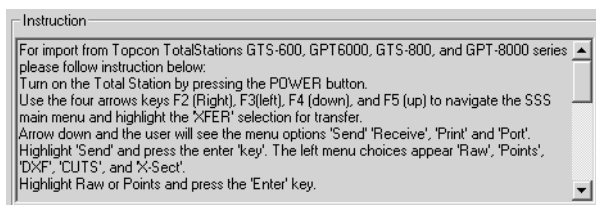


Figure 2-34. Total Station Instructions – Preparing for Export

- Press **Next** on the *Export to Device* dialog box.
- On the *Export to Total Station from* dialog box, navigate to and select the desired file (Figure 2-35).

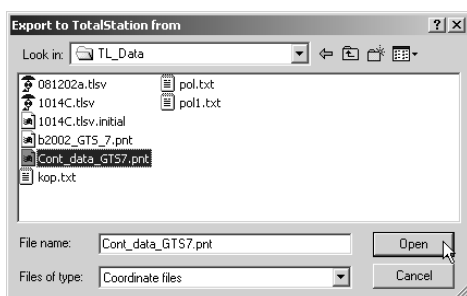


Figure 2-35. Export To TotalStation From...

- Click **Open**. Check the Total Station for the exported file (refer to the Total Station's documentation).

Exporting an OAF to TPS Receivers

Topcon Positioning System issues an Option Authorization File (OAF) to enable the specific options purchased for a TPS receiver. An OAF allows each receiver to be customized based on particular needs. Use the following steps to load an OAF from a computer to a TPS receiver.

1. On the *Export to Device* dialog box, right-click the TPS Receiver icon and click **Properties** on the pop-up menu (Figure 2-36).

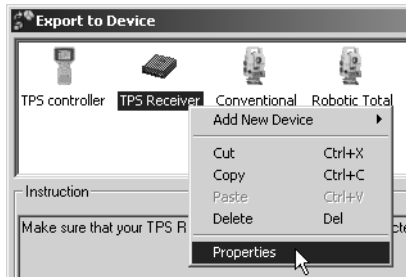


Figure 2-36. Export to Device – Receiver

2. Select the computer port (serial or USB) the receiver is connected to (Figure 2-37).

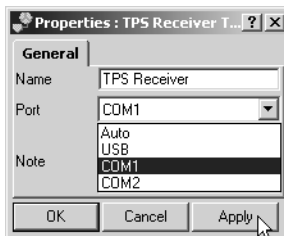


Figure 2-37. TPS Receiver Properties

3. Press **Next** on the *Export to Device* dialog box.

4. On the *Select file to upload* dialog box, navigate to and select the OAF file for this TPS receiver (Figure 2-38).

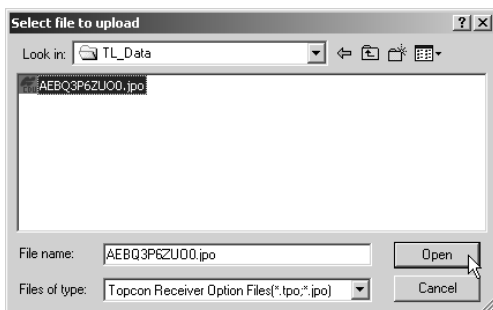


Figure 2-38. Select File To Upload

5. Click **Open**. The *Status* bar displays the uploading progress (Figure 2-39).



Figure 2-39. Upload Progress

If the OAF loads successfully from the computer to the TPS receiver, Topcon Link displays a confirmation message (Figure 2-40).

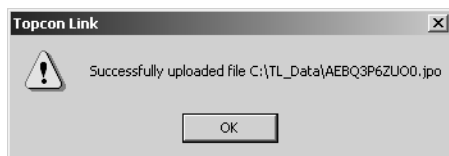


Figure 2-40. File Uploaded Successfully

Exporting Files to TPS Controllers

To export data from Topcon Link to a TPS Controller, first install and start Microsoft® ActiveSync™ on the computer (see “Importing TPS Controller Files” on page 2-6). A green icon on the system tray indicates a successful connection between the computer and TPS Controller.

When exporting files, Topcon Link exports coordinate files and TopSURV database files from a computer to a TPS Controller.

- When exporting TopSURV database files, Topcon Link converts *.tlsv job format to the *.tsv job format.
- When exporting coordinates files, Topcon Link leaves the files in the current format.



CAUTION

To avoid data loss, use only Topcon Link when exporting *.tlsv files from a computer to a TPS Controller.

1. On the *Export to Device* dialog box, select a TPS Controller and click **Next** (Figure 2-41).



Figure 2-41. Export to Device – Controller

2. In the left panel, select the desired coordinate file for export (Figure 2-42).

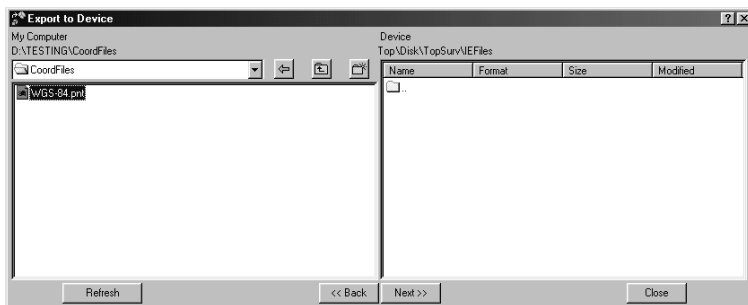


Figure 2-42. Select File for Export and Folder for File

3. In the right panel, select the TPS Controller folder in which to export the file.
4. Press **Next**. The Status bar displays the export progress (Figure 2-43).



Figure 2-43. Export Progress

Converting Files

Topcon Link™ converts files from:

- Coordinate file formats:
 - Topcon Total Station (GTS-7, FC-5, GTS-210/310-10, GTS-210/310-12)
 - Char-delimited (Name,Lat,Lon,H,Code; Name,N,E,Z,Code; Name,E,N,Z,Code; Custom)
 - ASCII / TSV
 - TDS (CR5)
- Measurement file formats from Topcon Total Station raw data formats (GTS-6, GTS-7, GTS-7+, FC-5, GTS-210/310)
- TopSURV file format (TopSURV)
- Topcon XML file format (XML)
- GPS+ raw measurements file formats
 - RINEX
 - TPD (Topcon Positioning Data)
 - TPS / JPS
- TDS Raw Data File
- Geoid file
- Feature file

Topcon Link converts files to:

- Any coordinate file to:
 - Any other coordinate file
 - Topcon XML
 - TopSURV
 - DXF
 - GIS (Shape, LandXML, DXF)
- Any measurement file to:
 - Any other measurement file
 - Any coordinate file
 - GIS (Shape, LandXML, DXF)
 - Topcon XML
 - TopSURV
- TopSURV file to:
 - Any coordinate file
 - Any measurement file
 - GIS (Shape, LandXML, DXF)
 - Topcon XML
 - GPS Vector file
- Topcon XML file to:
 - Any coordinate file
 - Any measurement file
 - GIS (Shape, LandXML, DXF)
 - TopSURV
- RINEX file to TPD
- GPS+ TPS / JPS files and TPD files to RINEX

- TSD Raw Data File containing measurement file form a Total Station:
 - Any coordinate file
 - Any measurement file
 - GIS (Shape, LandXML, DXF)
 - Topcon XML
 - TopSURV
 - TDS Raw Data File containing RTK data:
 - Any coordinate file
 - Any measurement file
 - GIS (Shape, LandXML, DXF)
 - Topcon XML
 - GPS Vector file
 - Geoid file to Topcon Geoid file
 - Feature File to TopSURV file
1. To convert a file from one format to another, do one of the following:
 - Click **File->Convert to File** (Figure 3-1).

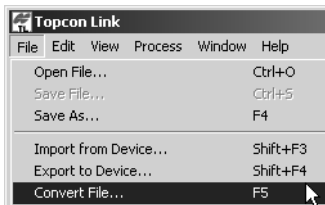


Figure 3-1. File->Convert File.

- Press **F5**.

- Click **Convert File** on the Toolbar (Figure 3-2).



Figure 3-2. Convert File – Toolbar Button

The *Convert File* dialog box displays (Figure 3-3).

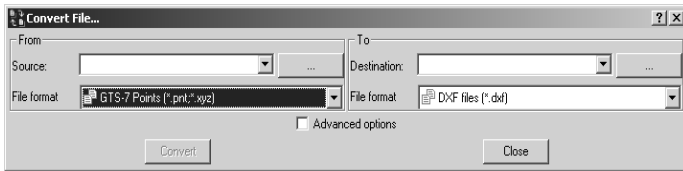


Figure 3-3. Convert File Dialog Box

- The left panel displays parameters and values used in the field operations of the file.
 - The right panel displays parameters and values necessary after the conversion.
2. In the left panel, select file type (Figure 3-4).

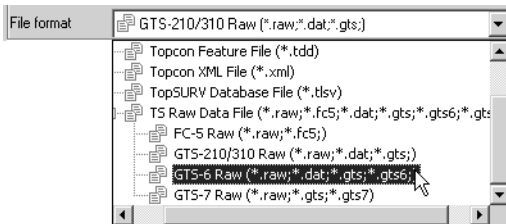


Figure 3-4. File Format List

3. Click **Browse** (“...”) and select the file for conversion in the *Open for convert* dialog box (Figure 3-5).

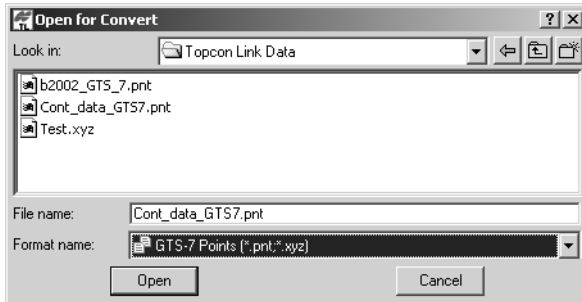


Figure 3-5. Open for Convert

4. Click **Open**. The path of the source file displays in the *Source* field (Figure 3-6).

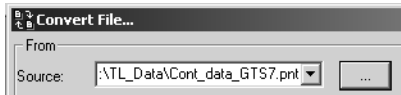


Figure 3-6. Convert File – Source

5. In the right panel, enter the destination file name and type.
6. Click **Browse** (“...”) and select or create a folder in the *Select a file* dialog box, then select the destination file type and enter the destination file name. Click **Select** (Figure 3-7).

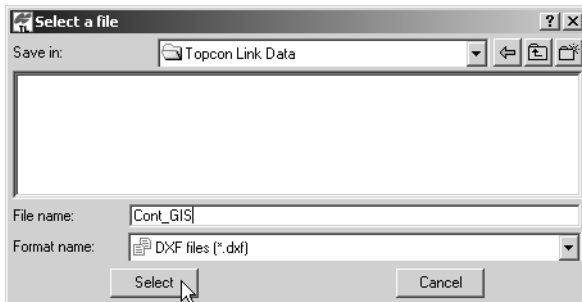


Figure 3-7. Select A File

7. Click **Advanced Options** to display further conversion parameters. Enter the desired information (Figure 3-8).

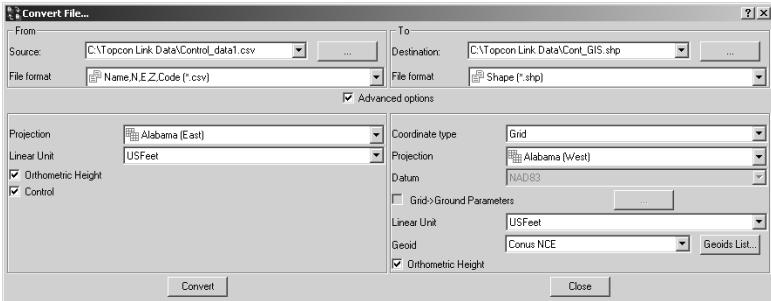


Figure 3-8. Convert File – Advanced Options

8. Click **Convert** in the *Convert File* dialog box to start the file conversion (Figure 3-8).

The following operations depend on the format type of the source and destination files. See the following sections for specific conversion parameters and information.

Converting Coordinate Files

If converting a coordinate type file, specify the following parameters in the left/right panels:

- The file format (Figure 3-9).

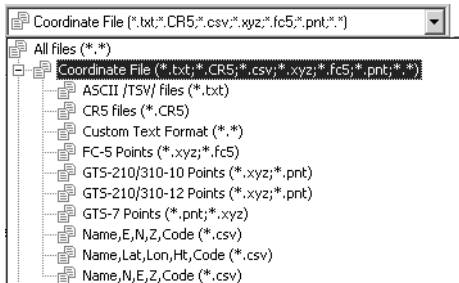


Figure 3-9. Coordinate File Formats

- In the left panel, enable *Orthometric Height* when the file uses orthometric heights (Figure 3-10).



Figure 3-10. Orthometric Height Checkbox

- In the left panel, enable *Control* to fix the coordinates of points when converting the file to a *.tstv file (Figure 3-11).



Figure 3-11. Control Checkbox

- In the right panel, enable *Orthometric Height* to calculate orthometric heights for the converted points (Figure 3-12).



Figure 3-12. Orthometric Height

- In the right panel, set the Geoid model:
 1. Click **Geoids List** (Figure 3-13).

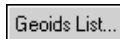


Figure 3-13. Geoids list button

2. On the *Geoids List* dialog box, click **Add** (Figure 3-14).

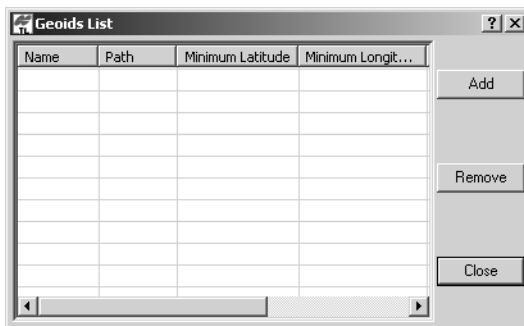


Figure 3-14. Geoids List Dialog Box

3. Select the desired *.bin file in *Open* dialog box and click **Open** (Figure 3-15).

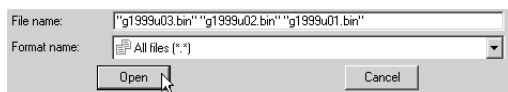


Figure 3-15. Open window

4. Click **Close** (Figure 3-16).

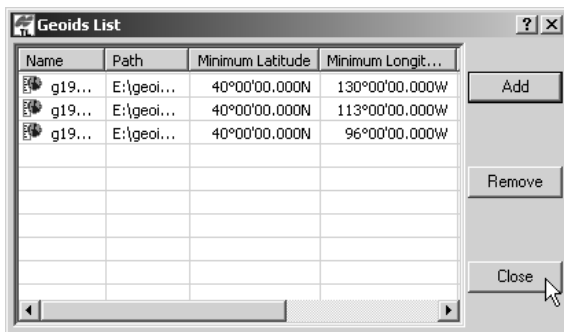


Figure 3-16. Geoids List

- In the right panel, select a geoid model (Figure 3-17).

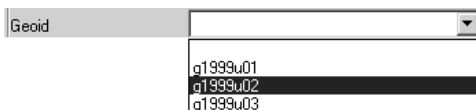


Figure 3-17. Select Geoid Model

ASCII/TSV and Custom Text Format Parameters

For ASCII/TSV or Custom Text formats, specify:

- A projection name for the coordinate type (Figure 3-18).

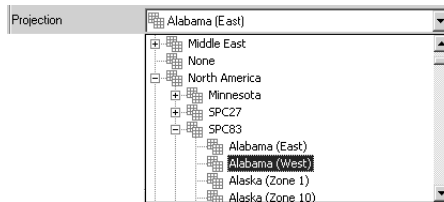


Figure 3-18. Projection List

- Or a Datum for Lat,Lon,H coordinate type (Figure 3-19).

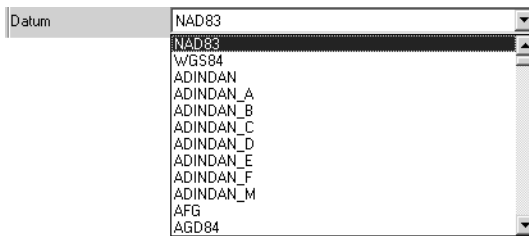


Figure 3-19. Datum List

- Linear units (Figure 3-20).

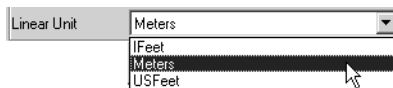


Figure 3-20. Linear Units List

Name,Lat,Lon,H,Code Format Parameters

For Name,Lat,Lon,H,Code formats, specify the following parameters:

- Datum (Figure 3-21)

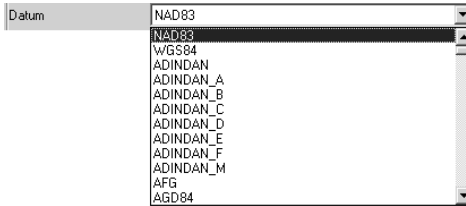


Figure 3-21. Datum List

- Linear units (Figure 3-22)

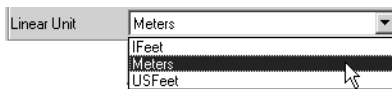


Figure 3-22. Linear Unit List

Other Coordinate File Types Format Parameters

For GTS-7 Points, FC-5, GTS-210/310-10, GTS-210/310-12, Name,E,N,Z,Code or Name,N,E,Z,Code formats, specify the following parameters:

- Projection (Figure 3-23).

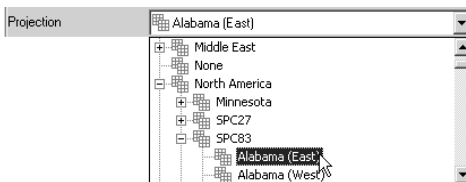


Figure 3-23. Projection List

- Linear units (Figure 3-24)

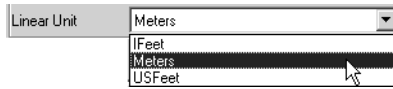


Figure 3-24. Linear Unit List

- When converting from (left panel) GTS-7 Points, FC-5, GTS-210/310-10 and GTS-210/310-12 file formats, enter the Grid and Ground transformation parameters using the following procedure:
 1. Click and enable the *Grid->Ground Parameters* check box (Figure 3-25).



Figure 3-25. For Grid Coordinate Type, Enable Grid->Ground Parameters

2. Click the **Grid to Ground Parameters** button (Figure 3-26).



Figure 3-26. Grid to Ground Parameters Button

3. Enter the applicable transformation parameters (Figure 3-27).

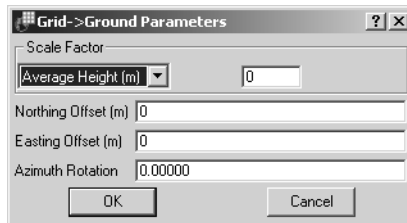


Figure 3-27. Grid to Ground Parameters

4. Click **OK**.
- When converting to (right panel) GTS-7 Points, FC-5 Points, GTS-210/310-10 Points and GTS-210/310-12 Points file formats, a coordinate file is created that contains

Ground coordinates. To convert Ground coordinates to Grid coordinates, see the above procedure.

Converting TopSURV Files

If converting a TopSURV file, select the correct file format (Figure 3-28) and click **Convert**.

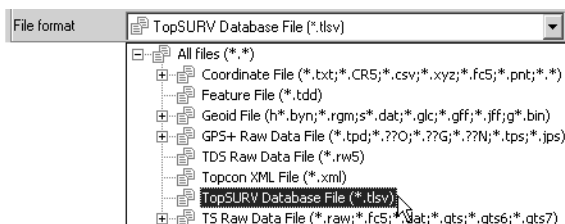


Figure 3-28. File Format List

Converting Total Station Raw Data Files

If converting a Total Station (TS) measurement file, specify the following parameters in the left/right panels.

In the left panel,

- the File format (Figure 3-29).

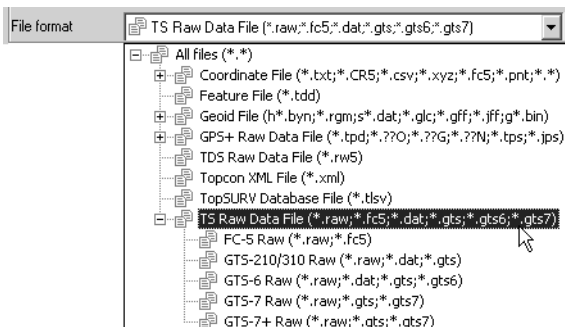


Figure 3-29. File Format List

- the Projection type (Figure 3-30).

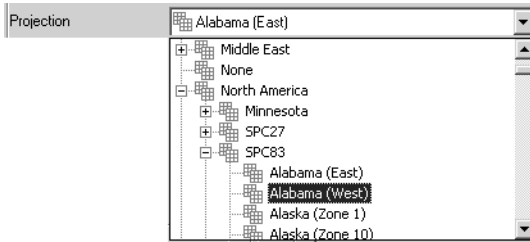


Figure 3-30. Projection List

- the relation between the Grid and Ground coordinates:
 1. Click and enable the *Grid->Ground Parameters* check box (Figure 3-31).



Figure 3-31. For Grid Coordinate Type, Enable Grid->Ground Parameters

2. Click the **Grid to Ground coordinates** button (Figure 3-32).



Figure 3-32. Grid to Ground Coordinates Button

3. On the *Grid->Ground Parameters* dialog box, enter the transformation parameters (Figure 3-33).

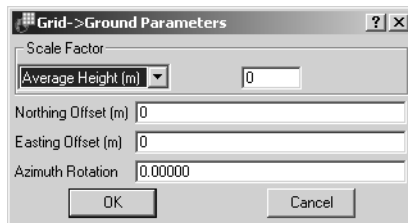


Figure 3-33. Grid->Ground Parameters Dialog Box

- the order of the coordinates (Figure 3-34).



Figure 3-34. Coordinate Order List

In the right panel,

- the File format (Figure 3-35).

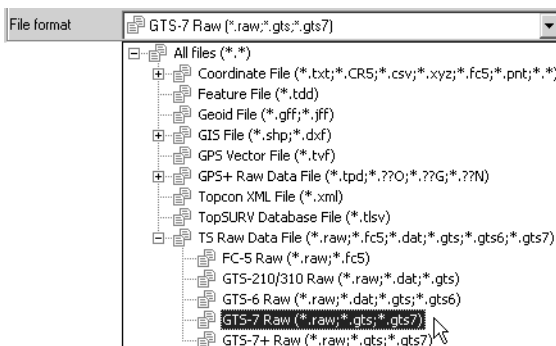


Figure 3-35. File Format List

- the Projection type (Figure 3-36).

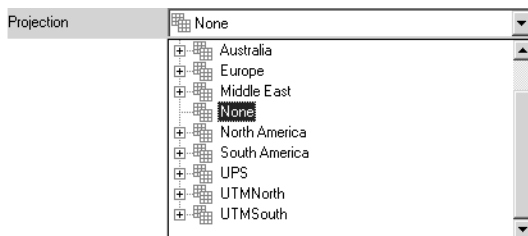


Figure 3-36. Projection List

- the relation between the Grid and Ground coordinates:
 1. Click and enable the *Grid->Ground Parameters* check box (Figure 3-31).



Figure 3-37. For Grid Coordinate Type, Enable Grid->Ground Parameters

- Click the **Grid to Ground coordinates** button (Figure 3-38).



Figure 3-38. Grid to Ground Coordinates Button

- On the **Grid->Ground Parameters** dialog box, enter the transformation parameters (Figure 3-39).

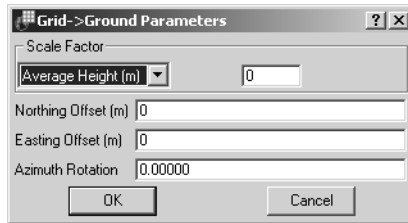


Figure 3-39. Grid->Ground Parameters Dialog Box

- the Linear units (Figure 3-40).

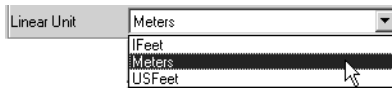


Figure 3-40. Linear Units List

- the Angular units (Figure 3-41).



Figure 3-41. Angular Units List

- the Coordinate order (Figure 3-42).



Figure 3-42. Coordinate Order List

Converting Topcon XML Files

If converting a Topcon XML file, set the following parameters in the left panel:

- Select the File format (Figure 3-43).

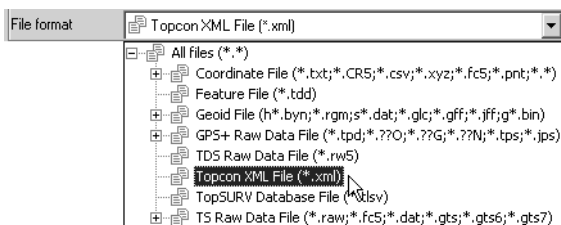


Figure 3-43. File Format List

- Select the Coordinate type (Figure 3-44).

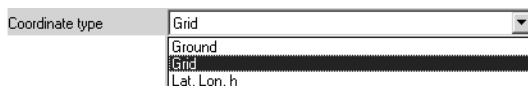


Figure 3-44. Coordinate Type List

If Ground or Grid coordinate type is selected, set the Projection, Linear unit, and Angular unit (Figure 3-45).

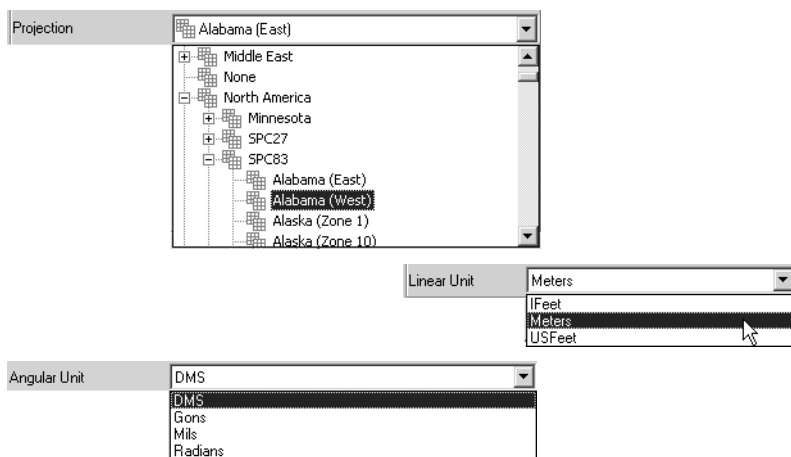


Figure 3-45. Projection, Linear Unit, Angular Unit Lists

If the *Lat, Lon, H* coordinate type is selected, set the Datum, Linear unit, and Angular unit (Figure 3-46).

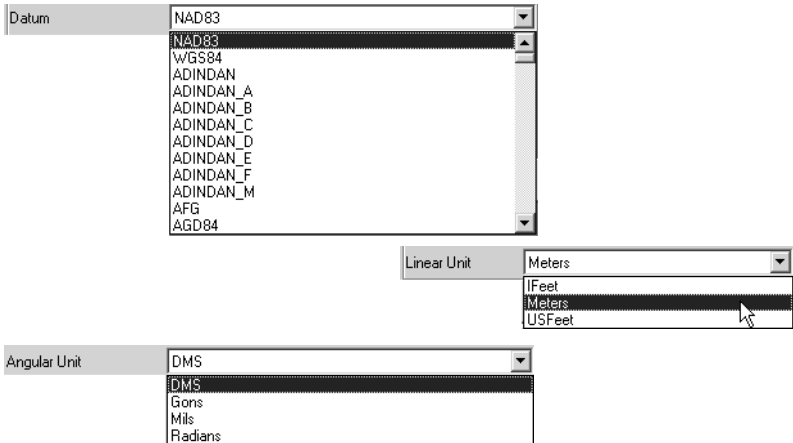


Figure 3-46. Datum, Linear Unit, and Angular Unit Lists

- If Ground coordinates selected, enter the relation between the Grid and Ground coordinates:
 1. Click and enable the *Grid->Ground Parameters* check box (Figure 3-47).



Figure 3-47. For Grid Coordinate Type, Enable Grid->Ground Parameters

2. Click the **Grid to Ground coordinates** button (Figure 3-48).



Figure 3-48. Grid to Ground Coordinates Button

3. On the *Grid->Ground Parameters* dialog box, enter the transformation parameters (Figure 3-49).

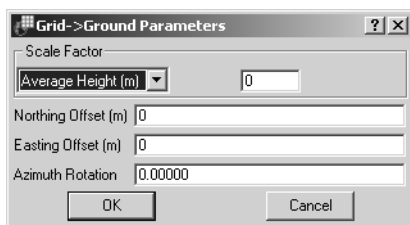


Figure 3-49. Grid->Ground Parameters Dialog Box

Converting LandXML Files

If converting a LandXML file, set the following parameters in the left panel:

- Select the File format (Figure 3-50).

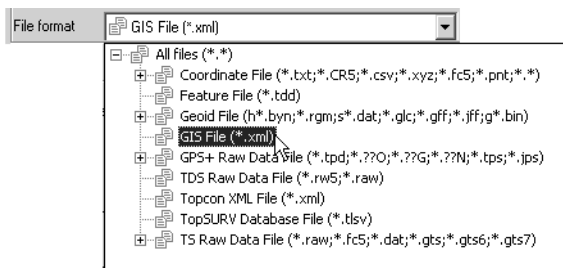


Figure 3-50. File Format List

- Select the Coordinate type (Figure 3-51).

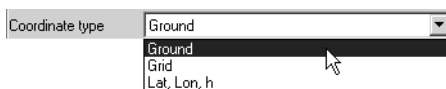


Figure 3-51. Coordinate Type List

If Ground or Grid coordinate type is selected, set the Projection and Linear unit (Figure 3-52).

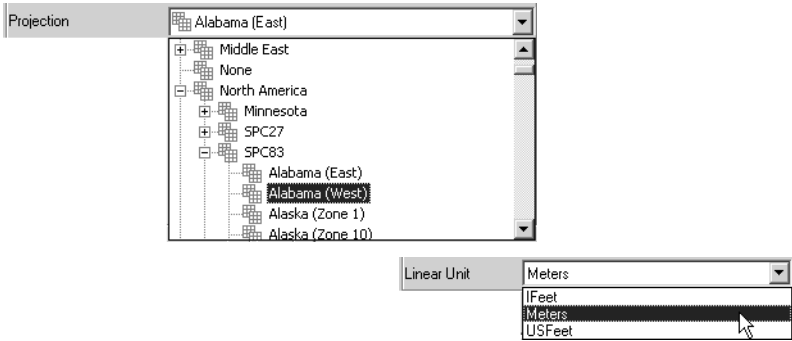


Figure 3-52. Projection, Linear Unit, Angular Unit Lists

If the *Lat, Lon, H* coordinate type is selected, set the Datum and Linear unit Angular unit (Figure 3-53).

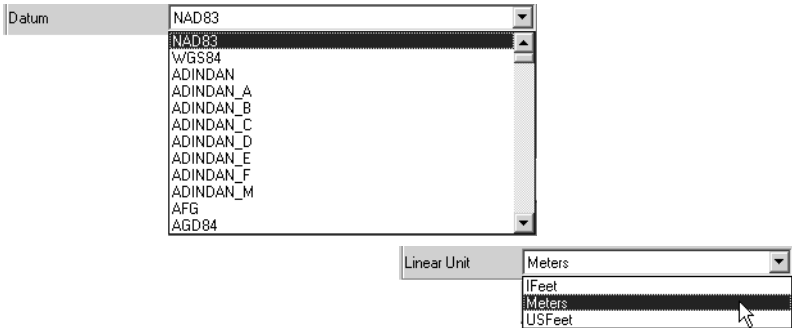


Figure 3-53. Datum, Linear Unit, and Angular Unit Lists

- If Ground coordinates selected (Figure 3-54 on page 3-20), enter the relation between the Grid and Ground coordinates:
 1. Click and enable the *Grid->Ground Parameters* check box (Figure 3-54 on page 3-20).



Figure 3-54. For Grid Coordinate Type, Enable Grid->Ground Parameters

2. Click the **Grid to Ground coordinates** button (Figure 3-55).



Figure 3-55. Grid to Ground Coordinates Button

3. On the *Grid->Ground Parameters* dialog box, enter the transformation parameters (Figure 3-56).

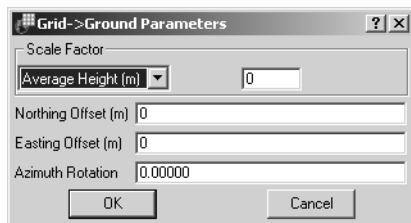


Figure 3-56. Grid->Ground Parameters Dialog Box

Converting GPS+ Raw Data Files

If converting a GPS+ Raw Data file (TPS, JNS, RINEX, TPD), select the correct file format in the *From* panel (Figure 3-57).

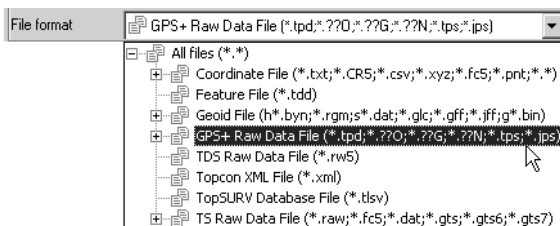


Figure 3-57. File Format List

Converting to GIS Files

If converting to a GIS file, specify the following parameters in the right panel:

- Select the file format (Figure 3-58).

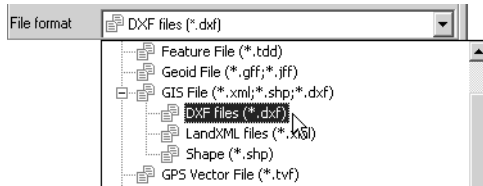


Figure 3-58. File Format List

- Select the coordinate type (Figure 3-59).

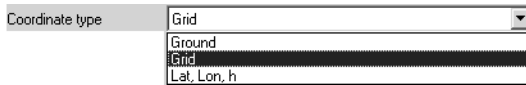


Figure 3-59. Coordinate Type List

If Ground or Grid coordinate type is selected, set the Projection and Linear units (Figure 3-60).

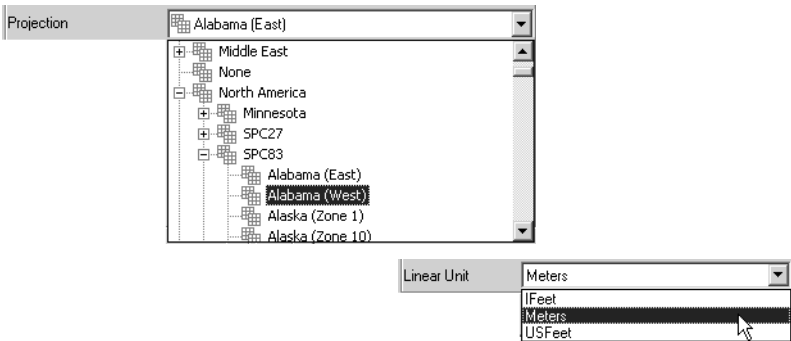


Figure 3-60. Projection and Linear Unit Lists

If the *Lat, Lon, H* coordinate type is selected, set the Datum and Linear units (Figure 3-61).

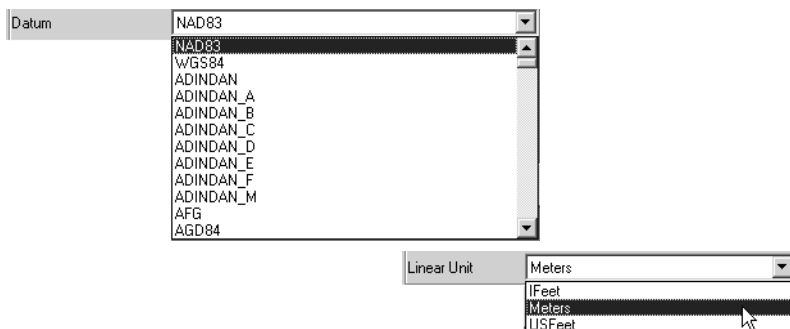


Figure 3-61. Datum and Linear Unit Lists

- For Ground coordinates, set the relation between the Ground coordinates and Grid coordinates. See steps 1 through 3 on page 3-19 for this procedure.
- Enable *Orthometric Height* to calculate orthometric heights for the converted points (Figure 3-62).



Figure 3-62. Orthometric Height

- Set the Geoid model:
 1. Click **Geoids List** (Figure 3-63).

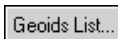


Figure 3-63. Geoids list button

2. On the *Geoids List* dialog box, click **Add** (Figure 3-64).

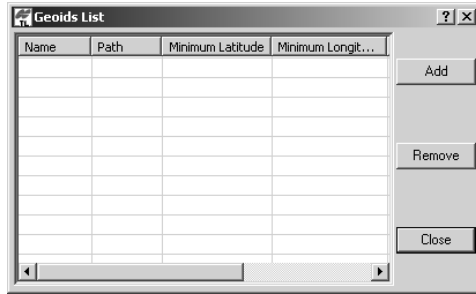


Figure 3-64. Geoids List Dialog Box

3. Select the desired *.bin file in *Open* dialog box and click **Open** (Figure 3-65).

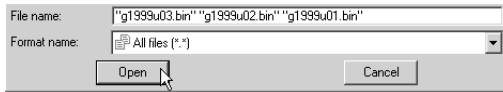


Figure 3-65. Open Window

4. Click **Close** (Figure 3-66).

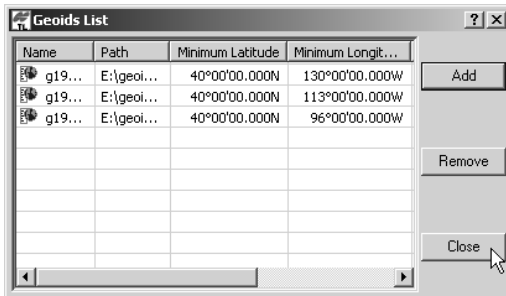


Figure 3-66. Geoids List

- Select a geoid model (Figure 3-67).

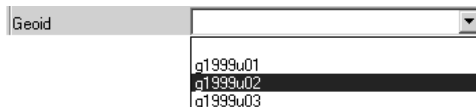


Figure 3-67. Select Geoid Model

Converting to TPD GPS+ Raw Data Files

If converting to a TPD GPS+ Raw Data file, select the correct file format in the *To* panel (Figure 3-68).

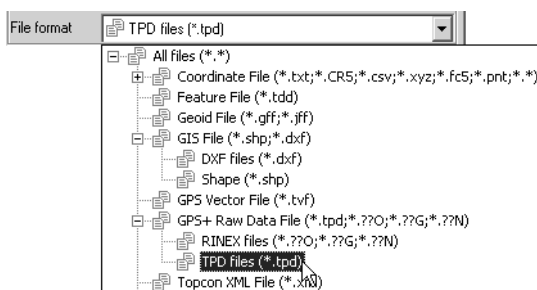


Figure 3-68. File Format List

Converting to RINEX GPS+ Raw Data Files

If converting to a RINEX GPS+ Raw Data file, set the following parameters in the *To* panel:

- Select the File format (Figure 3-69).

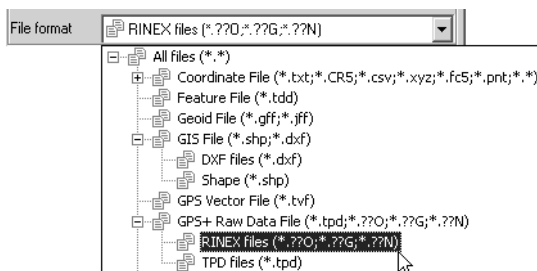


Figure 3-69. File Format List

- Click **GLONASS** to include or exclude raw GLONASS data measurements/ephemeris data (Figure 3-70 on page 3-25).

- Click **L1** and/or **L2** to include or exclude L1 or L2 raw data measurements (Figure 3-70). If both fields are disabled (unchecked), Topcon Link creates only a navigational file (*.0?o).



Figure 3-70. RINEX Advanced Options – Enabled

Converting TDS Raw Data Files

If converting a TDS measurement file, specify the following parameters in the left panel:

- the File format (Figure 3-71).

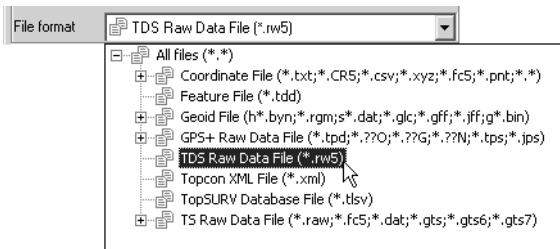


Figure 3-71. TDS Raw Data File Formats

- the Projection type (Figure 3-72).

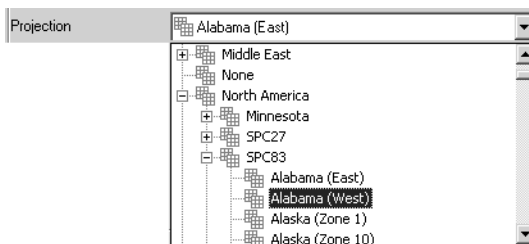


Figure 3-72. Projection List

- the Linear units (Figure 3-73).

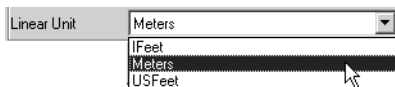


Figure 3-73. Linear Units List

- the Angular units (Figure 3-74).



Figure 3-74. Angular Units List

Converting Geoid Files

If converting a Geoid file, select the correct file in the *From* panel (Figure 3-75).

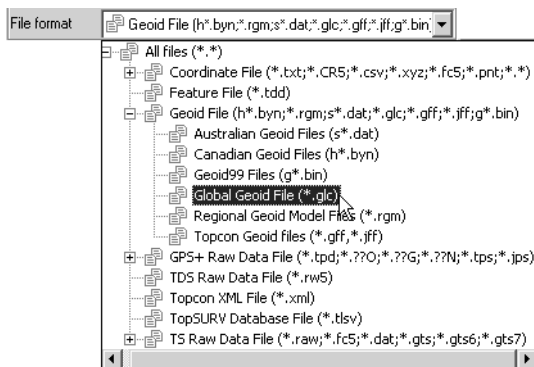


Figure 3-75. Global Geoid Format

Converting Topcon Geoid Files

Geoid files can be converted to the Topcon Geoid file format for use in Topcon Tools and TopSURV.

If converting to a Topcon Geoid file, set the following parameters in the *To* panel:

- Select the File format (Figure 3-76).

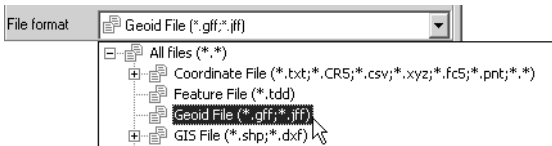


Figure 3-76. Geoid File Format

- Specify positions for the points limiting the use of this geoid model (Figure 3-77).

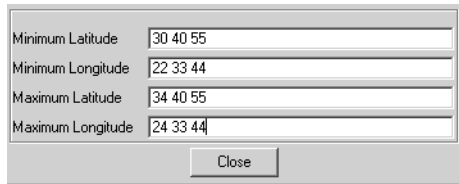


Figure 3-77. Point Limits

NOTE: Enter latitude and longitudes and the format shown in Figure 3-78.

dd° mm' ss''

Figure 3-78. Latitude and Longitude Format



TIP

Latitudes are positive for the Northern Hemisphere. Longitudes are positive for the Eastern Hemisphere.

Converting Feature Files

In converting a Feature file, select the correct file in the *From* panel (Figure 3-79).

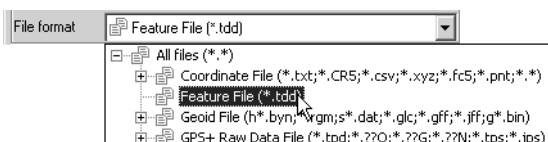


Figure 3-79. Feature File Format

Converting to GPS Vector File

If converting to a GPS Vector file, in the *To* panel, select the file format (Figure 3-80).

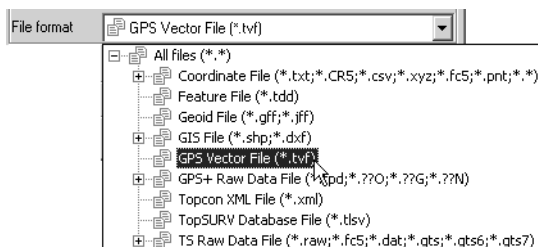


Figure 3-80. GPS Vector File Format

See Appendix C for more details.

Maintaining Files

This chapter discusses opening, viewing, and editing files in Topcon Link™.

Opening Files

Topcon Link can open the following formats and types of files:

- Coordinate file formats:
 - Topcon Total Station (GTS-7, FC-5, GTS-210/310-10, GTS-210/310-12)
 - Char-delimited (Name,Lat,Lon,Ht,Code; Name,N,E,Z,Code; Name,E,N,Z,Code; Custom)
 - TSV ASCII
 - TDS (CR5)
- Measurement file formats from Topcon Total Stations (GTS-6, GTS-7, GTS-7+, FC-5, GTS-210/310)
- TopSURV file format (TopSURV files).
- Feature file

1. To open a file, do one of the following:
 - Click **File->Open File** (Figure 4-1).



Figure 4-1. File->Open File...

- Press **Ctrl+O**.
- Click **Open** on the Toolbar (Figure 4-2).



Figure 4-2. Open – Toolbar Button

The *Open* dialog box displays (Figure 4-3).

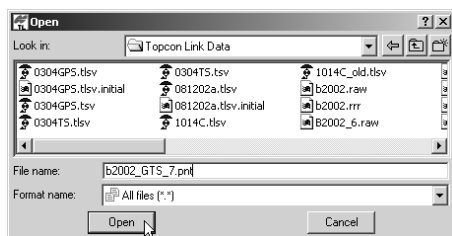


Figure 4-3. Open Dialog Box

2. To select the file format, use the *Format name* drop-down list to do one of the following:
 - Select the file format if known beforehand (Figure 4-4).

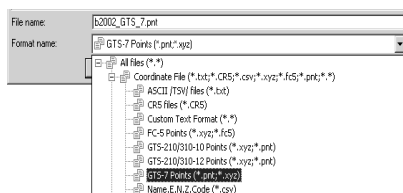


Figure 4-4. File Format

- Select the file type if the file type is known and the file format is unknown (Figure 4-5).

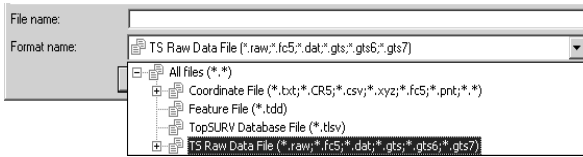


Figure 4-5. File Type

- Select All Files if the file format and type are unknown (Figure 4-6). In this case Topcon Link software automatically detects the file type and format.

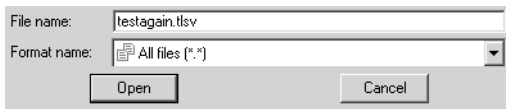


Figure 4-6. All Files

3. Click **Open**. The file opens in Topcon Link.

Selecting an incompatible file name and file format displays an error message (Figure 4-7).

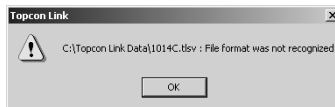


Figure 4-7. Unknown File Format Error Message

Select the correct file name or format and repeat the process.

Creating User-defined File Formats

To open a file of arbitrary coordinates format, create and save a user-defined format using the Open dialog box.

1. In the **Open** dialog box, select Custom Text Format in the *Format name* drop-down list and type a name for the file in the *File name* field (Figure 4-8). Click **Open**.

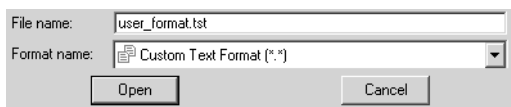


Figure 4-8. Custom Text Format

2. In the *Custom format properties* dialog box, enter the file's parameters (Figure 4-9 on page 4-5).
 - Delimiters – the separating character type; either Comma, Space, Tab, or Semicolon.
 - Coordinate system – Grid, Ground, or BLH.
 - Coordinates order, codes, and comments. Select the desired entry (names, coordinates, codes, comments), then:
 - Use the right arrow button to move entries from the left field to the right field. The order of names in the right field must correspond the order of names in the opened file.
 - Use the left arrow button to move entries out of the right panel and back to the left panel.
 - Use the Move Up and Move Down buttons to move names in the right panel up and down.
 - The format name and the format's file extension.

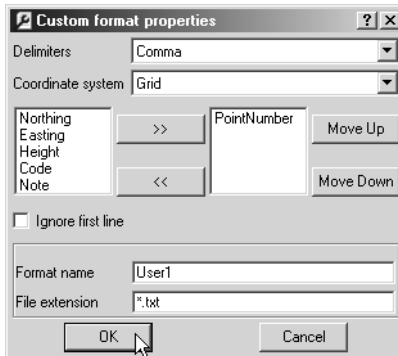


Figure 4-9. Custom Format Properties

3. Click **OK**. Topcon Link will do the following:
 - Store the user-defined format description in the Formats folder.
 - Store the format name in the list of the coordinate file formats (Figure 4-10).

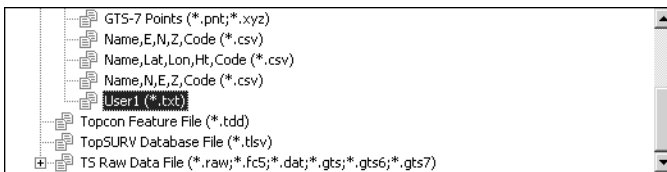


Figure 4-10. Format Name Stored in File Format List

- Attempt to open the selected file.



NOTICE

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

Viewing Files

After opening a file, or transferring a file from an external device, a data table displays in the Topcon Link work area.

Coordinate File Data Table

Coordinate Files display information on one tab in the data table (Figure 4-11).

Name	Grid Northing	Grid Easting	Elevation	Note	Code
Δ 3	3.99300	9.20000	-0.09600		
Δ 4	6.91200	7.63100	0.40700		
Δ 5	2.57700	3.56900	0.78800		
Δ 6	12.07100	3.71400	-0.83500		
Δ 7	15.84200	1.44200	2.27000		
Δ 8	21.13300	2.55300	0.50000		
Δ 9	17.53100	8.49800	-1.32000		
Δ 10	18.48200	15.98100	0.02200		
Δ 11	15.36000	16.99500	0.01800		
Δ 12	13.52000	13.37100	1.00000		
Δ 13	13.12100	12.35500	-1.88200		
Δ 14	10.30700	13.91400	0.72100		
Δ MARK	10.00000	10.00000	0.50000		#7456



Figure 4-11. Coordinate File

The *Points* tab (Figure 4-11) has the following columns:

- Name – the name of the point
- Northing – the measured northing coordinate for the point and coordinate type
- Easting – the measured easting coordinate for the point and coordinate type
- Elevation – the elevation of the point
- Note – any notes associated with the point
- Code – any codes associated with the point

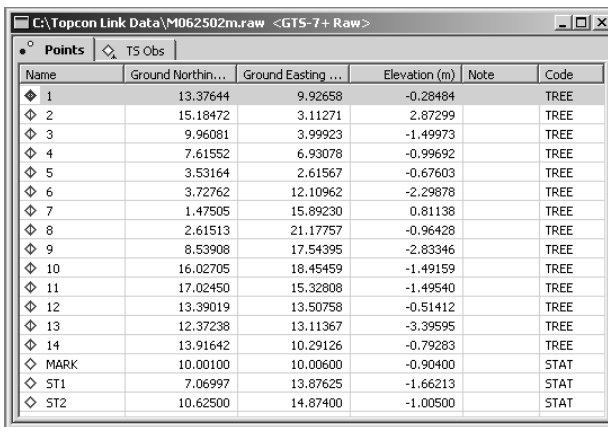
Table 4-1 lists the symbols Topcon Link uses to represent different information on the data table.

Table 4-1. Coordinate File Symbols

Location	Symbols	Description
Coordinate file symbols		
Point Tab		Unknown point
		Fixed coordinates point

Total Station Raw Data File Data Table

Total Station (TS) raw data files display information on two tabs in the data table (Figure 4-12).



Name	Ground Northin...	Ground Easting ...	Elevation (m)	Note	Code
1	13.37644	9.92658	-0.28484		TREE
2	15.18472	3.11271	2.87299		TREE
3	9.96081	3.99923	-1.49973		TREE
4	7.61552	6.93078	-0.99692		TREE
5	3.53164	2.61567	-0.67603		TREE
6	3.72762	12.10962	-2.29878		TREE
7	1.47505	15.89230	0.81138		TREE
8	2.61513	21.17757	-0.96428		TREE
9	8.53908	17.54395	-2.83346		TREE
10	16.02705	18.45459	-1.49159		TREE
11	17.02450	15.32808	-1.49540		TREE
12	13.39019	13.50758	-0.51412		TREE
13	12.37238	13.11367	-3.39595		TREE
14	13.91642	10.29126	-0.79283		TREE
MARK	10.00100	10.00600	-0.90400		STAT
ST1	7.06997	13.87625	-1.66213		STAT
ST2	10.62500	14.87400	-1.00500		STAT

Figure 4-12. Total Station Raw Data File

The *Points* tab (Figure 4-12) has the following columns for measured (not calculated) points:

- Name – the name of the point
- Northing – the measured northing coordinate for the point and the coordinate type

- Easting – the measured easting coordinate for the point and the coordinate type
- Elevation – the elevation of the point
- Note – any notes associated with the point
- Code – any codes associated with the point

The left panel of the *TS Obs* tab (Figure 4-13 on page 4-8) has the following columns for points with known coordinates:

- # – the number of the point
- Point Name – the name of the point
- Instrument Height – the height of the instrument in the selected units (ft, m)

#	Point Name	Instrument Height (m)
1	MARK	1.52000
2	ST1	1.46000
3	ST2	1.41000

Figure 4-13. TS Obs Tab – Left Panel

The right panel of the *TS Obs* tab (Figure 4-14) has the following columns for points with unknown coordinates measured from the point in the left panel:

- # – point number
- Point From – the beginning of the vector
- Point To – the end of the vector
- Reflector Height – the height of the reflector
- Azimuth, Horizontal Circle, Zenith Angle, Slope Distance – angular and linear measurements in the selected unit (ft, m)
- Code – any code associated with the point

- Type – the type of point (BS, SS, FS, or BKB)

#	Point Fr...	Point To	Reflector Hei...	Azimuth	Horizontal Circle	Zenith Angle	Slope Dist...	Code	Type
1	MARK	ST1	1.60000	0°00'00....	322°33'16.0000	97°57'06.0000	4.90200	STAT	BS
2	MARK	ST1	1.60000	322°33'16.0000	97°57'06.0000	4.90400	STAT	BS	BS
3	MARK	ST2	1.60000	7°56'17.0000	97°13'46.0000	4.95600	STAT	SS	SS
4	MARK	ST2	1.60000	7°56'17.0000	97°13'47.0000	4.95600	STAT	SS	SS
5	MARK	1	1.60000	91°02'23.0000	78°18'03.0000	3.44800	TREE	SS	SS
6	MARK	2	1.60000	142°44'56.0000	65°54'22.0000	9.44800	TREE	SS	SS
7	MARK	3	1.60000	180°04'31.0000	94°54'26.0000	6.02900	TREE	SS	SS

Figure 4-14. TS Obs Tab – Right Panel

Table 4-2 lists the symbols Topcon Link uses to represent different information on the data table.

Table 4-2. Total Station Raw Data File Symbols

Location	Symbols	Description
TS raw data measurements file symbols		
Points Tab		TS station
		TS point
TS Obs Tab, Left Panel		TS station
TS Obs Tab, Right Panel		ForeSight measurement
		SideShot measurement
		BackSight
		BackSightBearing point measurement
		TS Resection Observation

TopSURV File Data Table

TopSURV raw data files display information on four tabs in the data table (Figure 4-15).

Name	Grid Northing (m)	Grid Easting (m)	Elevation (m)	Note	Code
1102	235236.21898	559018.85004	245.85985		
1110	235236.37428	559020.85760	245.87010		
1111	235236.38106	559020.87789	245.47134		
1112	235236.37870	559020.84828	245.47127		
2000	235229.37408	559056.11853	243.83246		
2001	235229.37408	559056.11853	241.83246		
E4					
Office_2					
Office_3					
Office_4					
Office_5					
Office_6					
TGLA					

Figure 4-15. TopSURV Raw Data File

The *Points* tab (Figure 4-15) has the following columns:

- Name – the name of the point
- Northing – the measured northing coordinate for the point and the coordinate type
- Easting – the measured easting coordinate for the point and the coordinate type
- Elevation – the elevation of the point
- Note – any notes associated with the point
- Code – any codes associated with the point

The *GPS Occupations* tab (Figure 4-16 on page 4-11) has the following columns for individually measured points:

- Point Name – the name of the point
- Antenna Type – the type of antenna used at the point
- Antenna Height – the height of the antenna in the selected unit (ft, m)

- Antenna Height Method – the method used to measure the antenna height (vertical or slant)
- Start Time – the starting time of the measurement
- Duration – the length of time of the measurement

Point Name	Antenna Type	Antenna Height	Ant. Height Met...	Start Time	Duration
0	HIPer	1.55000	Vertical	10/14/2002 08:55:33	0:01:04
Auto1	HIPer	1.99000	Vertical	10/14/2002 08:56:09	0:00:00
Auto2	HIPer	1.99000	Vertical	10/14/2002 08:56:23	0:00:00
Auto3	HIPer	1.99000	Vertical	10/14/2002 08:56:37	0:00:00
Topo1	HIPer	1.99000	Vertical	10/14/2002 08:55:33	0:00:00
Topo2	HIPer	1.99000	Vertical	10/14/2002 08:55:43	0:00:00
Topo3	HIPer	1.99000	Vertical	10/14/2002 08:55:47	0:00:00

Figure 4-16. GPS Occupations Tab

The left panel of the *TS Obs* tab (Figure 4-17 on page 4-12) has the following columns for points with known coordinates:

- # – the number of the point
- Point Name – the name of the point
- Instrument Height – the height of the instrument in the selected units (ft, m)

The right panel of the *TS Obs* tab (Figure 4-17 on page 4-12) has the following columns for points with unknown coordinates measured from the point in the left panel:

- # – point number
- Point From – the beginning of the vector
- Point To – the end of the vector
- Reflector Height – the height of the reflector
- Azimuth, Horizontal Circle, Zenith Angle, Slope Distance – angular and linear measurements in the selected unit (ft, m)
- Code – any code associated with the point

- Type – the type of point (BS, SS, FS, or BKB)

#	Point Name	Instrument High	#	Point Fr...	Point To	Reflector Hei...	Azimuth	Horizontal Circle	Zenith Angle
1	TGLA	1.7?	1	TGLA	Office_3		148°42'3...	148°42'35.0000	90°56'52.0000
2	TGLA	1.7?	2	TGLA	88	1.77000		148°42'35.0000	91°01'15.0000
3	88	1.7?	3	TGLA	88	1.77000		129°26'24.0000	91°01'33.0000
4	88	1.7?	4	TGLA	88	1.77000		129°26'22.0000	90°57'13.0000
5	89	1.7?	5	TGLA	88	1.77000		148°42'42.0000	90°57'13.0000
6	89	1.7?	6	TGLA	88	1.77000		148°42'32.0000	90°57'00.0000
7	89	1.7?	7	TGLA	88	1.77000		129°26'23.0000	91°01'25.0000
8	TGLA		8	TGLA	88	1.77000		129°26'27.0000	91°01'35.0000
9	TGLA		9	TGLA	88	1.77000		148°42'34.0000	90°57'24.0000
10	TGLA		10	TGLA	1000	1.77000		155°57'26.0000	94°59'51.0000

Figure 4-17. TS Obs Tab

The *GPS Obs* tab (Figure 4-18 on page 4-13) has the following columns for baseline measurements from the Base station to the Rover station's point:

- Point From – the starting point of the baseline measurement
- Point To – the ending point of the baseline measurement
- Start Time – the date and time of the start of the measurement
- Duration – the length of time of the measurement
- Notes – any notes for the baseline measurement
- Horizontal Precisions, Vertical Precisions – displays horizontal and vertical precisions of the measurement
- dn, de, du – displays increments of the measurement
- Method – displays the measurement method (RTK Topo, RTK Auto)
- Solution type – displays the type of solution used for the measurement:
 - Failed: impossible to process measurement
 - Code Diff: code difference measurement
 - Phase Diff Float: float phase difference measurement
 - Phase Diff Fixed: fixed phase difference measurement

Point F...	Point To	Start Time	Duration	Horizo...	Vertical...	dn	de	du	Method	Solution Type
0	Topo1	10/14/2002 ...	0:00:00	0.00393	0.00232	26.11777	-19.52...	3.80897	RTK Topo	Fixed,Phase Diff
0	Topo2	10/14/2002 ...	0:00:00	0.00377	0.00239	26.11908	-19.52...	3.80393	RTK Topo	Fixed,Phase Diff
0	Topo3	10/14/2002 ...	0:00:00	0.00373	0.00236	26.12142	-19.52...	3.80079	RTK Topo	Fixed,Phase Diff
0	Auto1	10/14/2002 ...	0:00:00	0.00510	0.00325	26.11567	-19.52...	3.90725	RTK Auto...	Fixed,Phase Diff
0	Auto2	10/14/2002 ...	0:00:00	0.00509	0.00325	26.12071	-19.52...	3.91319	RTK Auto...	Fixed,Phase Diff
0	Auto3	10/14/2002 ...	0:00:00	0.00508	0.00325	26.11655	-19.52...	3.91079	RTK Auto...	Fixed,Phase Diff

Figure 4-18. GPS Obs Tab

The left panel of the *Codes* tab (Figure 4-19) has a table of available *.tslv file codes.

The right panel of the *Codes* tab (Figure 4-19) has the following columns:

- Name – a unique name for the code
- Default value – a numeric default value for the code
- Type – the type of code (numeric, text, or list)

Name	Name	Default Value	Type
static point	124_A		Numeric
kinematic point	Base_poin_0		Text

Figure 4-19. Codes Tab

Table 4-3 lists the symbols Topcon Link uses to represent different information on the data table.

Table 4-3. TopSURV File Symbols





























Location	Symbols	Description
TopSURV TS file symbols		
Points Tab		TS station
		TS point
		TS BackSight point
		Point coordinates input manually
		Point coordinates calculated by means of COGO
		Design point
		Stakeout point
		Fixed coordinates point
TS Obs Tab, Left Panel		TS station
TS Obs Tab, Right Panel		ForeSight measurement
		SideShot measurement
		BackSight measurement
		BackSightBearing point measurement
		TS Resection Observation
		TS MLM Observation

Table 4-3. TopSURV File Symbols

Location	Symbols	Description
TopSURV RTK file symbols		
Points Tab		Base station
		Located static point
		Located kinematic point
		Point coordinates input manually
		Point coordinates calculated by means of COGO
		Design point
		Stakeout point
		Fixed coordinates point
GPS Occupation Tab		Base station occupation
		Static occupation
		Kinematic occupation
GPS Obs Tab,		Baseline from base station to static point
		Baseline from base station to kinematic point

Viewing File Properties

To view an open file's properties, click **File->File properties** (Figure 4-20).

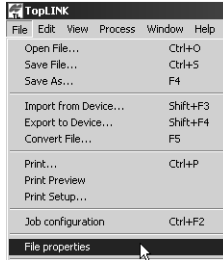


Figure 4-20. File->File Properties

- Coordinate files – displays the path to the opened file and the file format (Figure 4-21).

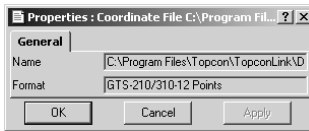


Figure 4-21. Properties for Coordinate File

- TopSURV files – displays the file name, path to the opened file, file format, job name, and surveyor's name (Figure 4-22).

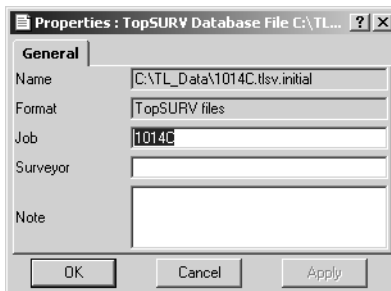


Figure 4-22. Properties for TopSURV File

- Total Station raw data files
 - displays name and format data in the General tab (Figure 4-21);
 - displays date, instrument, job, survey's name, and note data in the Session tab (Figure 4-23).

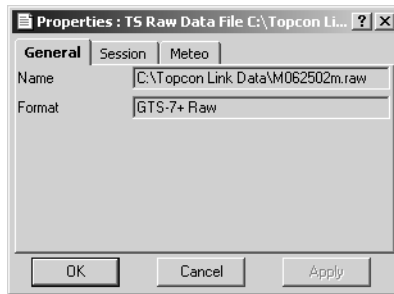


Figure 4-23. Properties for TS Raw Data File – Session

Editing Files

Once a file has been imported and/or converted, editing the file provides hands-on data usage, administration and handling. Saving the file prevents data loss, as well as providing a means for sharing and exporting files.

Saving Files

When saving as edited file (*.*) for the first time, Topcon Link makes a copy of the initial file (*.*.initial) in the current folder before saving. This file is left unchanged. All changes will be saved in the *.* file.

Save Changes to Current File and Format

To save changes, do one of the following:

- Click **File->Save File**.
- Press **Ctrl+S**.
- Click **Save** on the Toolbar.

- Close the current window and click **Yes** in the *Save Changes?* dialog box.

Save Changes to a Different Format

NOTICE NOTICE

Topcon Link cannot save edited information if the file currently lacks those fields. If Note or Code information changed for GTS-210/310-10, GTS-210/310-12, FC-5 format files or user-defined format files without Note or Code columns, Topcon Link will display the following dialog box (Figure 4-24). Save the file as a different format.

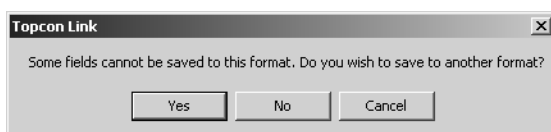


Figure 4-24. Save to Another Format?

- Click **No** or **Cancel** to continue without saving.
 - Click **Yes** to continue saving the file.
1. To save the file to a different format, click **Yes**.
 2. On the *Save as* dialog box, do one of the following:
 - Select a user-defined format in the *Format File* field that includes Note and Code columns (Figure 4-25).

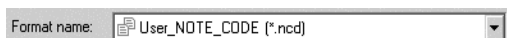


Figure 4-25. Format Name

- Define a new format that includes *Note* and *Code* columns. Select *Custom Text Format* in the *Format File* window and click **Open**. Then define new file

format that includes *Note* and *Code* columns. See “Creating User-defined File Formats” on page 4-4 for more information.

3. Enter the name and location of the new file.
4. Click **Save**.

Save Changes to a Different File

To save a file with another name:

1. Click **File->Save As**.
2. Select or create a destination folder and enter a new name in the *Save As* dialog box (Figure 4-26).

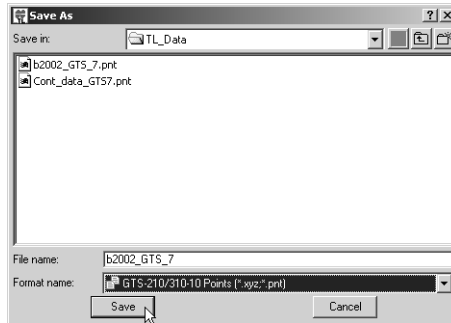


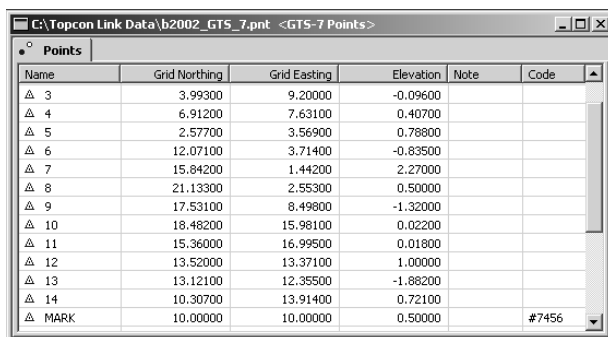
Figure 4-26. Save As Dialog Box

3. Click **Save**.

Editing Coordinate Files

In coordinate files (Figure 4-27), the following information can be edited:

- Point name
- Point coordinate
- Note
- Code
- Coordinate point order



Name	Grid Northing	Grid Easting	Elevation	Note	Code
Δ 3	3.99300	9.20000	-0.09600		
Δ 4	6.91200	7.63100	0.40700		
Δ 5	2.57700	3.56900	0.78800		
Δ 6	12.07100	3.71400	-0.83500		
Δ 7	15.84200	1.44200	2.27000		
Δ 8	21.13300	2.55300	0.50000		
Δ 9	17.53100	8.49800	-1.32000		
Δ 10	18.48200	15.98100	0.02200		
Δ 11	15.36000	16.99500	0.01800		
Δ 12	13.52000	13.37100	1.00000		
Δ 13	13.12100	12.35500	-1.88200		
Δ 14	10.30700	13.91400	0.72100		
Δ MARK	10.00000	10.00000	0.50000		#7456

Figure 4-27. Coordinate File

To edit coordinate file information, right-click one of the point rows to display the coordinate file pop-up menu (Figure 4-28).

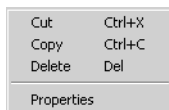


Figure 4-28. Coordinate File Pop-up Menu

- Cut – cuts the information
- Copy – copies the information
- Delete – deletes the information
- Properties – displays the properties dialog box.

Edit Name and Note Properties

To edit point Name and Note properties in a coordinate file:

1. Right-click a point and click **Properties** on the pop-up menu.
2. On the *Properties* dialog box, click the *General* tab (Figure 4-29).

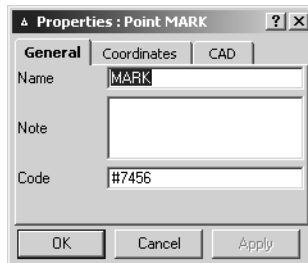


Figure 4-29. Coordinate Properties – General Tab

3. Edit the *Name* and *Note* fields as needed.
4. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Edit Coordinate Properties

To edit point Coordinate properties in a coordinate file:

1. Right-click a point and click **Properties** on the pop-up menu.
2. On the *Properties* dialog box, click the *Coordinates* tab (Figure 4-30).

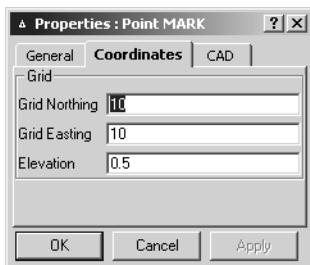


Figure 4-30. Coordinate Properties – Coordinates Tab

3. Edit the *Northing*, *Easting*, and *Elevation* fields as needed.
4. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.
5. To change the order of coordinate points, click **File->Job Configuration**.
6. On the *Job Configuration* dialog box, click **Display** and then the **Points** tab (Figure 4-31).

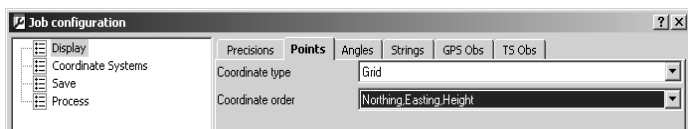


Figure 4-31. Job Configuration – Points Tab

7. Change the coordinate order as needed. Click **OK**.

Edit CAD Properties

To edit CAD properties of a point in a coordinate file,

1. Right-click a point and click **Properties** on the pop-up menu.
2. On the *Properties* dialog box, click the *CAD* tab (Figure 4-30).

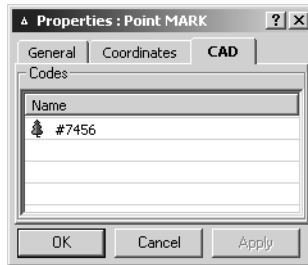


Figure 4-32. Coordinate Properties – CAD Tab

3. Select or edit the *Codes* as needed.
4. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Editing Total Station Raw Data Files

In Total Station (TS) raw data files (Figure 4-33 on page 4-24), the following information can be edited:

- Point name and point number
- Instrument height
- Point to and point notes
- Reflector height and azimuth
- Offsets
- CAD information
- String properties
- Observation display

Name	Ground Northing...	Ground Easting ...	Elevation (m)	Note	Code
◆ 1	13.37644	9.92658	-0.28484		TREE
◆ 2	15.18472	3.11271	2.87299		TREE
◆ 3	9.96081	3.99923	-1.49973		TREE
◆ 4	7.61552	6.93078	-0.99692		TREE
◆ 5	3.53164	2.61567	-0.67603		TREE
◆ 6	3.72762	12.10962	-2.29878		TREE
◆ 7	1.47505	15.89230	0.81138		TREE
◆ 8	2.61513	21.17757	-0.96428		TREE
◆ 9	8.53908	17.54395	-2.83346		TREE
◆ 10	16.02705	18.45459	-1.49159		TREE
◆ 11	17.02450	15.32808	-1.49540		TREE
◆ 12	13.39019	13.50758	-0.51412		TREE
◆ 13	12.37238	13.11367	-3.39595		TREE
◆ 14	13.91642	10.29126	-0.79283		TREE
◇ MARK	10.00100	10.00600	-0.90400		STAT
◇ ST1	7.06997	13.87625	-1.66213		STAT
◇ ST2	10.62500	14.87400	-1.00500		STAT

Figure 4-33. Total Station Raw Data File

To edit left panel TS point file information, right-click a point row to display the left panel pop-up menu (Figure 4-34).

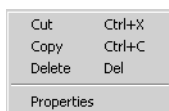


Figure 4-34. TS Point File – Left Panel Pop-up Menu

To edit right panel TS point file information, right-click a point rows to display the right panel pop-up menu (Figure 4-35).

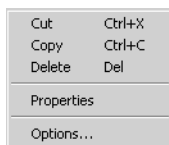


Figure 4-35. TS Point File – Right Panel Pop-up Menu

- Cut – cuts the information
- Copy – copies the information
- Delete – deletes the information

- Properties – displays the properties dialog box
- Options – displays the options dialog box

**TIP**

Click a column's heading to sort data in descending or ascending order.

Edit Name, Instrument Height, and Number Properties

To edit name, instrument height, and number properties of a point in a TS raw data file,

1. Right-click a point in the left panel and click **Properties** on the pop-up menu.
2. On the *Properties* dialog box, edit point name, instrument height, and point number as needed (Figure 4-36).

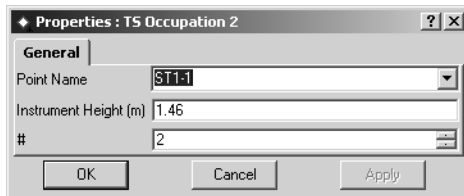


Figure 4-36. Properties

3. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Edit Point To and Notes Properties

To edit point to and notes properties of a point in a TS raw data file,

1. Right-click a point in the right panel and click **Properties** on the pop-up menu.
2. On the *Properties* dialog box, click the *General* tab (Figure 4-37).

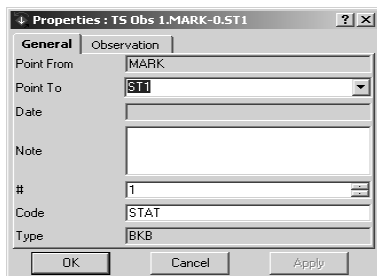


Figure 4-37. TS Properties – General Tab

3. Edit the *Point To*, *Note*, and *Code* fields as needed.
4. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Edit Reflector Height and Azimuth Properties

To edit reflector height and azimuth properties of a point in a TS raw data file:

1. Right-click a point in the right panel and click **Properties** on the pop-up menu.

2. On the *Properties* dialog box, click the *Observation* tab (Figure 4-38).

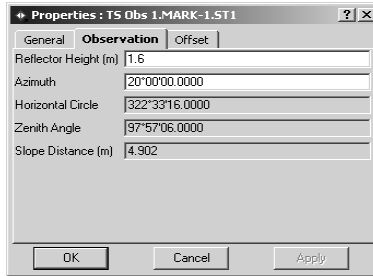


Figure 4-38. TS Properties – Observation Tab

3. Edit the *Reflector Height* and *Azimuth* fields as needed.
4. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Edit Offset Properties

To edit offset properties of a point in a TS raw data file:

1. Right-click a point in the right panel and click **Properties** on the pop-up menu.
2. On the *Properties* dialog box, click the *Offset* tab (Figure 4-39).

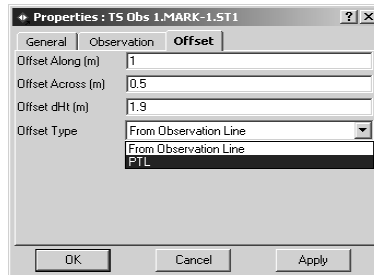


Figure 4-39. TS Properties – Offset Tab

3. Edit the *Offset* fields as needed.

- Click **OK** to set the changes and close the dialog box.
Click **Apply** to set the changes and continue editing the point.

Edit String Properties

To edit String properties of a point in a TS raw data file (only available when the *Display String and Control Code* is enabled; see “Edit Point Code Description” on page 4-30):

- Right-click a point in the right panel and click **Properties** on the pop-up menu.
- On the *Properties* dialog box, click the *String* tab (Figure 4-40).

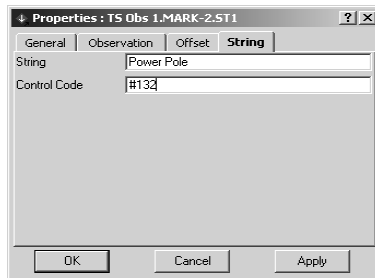


Figure 4-40. TS Properties – CAD Tab

- Edit *String* and *Control Code* fields as needed.
- Click **OK** to set the changes and close the dialog box.
Click **Apply** to set the changes and continue editing the point.

Edit Observation Display Properties

To edit observation display properties of a point in a TS raw data file:

1. Right-click a point in the right panel and click **Options** on the pop-up menu.
2. On the *Options* dialog box and *Display* tab, select the desired display appearance of the Total Station Observations data (Figure 4-41).

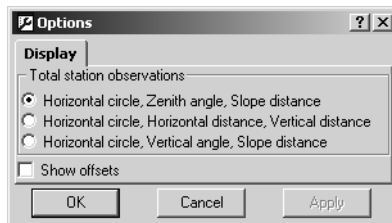


Figure 4-41. TS Options

3. Click and enable *Show offsets* to display offsets on the data table.
4. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Edit Point Code Description

To edit the letter/numerical code for point description in a TS raw data file:

1. Click **File->Job Configuration** (Figure 4-42).

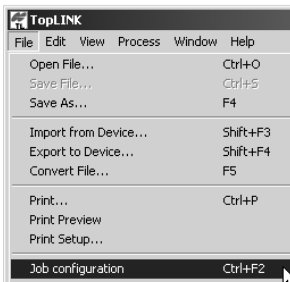


Figure 4-42. File->Job Configuration

2. On the *Job Configuration* dialog box, click *Display* and then the *Strings* tab (Figure 4-43).

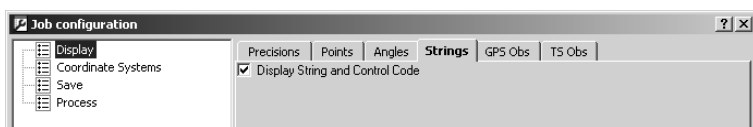


Figure 4-43. Job Configuration – Strings Tab

3. Click the *Display String and Control Code* option. String and Control Code columns will be added to the right panel of the *TS Obs* tab. *CAD* and *String* tabs will be added to the *Properties* dialog box.
4. Click **OK**.

Edit Multiple Points

To edit the Instrument Height, Reflector Height, Comment, Point Name, or Measurements for multiple points in either panel:

1. Press the **Shift** key and click several rows (Figure 4-44).

#	Point From	Point To	Reflector Height (m)
21	ST2-2	9	1.60000
22	ST2-2	10	1.60000
23	ST2-2	11	1.60000
24	ST2-2	12	1.60000
25	ST2-2	13	1.60000
26	ST2-2	14	1.60000
17	ST2-2	MARK2	1.60000

#	Point From	Point To	Reflector Height (m)
21	ST2-2	9	1.60000
22	ST2-2	10	1.60000
23	ST2-2	11	1.60000
24	ST2-2	12	1.60000
25	ST2-2	13	2.1
26	ST2-2	14	1.60000
17	ST2-2	MARK2	1.60000

Figure 4-44. Select and Edit Multiple Rows of Data

2. Enter the new information to any selected row (Figure 4-44).
3. Press **Enter** to apply the edited data across all rows.

Editing TopSURV Files

In TopSURV files (Figure 4-45 on page 4-32), the following information can be edited:

- Point parameters:
 - Name and note, point coordinates, and codes
 - Coordinate type and coordinate order
- GPS occupations parameters:
 - Name
 - Antenna type and height, and method of height measurement
 - Offsets
- TS observation parameters: name; antenna height

- GPS observation parameters:
 - For GPS raw data files: vector notes
 - For TS raw data files: instrument name, job ID and location, surveyor, and notes; temperature and pressure data

Name	Grid Northing (m)	Grid Easting (m)	Elevation (m)	Note	Code
1102	235236.21898	559018.85004	245.85985		
1110	235236.37428	559020.85760	245.87010		
1111	235236.38106	559020.87789	245.47134		
1112	235236.37870	559020.84828	245.47127		
2000	235229.37408	559056.11853	243.83246		
2001	235229.37408	559056.11853	241.83246		
E4					
Office_2					
Office_3					
Office_4					
Office_5					
Office_6					
TGLA					

Figure 4-45. Sample TopSURV File

To edit TopSURV file information, right-click a point or row to display the a pop-up menu (Figure 4-35).

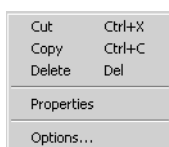


Figure 4-46. TS Point File – Right Panel Pop-up Menu

- Cut – cuts the information
- Copy – copies the information
- Delete – deletes the information
- Properties – displays the properties dialog box
- Options – (only available in some tabs) displays the options dialog box

Edit Point Name and Note Properties

Base station, static, and kinematic point coordinates from GPS solutions display in the *Points* tab. Points computed in RTK mode display in the same coordinate system/projection selected while creating the job in TopSURV.

1. To edit point name, notes and codes, right-click the point and click **Properties** on the pop-up menu.
2. On the **Properties** dialog box, click the *General* tab (Figure 4-47).

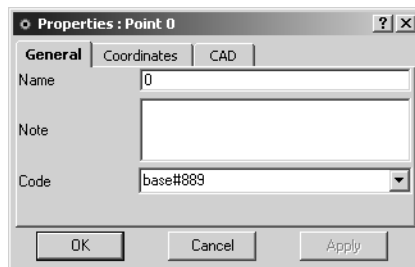


Figure 4-47. Point Properties – General Tab

3. Edit the *Name*, *Note*, and *Code* fields as needed.
4. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Edit Point Coordinates

1. To edit point coordinates, right-click the point and click **Properties** on the pop-up menu.
2. On the **Properties** dialog box, click the *Coordinates* tab (Figure 4-48 on page 4-34).

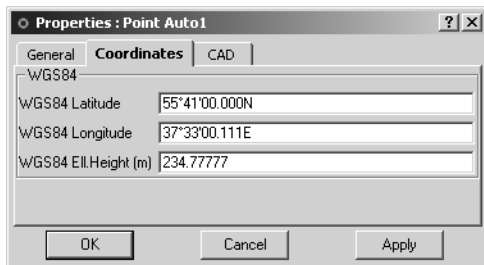


Figure 4-48. Point Properties – Coordinates Tab

3. Edit the *Latitude*, *Longitude*, and *Ell. Height* fields as needed.
4. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Add New Point Code

1. To add a new point code, right-click the point and click **Properties** on the pop-up menu.
2. On the *Properties* dialog box, click the *CAD* tab (Figure 4-47).

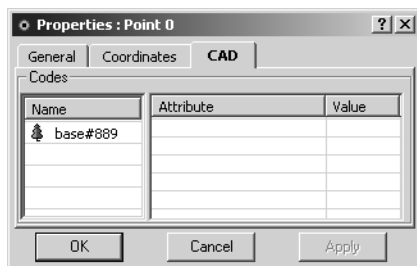


Figure 4-49. Point Properties – CAD Tab

- Right-click in the *Name* field and click **New Code** on the pop-up menu (Figure 4-50).

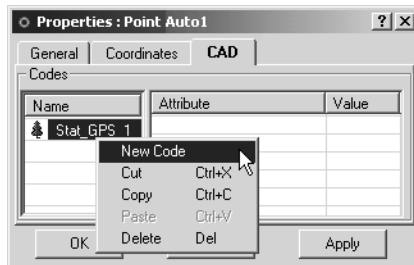


Figure 4-50. Code Pop-up Menu

- Type the new code Name and press **Enter**.
- Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Edit GPS Occupation Point Name

- Click the *GPS Occupations* tab.
- To edit point name, right-click the point and click **Properties** on the pop-up menu.
- On the *Properties* dialog box, click the *General* tab (Figure 4-51).

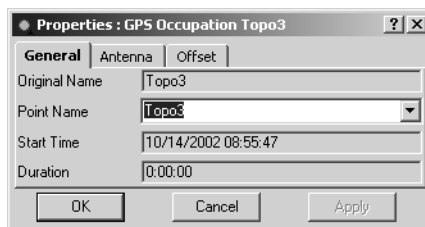


Figure 4-51. Point Properties – General Tab

- Edit the *Name* field as needed.
- Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Edit GPS Occupation Antenna Parameters

1. Click the *GPS Occupations* tab.
2. To edit antenna parameters, right-click the point and click **Properties** on the pop-up menu.
3. On the *Properties* dialog box, click the *Antenna* tab (Figure 4-51).

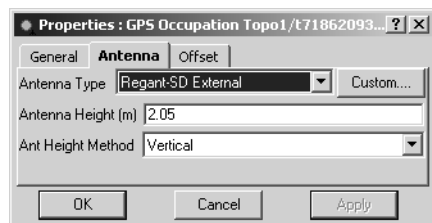


Figure 4-52. Point Properties – Antenna Tab

4. Edit the antenna *Type*, *Height*, and *Method* fields as needed.
5. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Edit GPS Occupation Offsets

1. Click the *GPS Occupations* tab.
2. To edit point offsets, right-click the point and click **Properties** on the pop-up menu.
3. On the *Properties* dialog box, click the *Offset* tab (Figure 4-51).

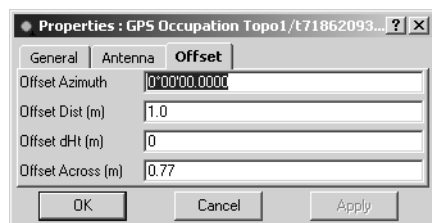


Figure 4-53. Point Properties – Offset Tab

4. Edit the *Offset* fields as needed.
5. Click **OK** to set the changes and close the dialog box.
Click **Apply** to set the changes and continue editing the point.

Edit TS Obs Parameters

1. Click the **TS Obs** tab.
2. To edit TS Obs tab properties, see “Editing Total Station Raw Data Files” on page 4-23.

Edit GPS Obs Point Notes

1. Click the *GPS Obs* tab.
2. To edit the point notes, right-click the point and click **Properties** on the pop-up menu.
3. On the *Properties* dialog box, click the *General* tab (Figure 4-51).



Figure 4-54. Point Properties – General Tab

4. Edit the *Note* field as needed.
5. Click **OK** to set the changes and close the dialog box.
Click **Apply** to set the changes and continue editing the point.

View GPS Obs Point Observations

1. Click the *GPS Obs* tab.
2. To view the point observations, right-click the point and click **Properties** on the pop-up menu.
3. On the *Properties* dialog box, click the *Observation* tab (Figure 4-51).

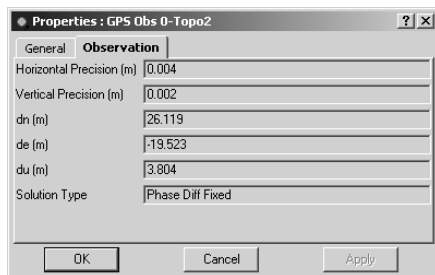


Figure 4-55. Point Properties – Observation Tab

4. Click **OK** to close the dialog box.

Edit GPS Observation Display

1. Click the *GPS Obs* tab.
2. To edit the GPS observation display, right-click the point and click **Options** on the pop-up menu.
3. On the *Options* dialog box, the desired coordinate baseline (Figure 4-51).

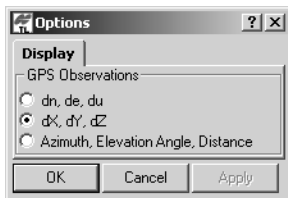


Figure 4-56. Point Properties – General Tab

4. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

Edit TopSURV File Codes

1. Click the *Codes* tab.
2. To edit the code's attribute, right-click the code and click **New Attribute** on the pop-up menu, then select the desired attribute (Figure 4-57).

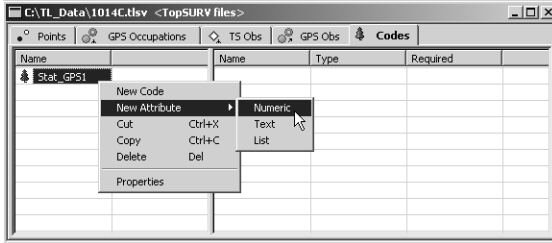


Figure 4-57. Select Code Attribute

3. On the Attributes dialog box, enter the applicable parameters for the code's attribute (Figure 4-58, Figure 4-59 on page 4-40, and Figure 4-60 on page 4-40). Click **OK**.

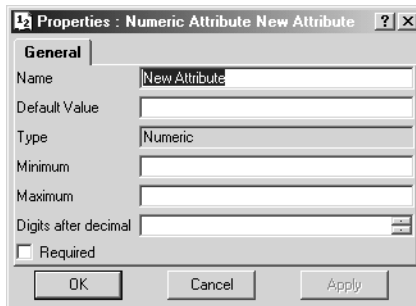


Figure 4-58. Edit Code Numeric Attributes

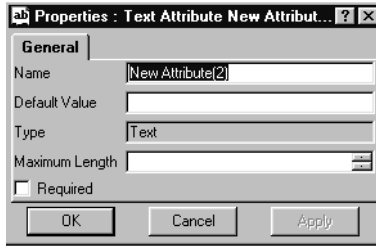


Figure 4-59. Edit Code Text Attribute

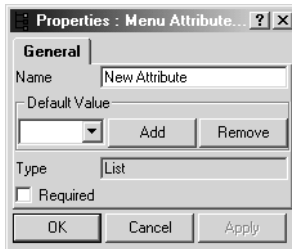


Figure 4-60. Edit Code Menu Attribute



TIP

Later, double-click the attribute to edit it.

4. To edit the code name, do one of the following:
 - Double-click the code's name, type the new name, and press **Enter**.
 - Right-click the code's name and click **Properties** on the pop-up menu. Edit the code's name and click **OK** (Figure 4-61).

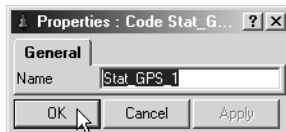


Figure 4-61. Edit Code Name

Using Files

This chapter discusses file functions available in Topcon Link™.

Computing Coordinates

To compute points coordinates using raw data file information:

1. Open a raw data file.
2. Do one of the following:
 - Click **Process->Compute Coordinates** (Figure 5-1).



Figure 5-1. Process->Compute Coordinates

- Click **Compute Coordinates** on the Toolbar (Figure 5-2).



Figure 5-2. Compute Coordinates– Toolbar Button



NOTICE

If none of the points have known coordinates, Topcon Link uses a point with (0, 0, 0) coordinates as the beginning point.

Topcon Link computes points coordinates and adds them to the Total Station raw data file window (Figure 5-3).

Name	Ground Northin...	Ground Easting ...	Elevation (m)	Note	Code
◇ 1	13.37644	9.92658	-0.28484		TREE
◇ 2	15.18472	3.11271	2.87299		TREE
◇ 3	9.96081	3.99923	-1.49973		TREE
◇ 4	7.61552	6.93078	-0.99692		TREE
◇ 5	3.53164	2.61567	-0.67603		TREE
◇ 6	3.72762	12.10962	-2.29878		TREE
◇ 7	1.47505	15.89230	0.81138		TREE
◇ 8	2.61513	21.17757	-0.96428		TREE
◇ 9	8.53908	17.54395	-2.83346		TREE
◇ 10	16.02705	18.45459	-1.49159		TREE
◇ 11	17.02450	15.32808	-1.49540		TREE
◇ 12	13.39019	13.50758	-0.51412		TREE
◇ 13	12.37238	13.11367	-3.39595		TREE
◇ 14	13.91642	10.29126	-0.79283		TREE
◇ MARK	10.00100	10.00600	-0.90400		STAT
◇ ST1	7.06997	13.87625	-1.66213		STAT
◇ ST2	10.62500	14.87400	-1.00500		STAT

Figure 5-3. Raw Data File

Traverse Adjustment

The procedure combines points coordinates computation and network adjustment.

Network adjustment methods of adjustment may be classified as:

- Approximate adjustment – includes Interior Angle Balancing, Azimuth Balancing, Compass rule (Bowditch Rule), Transit Rule, and the Crandall method.
- Rigorous adjustment – includes the method of least squares.

Traditional methods of approximate traverse adjustment have been developed to accommodate prevailing conditions in certain combinations of angular and linear precisions in the observations.

In this respect, three combinations are still common.:

- Precision in angles or directions exceeds its equivalent in linear distance observations.

- Precision in angles or directions essentially is equal to its equivalent in the precision of distances
- Precision in distances exceeds that in angles and directions.

Set Adjustment Type

1. To select a network adjustment type, click **Process-> Process Properties**.
2. On the *Process properties* dialog box, select the *Compute Coordinates* tab and choose one of the following the Adjustment types (Figure 5-4):
 - None – requires apriori values
 - Least Squares – requires apriori values; see “Least Squares Method” on page 5-5 for details
 - Compass Rule – see “Compass Rule” on page 5-5 for details
 - Transit – see “Transit Rule” on page 5-6 for details
 - Crandall – see “Crandall Method” on page 5-6 for details
 - Angle Balance – see “Interior Angle Balancing Method” on page 5-7 for details

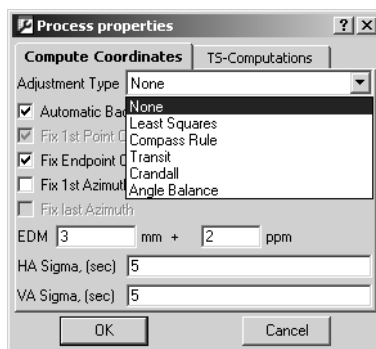


Figure 5-4. Process Properties – Compute Coordinates

3. Select an azimuth balancing parameter (Figure 5-4). See “Azimuth Balancing Method” on page 5-7 for details.
4. For None or Least Squares adjustment types, select the apriori values of error of linear and angular measurements (Figure 5-5). The None method is used only when solving a resection.



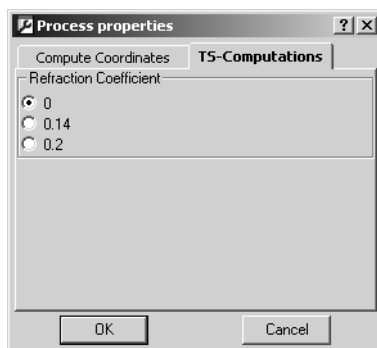
EDM	3	mm +	2	ppm
HA Sigma, (sec)	5			
VA Sigma, (sec)	5			

Figure 5-5. Assign Apriori Values for Least Squares Method

5. Click **OK**.

Set Refraction Coefficient

To correct the vertical angle for the earth’s curvature and the refraction in the atmosphere, select the *TS-Computation* tab on the *Process properties* dialog box and select the appropriate refraction coefficient (Figure 5-6).



Process properties

Compute Coordinates | **TS-Computations**

Refraction Coefficient

0
 0.14
 0.2

OK Cancel

Figure 5-6. Process Properties – TS-Computation

Least Squares Method

The method of *least squares* provides the most rigorous adjustment:

- allows for variation in precision in the observations,
- minimizes the random variations in the observations,
- provides the best estimates for positions of all traverse stations, and
- yields statistics relative to the accuracies of adjustment observations and positions.

This method requires more of a computational effort than the approximate adjustment.

Compass Rule

The *compass rule* was developed for the second combination of precisions and observations, and can be shown to be rigorous when the angular precision equals the precision in linear distances condition is rigidly enforced.

With the compass rule, adjustments are applied to both latitudes and departures in proportion to the length of the lines. In other words, the longer a line, the greater are its latitude and departure adjustments (and vice versa), as shown in the following formulas:

$$\frac{\textit{AdjustmentInLatitudeAB}}{\textit{LatitudeMisclosure}} = \frac{\textit{LengthOfAB}}{\textit{PerimeterOfTraverse}}$$

$$\frac{\textit{AdjustmentInDepartureAB}}{\textit{DepartureMisclosure}} = \frac{\textit{LengthOfAB}}{\textit{PerimeterOfTraverse}}$$

This method works for closed traverses or traverses between two known points.

Transit Rule

The *transit rule* was developed for the first combination of precisions and observations.

With the transit rule, adjustments are applied to respective latitudes in proportion to their lengths; thus, the longer a latitude, the greater is its adjustment (and vice versa). Similarly, adjustments are applied to respective departures in proportion to their lengths. Adjustment can be computed using the following formulas:

$$\frac{\textit{AdjustmentInLatitudeAB}}{\textit{LatitudeMisclosure}} = \frac{\textit{LatitudeOfAB}}{\textit{AbsoluteSumOfLatitudes}}$$

$$\frac{\textit{AdjustmentInDepartureAB}}{\textit{DepartureMisclosure}} = \frac{\textit{DepartureOfAB}}{\textit{AbsoluteSumOfDepartures}}$$

This method works for closed traverses or traverses between two known points.

Crandall Method

The *Crandall* method is a rather complicated procedure that is more rigorous than either the compass or transit rule, requiring substantially more computations.

In the Crandall method of traverse adjustment, the angular error is equally distributed to all measured angles. The adjusted angles are then held fixed and all remaining corrections placed in the linear measurements through a weighted, least-squares procedure. The Crandall method is suitable for adjusting traverses where the linear measurements contain larger random errors than the angular measurements.

Because of the angle balancing, this method works only for closed traverses or traverses where azimuths are known at beginning and ending point, plus beginning and ending points are known for allocating distance corrections.

Interior Angle Balancing Method

The Interior Angle Balancing method. The sum of all interior angles of a closed traverse (loop) should equal $(n-2) * 180$ degrees. The discrepancy should be allocated equally to each interior angle. Clearly works only for closed traverses (loops).

Azimuth Balancing Method

The Azimuth Balancing method. Knowing azimuths at beginning and ending of traverse, calculate azimuth misclosure and distribute equally to all direction measurements. Works for open traverses.

User-defined Parameters

1. To change the information view of the opened file, click **File->Job Configuration** (Figure 5-7).

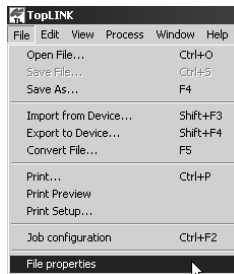


Figure 5-7. File->Job Configuration

- Click **Display** on the *Job Configuration* dialog box (Figure 5-8).

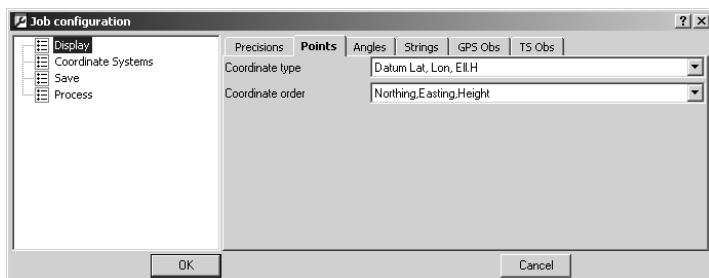


Figure 5-8. Job Configuration – Click Display

- Edit the following parameters:
 - The *Precisions* tab (Figure 5-9) defines the number of digits after decimal.

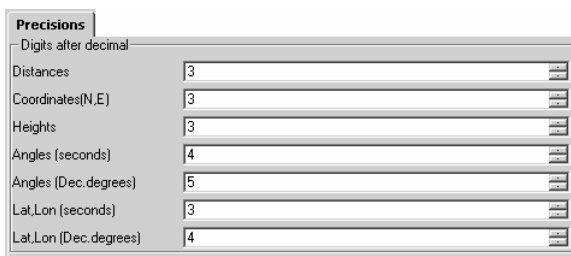


Figure 5-9. Precisions Tab

- The *Points* tab (Figure 5-10) sets a coordinate type and a coordinate order.

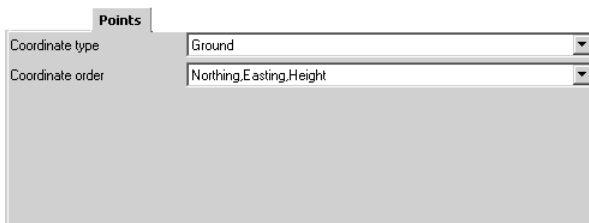


Figure 5-10. Points Tab

- The *Angles* tab (Figure 5-11) defines an angle representation.

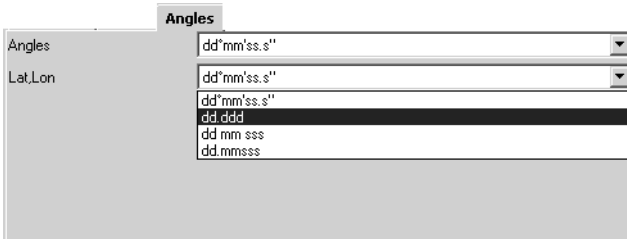


Figure 5-11. Angles Tab

- The *Strings* tab (Figure 5-12) contains the field that switches on/off the output alphanumeric code describing surveying points on the screen.

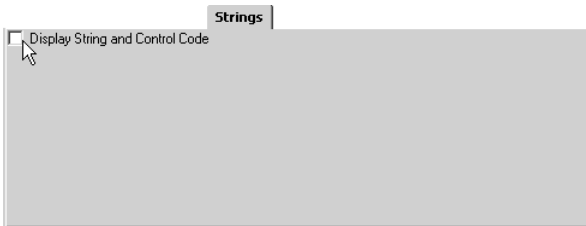


Figure 5-12. Strings Tab

- The *GPS Obs* tab (Figure 5-13) defines how the baseline's coordinates are represented.



Figure 5-13. GPS Obs tab

- The *TS Obs* tab (Figure 5-14) defines the representation of the Total Station measurements.

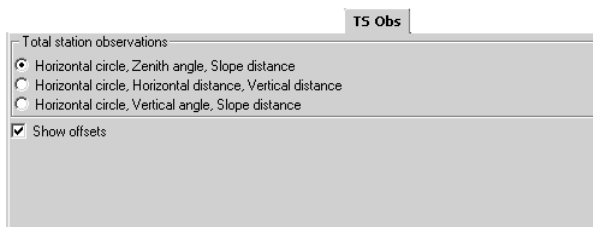


Figure 5-14. TS Obs Tab

- To view, add, or remove available geoid files, click Coordinate Systems in the Job Configuration dialog box (Figure 5-15).

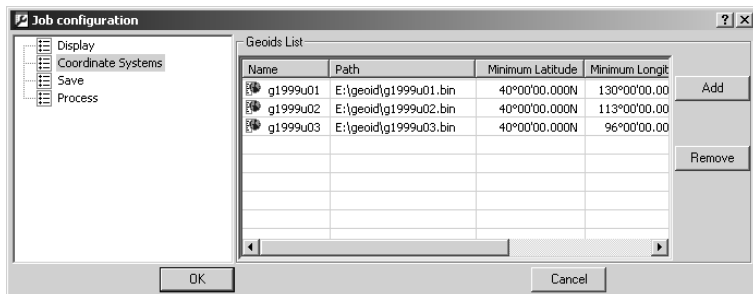


Figure 5-15. Job Configuration – Coordinate Systems

- To change autosave time intervals when editing a file, click **Save** in the *Job Configuration* dialog box and type the desired interval (Figure 5-16).

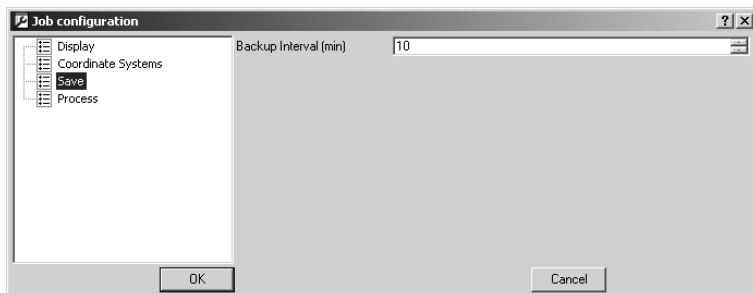


Figure 5-16. Job Configuration – Click Save and Set Backup Interval

- Topcon Link automatically creates a reserve copy of the editing file after the expiration of the entered time interval. After saving a file, Topcon Link automatically deletes the reserve copy.
 - The default time interval is 10 minutes; the lowest time interval is 1 minute. To switch the autosaving off, type a “0” in the *AutoSave Interval* field.
 - If starting Topcon Link after an abnormal termination and the editing file was not saved, Topcon Link opens a reserve copy of the edited file and marks it as “Recovered”.
6. To change the type of adjustment click **Process properties** (Figure 5-17)

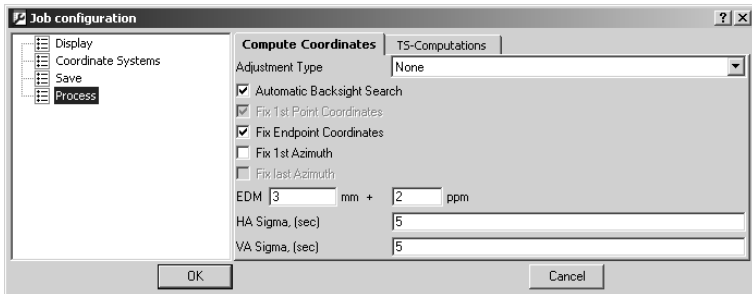


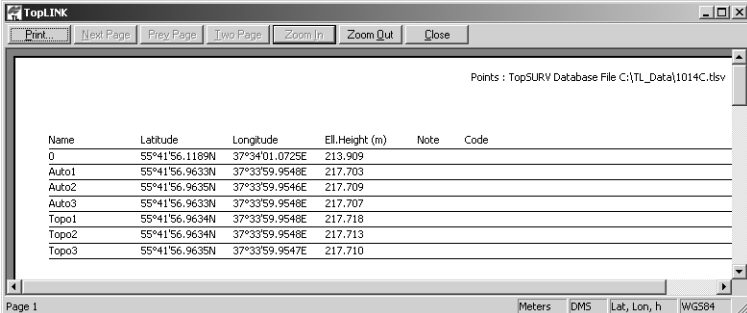
Figure 5-17. Job Configuration – Set Process Properties

Printing Files

To print a coordinates file, TS raw data file, or TopSURV file:

1. Open the desired file.
2. Click **File->Print Setup** and define the *Printer Properties*, *Paper Size*, and *Orientation* parameters.
3. On the file window, click the desired tab or a left/right panel.

4. Click **File->Print Preview**. Check the file representation (Figure 5-18). Repeat steps 2 and 3 as needed.



The screenshot shows the TopLINK software interface. At the top, there is a menu bar with options: Print, Next Page, Prev Page, Two Page, Zoom In, Zoom Out, and Close. Below the menu bar, the main window displays a table of points data. The table has columns for Name, Latitude, Longitude, Ell. Height (m), Note, and Code. The data rows are as follows:

Name	Latitude	Longitude	Ell. Height (m)	Note	Code
0	55°41'56.1189N	37°34'01.0725E	213.909		
Auto1	55°41'56.9633N	37°33'59.9548E	217.703		
Auto2	55°41'56.9635N	37°33'59.9546E	217.709		
Auto3	55°41'56.9633N	37°33'59.9548E	217.707		
Topo1	55°41'56.9634N	37°33'59.9548E	217.718		
Topo2	55°41'56.9634N	37°33'59.9548E	217.713		
Topo3	55°41'56.9635N	37°33'59.9547E	217.710		

At the bottom of the window, there is a status bar with the text "Page 1" on the left and "Meters DMS Lat, Lon, h WGS84" on the right.

Figure 5-18. Print Preview – Points Tab, TopSURV File

5. Click **File->Print** menu, click **OK**.

Option Authorization File

Topcon Positioning Systems issues an Option Authorization File (OAF) to enable the specific options that customers purchase. An Option Authorization File allows customers to customize and configure the receiver according to particular needs, thus only purchasing those options needed.

Typically, all receivers ship with a temporary OAF that allows the it to be used for a predetermined period of time. When the receiver is purchased, a new OAF permanently activates desired, purchased options. Receiver options remain intact when clearing the NVRAM or resetting the receiver.

The OAF enables the following kinds of functions. For a complete list of available options and details, visit the TPS website (www.topcongps.com/tech/index) or consult your TPS dealer.

- Type of signal (standard L1; optional L2)
- Memory (standard 0Mb; optional 1Mb up to 96Mb)
- Update rate standard 1Hz (optional 5, 10, or 20Hz)
- RTK at 1Hz, 5Hz, 10Hz, and 20Hz
- RTCM/CMR Input/Output
- Event marker
- Co-Op tracking
- Advanced multipath reduction
- Wide Area Augmentation System (WAAS)
- Receiver Autonomous Integrity Monitoring (RAIM)
- 1 PPS (Pulse-Per-Second; a timing signal)

Cables/COM Ports

Serial Interface Cable

Serial interface cables connect the total station (TS) with an IBM PC compatible computer.

- F-4 cable (GTS – D-sub 9 pins). Table B-1 describes pin connections for the TS and computer (PC).

Table B-1. F-4 Cable

(GTS)	(PC)
GND (1) _____	(5) GND
N.C. (2)	
TXD (3) →	(3) RXD
RXD (4) ←	(2) TXD
(RTS) (5) _____	(8) CTS
N.C. (6) _____	(6) DSR

- F-3 cable (GTS – D-sub 25 pins). Table B-2 describes pin connections for the TS and computer (PC).

Table B-2. F-3 Cable

(GTS)	(PC)
GND (1) _____	(1) FG
N.C. (2) _____	(7) SG

Table B-2. F-3 Cable (Continued)

	(GTS)		(PC)
TXD	(3)	→	(3) RXD
RXD	(4)	←	(2) TXD
(RTS)	(5)	—	(5) CTS
N.C	(6)	—	(6) DSR

Parallel Interface Cable

The parallel interface cable connects a TS with a Centronics printer.

B-2 Cable (GTS Parallel – centronics 1/F 38 pins). Table B-3 describes pin connections for the total station and printer.

Table B-3. F-4 Cable

	(GTS)		(Printer)
STROB	(1)	—	(1) STROB
BUSY	(2)	—	(11) INPUT-BUSY
D0	(3)	—	(2) DATA1
D1	(4)	—	(3) DATA2
D2	(5)	—	(4) DATA3
D3	(6)	—	(5) DATA4
D4	(7)	—	(6) DATA5
D5	(8)	—	(7) DATA6
D6	(9)	—	(8) DATA7
D7	(10)	—	(9) DATA8
GND	(11)	—	(14) GND
N.C.	(12)	—	(16) GND

Serial C-RS232C Connector Definition

The RS232 cable connects the GNSS TPS receiver (ports A and D) with a computer. Figure B-1 shows the pin locations for the receiver's connector.



Figure B-1. RS232C Receiver Connector

Table B-4 gives RS232 connector pin details.

Table B-4. 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

The RS232 connector types are sealed receptacle, 7 pin W.W. FISCHER, INC, p/n DBEU 102 A056.

Table B-5 gives connection details for the receiver and cable.

Table B-5. RS232 Connection Pin Details

TPS Receiver	DB9 Female
1	-
2	5
3	7
4	8
5	3
6	2
7	1

Total Station COM Port Settings

The following RS-232-C interface options can be set in the **GTS-600** series application program.

Baud Rate: 1200 / 2400 / 4800 / 9600 / 19200 baud
 Parity: NONE / ODD / EVEN
 Data Bits: 7 / 8
 Stop Bits: 1 / 2
 Protocol: ACK – NACK (Uploading in FC-5 format only)
 ONE WAY

The following RS-232-C interface options can be set in the **GTS-700** series application program.

Baud Rate: 300 / 1200 / 2400 / 4800 / 9600 / 19200
 Parity: NONE / ODD / EVEN
 Data Bits: 7 / 8
 Stop Bits: 0 / 1 / 2
 Protocol: XON-XOFF

ACK – NACK (Uploading in FC-5 format only)

The following RS-232-C interface options can be set in the **GTS-800A** series application program.

Baud Rate: 1200 / 2400 / 4800 / 9600 baud
 Parity: NONE / ODD / EVEN
 Data Bits: 7 / 8
 Stop Bits: 1 / 2
 Data Format: ASCII
 Signal Control: RTS. Hi / Low

The following RS-232-C interface options can be set in the **GTS-2000** series application program.

Baud Rate: 300 / 600 / 1200 / 2400 / 4800 / 9600 baud
 Parity: NONE / ODD / EVEN
 Data Bits: 7 / 8
 Stop Bits: 1 / 2
 Protocol: ACK – NACK (Uploading in FC-5 format only)
 ONE WAY

The following RS-232-C interface options can be set in the **AP-L1A** series application program.

Bit Format:	Selecting items	Contents
	D8 S1 NONE	8bit, stop 1, NONE
	D8 S2 NONE	8bit, stop 2, NONE
	D7 S1 NONE	7bit, stop 1, NONE
	D7 S2 NONE	7bit, stop 2, NONE

D8 S1 EVEN	8bit, stop 1, EVEN
D8 S2 EVEN	8bit, stop 2, EVEN
D7 S1 EVEN	7bit, stop 1, EVEN
D7 S2 EVEN	7bit, stop 2, EVEN
D8 S1 ODD	8bit, stop 1, ODD
D8 S2 ODD	8bit, stop 2, ODD
D7 S1 ODD	7bit, stop 1, ODD
D7 S2 ODD	7bit, stop 2, ODD

Trans speed in baud:	COM1	COM2
	38400	
	19200	
	9600	9600
	4800	4800
	2400	2400
	1200	1200

Terminate: EXT, ETX+CR, ETX+CRLF

Protocol: (only for COM2)

Selecting items	Contents
SERIAL	Based on RS-232C (3 lines system)
MODEM	Based on RS-232C.

GNSS Receiver COM Port Settings

The following RS-232-C interface options are default communication settings for the GNSS receiver application program.

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

Sample File Formats

Coordinate File Formats

Topcon Link can send, receive, and convert a number of different data types. Formats of files that are ASCII are listed below. These sample files are used in the *Topcon Link Reference Manual* screen shots.

GTS-6 Points Coordinate Format

GTS-6 coordinate input and output has the same format.

Name, X(easting), Y(northing), Z(elevation)

_+1	_x+00000009939_y+00000013376_z+00000001119
_+10	_x+00000018482_y+00000015981_z+00000000022
_+11	_x+00000015360_y+00000016995_z+00000000018
_+1113	_x+00000013121_y+00000012355_z-00000001882
_+1114	_x+00000010307_y+00000013914_z+00000000721
_+12	_x+00000013520_y+00000013371_z+00000001000
_+2	_x+00000003135_y+00000015221_z+00000004277
_+3	_x+00000003993_y+00000009992_z-00000000096
_+4	_x+00000006912_y+00000007631_z+00000000407
_+5	_x+00000002577_y+00000003569_z+00000000788
_+6	_x+00000012071_y+00000003714_z-00000000835
_+7	_x+00000015842_y+00000001442_z+00000002275
_+8	_x+00000021133_y+00000002553_z+00000000500
_+9	_x+00000017531_y+00000008498_z-00000001320
_+MARK	_x+00000010000_y+00000010000_z+00000000500
_+MARK1	_x+00000010033_y+00000009975_z-00000000959
_+MARK2	_x+00000010006_y+00000010001_z-00000000904

```

_+ST1      _ x+00000013856_ y+00000007047_ z-00000000258
_+ST1-1    _ x+00000013856_ y+00000007047_ z-00000000258
_+ST1-3    _ x+00000013830_ y+00000007105_ z-00000000927
_+ST2      _ x+00000014870_ y+00000010679_ z-00000000204
_+ST2-1    _ x+00000014874_ y+00000010625_ z-00000001005
_+ST2-2    _ x+00000014870_ y+00000010679_ z-00000000204_
    
```

GTS-7 Points Coordinate Format

Name, Easting, Northing, Elevation

```

1,13.37600,9.93900,1.11900,
2,15.22100,3.13500,4.27700,
3,9.99200,3.99300,-0.09600,
4,7.63100,6.91200,0.40700,
5,3.56900,2.57700,0.78800,
6,3.71400,12.07100,-0.83500,
7,1.44200,15.84200,2.27500,
8,2.55300,21.13300,0.50000,
9,8.49800,17.53100,-1.32000,
10,15.98100,18.48200,0.02200,
11,16.99500,15.36000,0.01800,
12,13.37100,13.52000,1.00000,
1113,12.35500,13.12100,-1.88200,
1114,13.91400,10.30700,0.72100,
MARK,10.00000,10.00000,0.50000,
MARK1,9.97500,10.03300,-0.95900,
MARK2,10.00100,10.00600,-0.90400,
ST1,7.04700,13.85600,-0.25800,
ST1-1,7.04700,13.85600,-0.25800,
ST1-3,7.10500,13.83000,-0.92700,
ST2,10.67900,14.87000,-0.20400,
ST2-1,10.62500,14.87400,-1.00500,
ST2-2,10.67900,14.87000,-0.20400,
    
```

Name,E,N,Z,Code Coordinate Format

Name, Easting, Northing, Elevation, Code

1,13.37600,9.93900,1.11900
 2,15.22100,3.13500,4.27700
 3,9.99200,3.99300,-0.09600
 4,7.63100,6.91200,0.40700
 5,3.56900,2.57700,0.78800
 6,3.71400,12.07100,-0.83500
 7,1.44200,15.84200,2.27500
 8,2.55300,21.13300,0.50000
 9,8.49800,17.53100,-1.32000
 10,15.98100,18.48200,0.02200
 11,16.99500,15.36000,0.01800
 12,13.37100,13.52000,1.00000
 1113,12.35500,13.12100,-1.88200
 1114,13.91400,10.30700,0.72100
 MARK,10.00000,10.00000,0.50000
 MARK1,9.97500,10.03300,-0.95900
 MARK2,10.00100,10.00600,-0.90400
 ST1,7.04700,13.85600,-0.25800
 ST1-1,7.04700,13.85600,-0.25800
 ST1-3,7.10500,13.83000,-0.92700
 ST2,10.67900,14.87000,-0.20400
 ST2-1,10.62500,14.87400,-1.00500
 ST2-2,10.67900,14.87000,-0.20400

Name,Lat,Lon,Ht,Code Coordinate Format

Name, Lat, Lon, Ht, Code

1,0°00'00.32"N,0°00'00.43"E,1.11900
 2,0°00'00.10"N,0°00'00.49"E,4.27700
 3,0°00'00.13"N,0°00'00.32"E,-0.09600
 4,0°00'00.23"N,0°00'00.25"E,0.40700
 5,0°00'00.08"N,0°00'00.12"E,0.78800
 6,0°00'00.39"N,0°00'00.12"E,-0.83500
 7,0°00'00.52"N,0°00'00.05"E,2.27500

8,0°00'00.69"N,0°00'00.08"E,0.50000
 9,0°00'00.57"N,0°00'00.28"E,-1.32000
 10,0°00'00.60"N,0°00'00.52"E,0.02200
 11,0°00'00.50"N,0°00'00.55"E,0.01800
 12,0°00'00.44"N,0°00'00.43"E,1.00000
 1113,0°00'00.43"N,0°00'00.40"E,-1.88200
 1114,0°00'00.34"N,0°00'00.45"E,0.72100
 MARK,0°00'00.33"N,0°00'00.32"E,0.50000
 MARK1,0°00'00.33"N,0°00'00.32"E,-0.95900
 MARK2,0°00'00.33"N,0°00'00.32"E,-0.90400
 ST1,0°00'00.45"N,0°00'00.23"E,-0.25800
 ST1-1,0°00'00.45"N,0°00'00.23"E,-0.25800
 ST1-3,0°00'00.45"N,0°00'00.23"E,-0.92700
 ST2,0°00'00.49"N,0°00'00.35"E,-0.20400
 ST2-1,0°00'00.49"N,0°00'00.34"E,-1.00500
 ST2-2,0°00'00.49"N,0°00'00.35"E,-0.20400

Name,N,E,Z,Code Coordinate Format

Name, N, E, Z, Code

1,9.93900,13.37600,1.11900
 2,3.13500,15.22100,4.27700
 3,3.99300,9.99200,-0.09600
 4,6.91200,7.63100,0.40700
 5,2.57700,3.56900,0.78800
 6,12.07100,3.71400,-0.83500
 7,15.84200,1.44200,2.27500
 8,21.13300,2.55300,0.50000
 9,17.53100,8.49800,-1.32000
 10,18.48200,15.98100,0.02200
 11,15.36000,16.99500,0.01800
 12,13.52000,13.37100,1.00000
 1113,13.12100,12.35500,-1.88200
 1114,10.30700,13.91400,0.72100
 MARK,10.00000,10.00000,0.50000
 MARK1,10.03300,9.97500,-0.95900

MARK2,10.00600,10.00100,-0.90400
 ST1,13.85600,7.04700,-0.25800
 ST1-1,13.85600,7.04700,-0.25800
 ST1-3,13.83000,7.10500,-0.92700
 ST2,14.87000,10.67900,-0.20400
 ST2-1,14.87400,10.62500,-1.00500
 ST2-2,14.87000,10.67900,-0.20400

Raw Data File Formats

GTS-6 Raw Format

Refer to the GTS-6 interface manual for details.

```

_MARK_(STAT_)1.52000_+ST1_ W+000049020m09757060-
03726440d+0000138560+0000070470-
0000002580***+0000+000000_*STAT_,1.60000_+ST1_
W+000049040m09757060-03726440d+0000138560+0000070470-
0000002580***+0000+000000_*STAT_,1.60000_+ST2_
W+000049560m09713460+00756170d+0000148700+0000106790-
0000002040***+0000+000000_*STAT_,1.60000_+ST2_
W+000049560m09713470+00756170d+0000148700+0000106790-
0000002040***+0000+000000_*STAT_,1.60000_+1_
?+00003448m0781803+0910223d+00003376***+00+00000_*TREE_,1.600
00_+2_
?+00009448m0655422+1424456d+00008625***+00+00000_*TREE_,1.600
00_+3_ ?+00006029m0945426-
1795529d+00006007***+00+00000_*TREE_,1.60000_+4_
?+00003892m0901125-
1423025d+00003892***+00+00000_*TREE_,1.60000_'ST1-
1_(STAT_)1.52000_+MARK1_
W+000048540m09720510+14233160d+0000100330+0000099750-
0000009590***+0000+000000_*STAT_,1.60000_+MARK1_
W+000048560m09720510+14233160d+0000100330+0000099750-
0000009590***+0000+000000_*STAT_,1.60000_+ST2-1_
W+000037800m10010080+07407150d+0000148740+0000106250-
0000010050***+0000+000000_*STAT_,1.60000_+ST2-1_
W+000037790m10010080+07407150d+0000148740+0000106250-
0000010050***+0000+000000_*STAT_,1.60000_+5_
?+00011857m0843301-

```

```

1625151d+00011803***+00+00000_*TREE_,1.60000_+6_
?+00003813m0972903-
1181002d+00003781***+00+00000_*TREE_,1.60000_+7_
?+00006496m0661635-
0702932d+00005947***+00+00000_*TREE_,1.60000_+8_
?+00008594m0842419-
0314150d+00008553***+00+00000_*TREE_,1.60000_*ST2-
2_(STAT_)1.52000_+MARK2_ W+000049500m09711260-
17203440d+0000100060+0000100010-
0000009040***+0000+000000_*STAT_,1.60000_+MARK2_
W+000049500m09711250-17203440d+0000100060+0000100010-
0000009040***+0000+000000_*STAT_,1.60000_+ST1-3_
W+000037770m09947420-10613530d+0000138300+0000071050-
0000009270***+0000+000000_*STAT_,1.60000_+ST1-3_
W+000037770m09947410-10613530d+0000138300+0000071050-
0000009270***+0000+000000_*STAT_,1.60000_+9_
?+00003593m1064517-
0392059d+00003441***+00+00000_*TREE_,1.60000_+10_
?+00006422m0871605+0554414d+00006415***+00+00000_*TREE_,1.600
00_+11_
?+00006342m0871605+0853339d+00006335***+00+00000_*TREE_,1.600
00_+12_
?+00003273m0665438+1163803d+00003011***+00+00000_*TREE_,1.600
00_+13_
?+00002902m1232505+1361343d+00002422***+00+00000_*TREE_,1.600
00_+14_
?+00005683m0794856+1444001d+00005594***+00+00000_*TREE_,1.600
00_

```

GTS-7 Raw Format

The general format for each record is:

CONTROL WORD field1,.....,fieldn

JOB	job name, description
DATE	date, name
NAME	surveyors name
INST	instrument id
UNITS	Meter/Feet, Degree/Gon
SCALE	grid factor,scale factor,elevation

ATMOS	temp,press
STN	ptno, ins ht, stn id
XYZ	X(easting), Y(northing), Z(elevation)
BKB	ptno, backsight bearing, backsight angle
BS	ptno[,target height]
FS	ptno,target height, pt code[,string number]
SS	ptno,target height, pt code[,string number]
CTL	control code[,pt code 2[,string no 2]](optional)
HV	HA, VA
SD	HA, VA, SD
HD	HA, HD, VD
OFFSET	- radial offset, tangential offset, vertical offset
NOTE	comments
XYZ	if present follows the STN record
BKB	if present follows the BKB record or STN record if no BKB
CTL	if present follows the FS or SS header record
HV,SD,orHD	- must follow a BS, FS, or SS header and follows the CTL if present
OFFSET	- may follow any SD or HD record
TTools v1.0	
JOB	C:\Download\777.raw,Comment
NAME	TopconTools
INST	TS
UNITS	M,D
SCALE	1.000000,1.000000,0.000000
DATE	00/00/00,00:00
TEMP	0.000,000
STN	MARK,1.52000,STAT
BKB	ST1,0.0000,322.33160
XYZ	13.85600,7.04700,-0.25800
BS	ST1,1.60000
SD	-37.26440,97.57060,4.90200
SS	ST1,1.60000,STAT
SD	-37.26440,97.57060,4.90400

XYZ 13.85600,7.04700,-0.25800
SS ST2,1.60000,STAT
SD 7.56170,97.13460,4.95600
XYZ 14.87000,10.67900,-0.20400
SS ST2,1.60000,STAT
SD 7.56170,97.13470,4.95600
XYZ 14.87000,10.67900,-0.20400
SS 1,1.60000,TREE
SD 91.02230,78.18030,3.44800
SS 2,1.60000,TREE
SD 142.44560,65.54220,9.44800
SS 3,1.60000,TREE
SD -179.55290,94.54260,6.02900
SS 4,1.60000,TREE
SD -142.30250,90.11250,3.89200
STN ST1-1,1.52000,STAT
BKB MARK1,0.0000,142.33160
XYZ 10.03300,9.97500,-0.95900
BS MARK1,1.60000
SD 142.33160,97.20510,4.85400
SS MARK1,1.60000,STAT
SD 142.33160,97.20510,4.85600
XYZ 10.03300,9.97500,-0.95900
SS ST2-1,1.60000,STAT
SD 74.07150,100.10080,3.78000
XYZ 14.87400,10.62500,-1.00500
SS ST2-1,1.60000,STAT
SD 74.07150,100.10080,3.77900
XYZ 14.87400,10.62500,-1.00500
SS 5,1.60000,TREE
SD -162.51510,84.33010,11.85700
SS 6,1.60000,TREE
SD -118.10020,97.29030,3.81300
SS 7,1.60000,TREE
SD -70.29320,66.16350,6.49600
SS 8,1.60000,TREE

SD	-31.41500,84.24190,8.59400
STN	ST2-2,1.52000,STAT
BKB	MARK2,0.0000,187.56160
XYZ	10.00600,10.00100,-0.90400
BS	MARK2,1.60000
SD	-172.03440,97.11260,4.95000
SS	MARK2,1.60000,STAT
SD	-172.03440,97.11250,4.95000
XYZ	10.00600,10.00100,-0.90400
SS	ST1-3,1.60000,STAT
SD	-106.13530,99.47420,3.77700
XYZ	13.83000,7.10500,-0.92700
SS	ST1-3,1.60000,STAT
SD	-106.13530,99.47410,3.77700
XYZ	13.83000,7.10500,-0.92700
SS	9,1.60000,TREE
SD	-39.20590,106.45170,3.59300
SS	10,1.60000,TREE
SD	55.44140,87.16050,6.42200
SS	11,1.60000,TREE
SD	85.33390,87.16050,6.34200
SS	12,1.60000,TREE
SD	116.38030,66.54380,3.27300
SS	13,1.60000,TREE
SD	136.13430,123.25050,2.90200
SS	14,1.60000,TREE
SD	144.40010,79.48560,5.68300

GTS-7+ Raw Format

The GTS-7+ format is similar the GTS-7 format, but also saves measured points SideShots coordinates after calculating coordinates in Topcon Link.

TOPCON XML File Format

```

<?xml version="1.0"?>
<data>
<Point>
<PointNumber>1</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>2</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>3</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>4</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>5</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>6</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>7</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>8</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>9</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>10</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>11</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>12</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>13</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>14</PointNumber><Code>TREE</Code></Point><Point>
<PointNumber>MARK</PointNumber><Code>STAT</Code></Point><Point>
<PointNumber>MARK1</PointNumber><Code>STAT</
Code><Northing>32.91667</Northing><Easting>32.72638</Easting><Height>-
3.14633</Height></Point><Point>
<PointNumber>MARK2</PointNumber><Code>STAT</
Code><Northing>32.82808</Northing><Easting>32.81168</Easting><Height>-
2.96588</Height></Point><Point>
<PointNumber>ST1</PointNumber><Code>STAT</
Code><Northing>45.45932</Northing><Easting>23.12008</Easting><Height>-
0.84646</Height></Point><Point>
<PointNumber>ST1-1</PointNumber><Code>STAT</Code></Point><Point>
<PointNumber>ST1-3</PointNumber><Code>STAT</
Code><Northing>45.37402</Northing><Easting>23.31037</Easting><Height>-
3.04134</Height></Point><Point>
<PointNumber>ST2</PointNumber><Code>STAT</
Code><Northing>48.78609</Northing><Easting>35.03609</Easting><Height>-
0.66929</Height></Point><Point>

```

```

<PointNumber>ST2-1</PointNumber><Code>STAT</
Code><Northing>48.79921</Northing><Easting>34.85892</Easting><Height>-
3.29724</Height></Point><Point>
<PointNumber>ST2-2</PointNumber><Code>STAT</Code></Point><Project>
<JobName>C:\Download\x2.xml</JobName><DistanceUnitIndicator>Feet</
DistanceUnitIndicator><AngleUnitIndicator>DMS</
AngleUnitIndicator><GridFactor>1.000000</GridFactor><Scale>1.000000</
Scale><Elevation>0.000000</Elevation></Project><Station>
<StationPoint>MARK</StationPoint><StationCode>STAT</
StationCode><InstrumentHeight>4.98688</InstrumentHeight><Observation>
<AngleUnitIndicator>DMS</AngleUnitIndicator><DistanceUnitIndicator>Feet</
DistanceUnitIndicator><PointNumber>ST1</PointNumber><Code1>STAT</
Code1><ObsType>Backsight</ObsType><PrismHeight>5.24934</
PrismHeight><HorizontalAngle>-37.26440</
HorizontalAngle><SlopeDistance>16.08268</
SlopeDistance><HorizontalDistance>15.92848</
HorizontalDistance><VerticalAngle>97.57060</
VerticalAngle><VerticalDistance>-2.22484</
VerticalDistance><Northing>45.45932</Northing><Easting>23.12008</
Easting><Height>-0.84646</Height></Observation><BacksightPoint>
<PointNumber>ST1</PointNumber><BacksightBearing>0.0000</
BacksightBearing><Code1>STAT</Code1><BacksightAngle>322.33160</
BacksightAngle><Northing>45.45932</Northing><Easting>23.12008</
Easting><Height>-0.84646</Height></BacksightPoint><Observation>
<AngleUnitIndicator>DMS</AngleUnitIndicator><DistanceUnitIndicator>Feet</
DistanceUnitIndicator><PointNumber>14</PointNumber><Code1>TREE</
Code1><ObsType>Shotsight</ObsType><PrismHeight>5.24934</
PrismHeight><HorizontalAngle>144.40010</
HorizontalAngle><SlopeDistance>18.64501</
SlopeDistance><HorizontalDistance>18.35302</
HorizontalDistance><VerticalAngle>79.48560</
VerticalAngle><VerticalDistance>3.29677</VerticalDistance></Observation></
Station></data>

```

DXF Format

0
SECTION
2
9
\$CECOLOR
62
0
9
\$EXTMIN
10
0.3245
20
0.3245
9
\$EXTMAX
10
0.3245
20
0.3245
9
\$LIMMIN
10
7.0470
20
10.0060
9
\$LIMMAX
10
11.1658
20
15.0363
0
ENDSEC
0

1_point_names
70
0
6
DASHED
62
255
0
LAYER
2
2_comment
70
0
6
DASHED1
62
5
0
ENDTAB
0
ENDSEC
0
SECTION
BLOCKS
0
BLOCK
8
0
2
MARK1
70
2
10
9.9750
20
10.0330

30
-0.9590
0
POINT
8
0
10
9.9750
20
10.0330
30
-0.9590
0
ATTDEF
8
SEQEND
0
INSERT
8
0
66
1
2
ST2-1
10
10.6250
20
14.8740
30
-1.0050
0
SEQEND
0
ENDSEC
0
EOF

LandXML File Format

```

<?xml version="1.0"?>
<LandXML xmlns="http://www.landxml.org/schema/LandXML-1.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.landxml.org/schema/LandXML-1.0 http://
www.landxml.org/schema/LandXML-1.0/LandXML-1.0.xsd" version="1.0"
date="10/24/2003" time="20:30:47" readOnly="false" language="English">
<Project name=""/>
<Units>
<Metric linearUnit="meter" areaUnit="squareMeter" volumeUnit="cubicMeter"
temperatureUnit="celsius" pressureUnit="mmHG" angularUnit="decimal
degrees" directionUnit="decimal degrees"/>
</Units>
<Application name="TopSurv" manufacturer="Topcon" version="1.10"
desc="OnBoard Version" manufacturerURL="www.topcon.com"/>
<CgPoints>
<CgPoint name="0">9807019.29622078 973450.31989092 213.271773</
CgPoint>
<CgPoint name="Auto1">9806910.67604002 973580.14059322 217.066318</
CgPoint>
<CgPoint name="Auto2">9806910.65496200 973580.16603014 217.072248</
CgPoint>
<CgPoint name="Auto3">9806910.67343960 973580.14156662 217.069849</
CgPoint>
<CgPoint name="Topo1">9806910.66581991 973580.14734168 217.080830</
CgPoint>
<CgPoint name="Topo2">9806910.66050706 973580.15343608 217.075792</
CgPoint>
<CgPoint name="Topo3">9806910.65094054 973580.16451221 217.072649</
CgPoint>
</CgPoints>
</LandXML>

```

GPS Vector File Format

GPS Vector files have the following format:

Header

VPP(for vector),Name_Point1,Name_Point2,
dX,dY,dZ,sigma_dX,sigma_dY,sigma_dZ, Y(northing),
Z(elevation),cor_XY,cor_XZ,cor_YZ,noteP(for
point),Name_Point,Lat(DD MM SS.ss),Lon(DD MM
SS.ss),Ell.Height

//TopconVectorFormat:v.1,

VPP,s0_8OW0,s2_8HDS,0.499,-1.692,

-0.949,0.002,0.001,0.002,0.763,0.748,0.825

VPP,s0_8OW0,s1_416O,-2.126,0.769,-0.597,0.002,0.003,0.004,0.450,0.319,0.573

VPP,s1_416O,s2_8HDS,2.683,-2.418,-0.296,0.005,0.005,0.006,0.510,0.482,0.652

VPP,master_8BGG,s0_8OW0,2.489,2.791,

-3.170,0.003,0.005,0.006,0.436,0.099,0.571

VPP,master_8BGG,s1_416O,0.327,3.540,

-3.788,0.003,0.004,0.007,0.457,0.258,0.602

VPP,master_8BGG,s2_8HDS,2.982,1.087,

-4.134,0.003,0.002,0.003,0.764,0.725,0.829

P,master_8BGG,55 33 44.000N,37 55 40.000E,506.774,

P,s0_8OW0,55 33 44.444N,37 58 40.888E,504.980,

P,s1_416O,55 33 44.666N,37 58 40.999E,501.043,

P,s2_8HDS,55 33 44.555N,37 58 40.777E,501.204,

Printed File Formats

Topcon Link can print coordinate or Total Station raw data, as well as TopSURV files.

- Coordinate file (Figure C-1):

Points : D:\Topcon Link Data\Control_data1.csv

Name	Grid Northing	Grid Easting	Elevation	Note	Code
11	16.99500	15.36000	0.01800		
12	13.37100	13.52000	1.00000		
13	12.35500	13.12100	-1.88200		
14	13.91400	10.30700	0.72100		
MARK	10.00000	10.00000	0.50000		Base station
ST1	7.04700	13.85600	-0.25800		

Figure C-1. Sample Printed Coordinate File Format

- Total Station raw data file with the *Points* tab selected (Figure C-2):

Points : C:\Topcon Link Data\M062502m.raw

Name	Ground Northin...	Ground Easting (m)	Elevation (m)	Note	Code
1	13.37644	9.92658	-0.28484		TREE
2	15.18472	3.11271	2.87299		TREE
3	9.96091	3.99923	-1.49993		TREE
4	7.81552	6.93078	-0.98692		TREE
5	3.53164	2.61567	-0.67603		TREE
6	3.72762	12.10962	-2.29878		TREE
7	1.47505	15.89230	0.81138		TREE
8	2.61513	21.17757	-0.96428		TREE
9	8.53908	17.54985	-2.83346		TREE
10	16.02705	18.46459	-1.49159		TREE
11	17.02450	15.32808	-1.49540		TREE
12	13.39019	13.50758	-0.51412		TREE
13	12.37238	13.11367	-3.39595		TREE
14	13.91642	10.29126	-0.79283		TREE
MARK	10.00100	10.00600	-0.90400	base	STAT
ST1	7.06997	13.87625	-1.66213		STAT
ST2	10.62500	14.87400	-1.00500		STAT

Figure C-2. Sample Printed TS Raw Data File Format – Points Tab

- Total Station raw data file with the *TS Obs* tab selected and the left panel is active (Figure C-3):

TS Occupations : C:\Topcon Link Data\0062502m.raw

#	Point Name	Instrument...
1	MARK	1.52000
2	ST1	1.46000
3	ST2	1.41000

Figure C-3. Sample Printed TS Raw Data File – TS Obs Tab, Left Panel

- Total Station raw data file with the *TS Obs* tab selected and the right panel is active (Figure C-4):

TS Obs : TS Occupation 1

#	Point From	Point To	Reflector Heig...	Azimuth	Horizontal Circle	Zenith Angle	Slope Dist...	Date	Note	Offset Along (m)
1	MARK	ST1	1.60000	0°00'00.0000	322°33'16.0000	97°57'06.0000	4.90200			
2	MARK	ST1	1.60000		322°33'16.0000	97°57'06.0000	4.90400			
3	MARK	ST2	1.60000		7°56'17.0000	97°13'46.0000	4.95600			
4	MARK	ST2	1.60000		7°56'17.0000	97°13'47.0000	4.95800			
5	MARK	1	1.60000		91°02'23.0000	78°18'03.0000	3.44800			
6	MARK	2	1.60000		142°44'56.0000	65°54'22.0000	9.44800			
7	MARK	3	1.60000		188°04'31.0000	94°54'26.0000	6.02900			
8	MARK	4	1.60000		217°29'35.0000	90°11'25.0000	3.89200			

Figure C-4. Sample Printed TS Raw Data File – TS Obs Tab, Right Panel

- TopSURV data file with the *Points* tab selected (Figure C-5):

Points : C:\Topcon Link Data\081202a.lsv

Name	Latitude	Longitude	Ell.Height (m)	Note	Code
E4	40°07'04.7067N	82°58'50.9012W	251.58816		
Office_2	40°07'05.3232N	82°58'50.8919W	243.37576		
Office_3	40°07'05.1685N	82°58'50.2114W	243.42636		
Office_4	40°07'03.9975N	82°58'50.5684W	243.35076		
Office_5	40°07'03.3563N	82°58'52.6305W	243.67566		
Office_6	40°07'04.7437N	82°58'53.0241W	244.55546		
TGLA	40°07'05.3280N	82°58'50.3392W	243.48986		
TGLB	40°07'05.2459N	82°58'50.2718W	243.46136		
W1	40°07'04.5276N	82°58'51.3017W	251.60816		
W2	40°07'04.5778N	82°58'51.1901W	251.61576		

Figure C-5. Sample Printed TopSURV File – Points Tab

- TopSURV data file with the *GPS Occupations* tab selected (Figure C-6):

GPS Occupations : C:\Topcon Link Data\1014C.tsv

Point Name	Antenna Type	Antenna Height (m)	Ant Height Method	Start Time	Duration	Offset Azimuth	Offset Dist (r
0	Legant	1.77000	Slant	10/14/2002 08:...	0:01:04		
Auto1	HIPer	1.55000	Vertical	10/14/2002 08:...	0:00:00		
Auto2	HIPer	1.55000	Vertical	10/14/2002 08:...	0:00:00		
Auto3	HIPer	1.55000	Vertical	10/14/2002 08:...	0:00:00		
Topo1	HIPer	1.55000	Vertical	10/14/2002 08:...	0:00:00		
Topo2	HIPer	1.55000	Vertical	10/14/2002 08:...	0:00:00		
Topo3	HIPer	1.55000	Vertical	10/14/2002 08:...	0:00:00		

Figure C-6. Sample Printed TopSURV File – GPS Occupations Tab

- TopSURV data file with the *TS Obs* tab selected and the left panel is active (Figure C-7):

TS Occupations : C:\Topcon Link Data\081202a.tsv.initial

#	Point Name	Instrument...
1	TGLA	1.75000
2	TGLA	1.75000
3	88	1.75000
4	88	1.75000
5	89	1.75000
6	89	1.75000
7	89	1.75000

Figure C-7. Sample Printed TopSURV File – TS Obs Tab, Left Panel

- TopSURV data file with the *TS Obs* tab selected and the right panel is active (Figure C-8):

TS Obs : TS Occupation 1

#	Point From	Point To	Reflector Heig...	Azimuth	Horizontal Circle	Zenith Angle	Slope Dist...	Date	Note	Offset Along (m)
1	TGLA	Office_3		148°42'3...	148°42'35.0000					8/1...
2	TGLA	88	1.77000		148°42'35.0000	90°56'52.0000	5.83000			8/1...
3	TGLA	88	1.77000		129°26'24.0000	91°01'15.0000	34.13000			8/1...
4	TGLA	88	1.77000		129°26'22.0000	91°01'33.0000	34.13000			8/1...
5	TGLA	88	1.77000		148°42'42.0000	90°57'13.0000	5.83000			8/1...
6	TGLA	88	1.77000		148°42'32.0000	90°57'00.0000	5.83000			8/1...
7	TGLA	88	1.77000		129°26'23.0000	91°01'25.0000	34.13000			8/1...
8	TGLA	88	1.77000		129°26'27.0000	91°01'35.0000	34.13000			8/1...
9	TGLA	88	1.77000		148°42'34.0000	90°57'24.0000	5.83000			8/1...
10	TGLA	1000	1.77000		155°57'26.0000	94°59'51.0000	9.37000			8/1...
11	TGLA	1000	1.77000		153°29'13.0000	94°59'51.0000	8/1...			8/1...
12	TGLA	1001	1.77000		103°52'22.0000	91°48'14.0000	19.71000			8/1...
13	TGLA	1001	1.77000		103°43'10.0000	91°48'14.0000	8/1...			8/1...
14	TGLA	89	1.77000		103°43'10.0000	91°48'15.0000	19.73000			8/1...
15	TGLA	90	1.77000		103°43'09.0000	91°48'17.0000	19.73000			8/1...

Figure C-8. Sample Printed TopSURV File – TS Obs Tab, Right Panel

- TopSURV data file with the *GPS Obs* tab selected (Figure C-9):

GPS Obs : C:\Topcon Link Data\1014C.tlsv

Point From	Point To	Start Time	Duration	Note	Horizon...	Vertical...	dn (m)	de (m)	du (m)	Method
0	Topo1	10/14/2002 ...	0:00:00		0.00393	0.00232	26.11777	-19.52170	3.80897	RTK Topo
0	Topo2	10/14/2002 ...	0:00:00		0.00377	0.00239	26.11908	-19.52256	3.80393	RTK Topo
0	Topo3	10/14/2002 ...	0:00:00		0.00373	0.00236	26.12142	-19.52414	3.80079	RTK Topo
0	Auto1	10/14/2002 ...	0:00:00		0.00510	0.00325	26.11567	-19.52228	3.90725	RTK AutoTopo
0	Auto2	10/14/2002 ...	0:00:00		0.00509	0.00325	26.12071	-19.52616	3.91319	RTK AutoTopo
0	Auto3	10/14/2002 ...	0:00:00		0.00508	0.00325	26.11655	-19.52194	3.91079	RTK AutoTopo

Figure C-9. Sample Printed TopSURV File – GPS Obs Tab

- TopSURV data file with the *Codes* tab selected (Figure C-10):

Name	_____
build cor	_____
trav pt	_____
tree	_____

Figure C-10. Sample Printed TopSURV File – Codes Tab

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TOPCON



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