

# **Topcon Link**

Data Import/Export Software

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## Topcon Link Reference Manual

Part Number 7010-0522 Rev H

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# Preface

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



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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.	
Торо	Indicates the name of a dialog box or screen.	
Notes	Indicates a field on a dialog box or screen, or a tab within a dialog box or screen.	



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



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



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

## **Notes:**

# What's New with Topcon Link

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

- $\Rightarrow$  Files (data) can be imported from a Topcon Memory Card.
- ➡ GPS+ raw and DL observation files can be downloaded for viewing.
- The file formats for Design (\*.tn3, \*.dwg, \*.dxt) and SHP (\*.shp) files have been added for data conversion.

# Notes:


# Introduction

Topcon Link<sup>TM</sup> can be used to:

- Import files from Topcon Digital Level, Total Stations, Topcon Memory Cards, TPS controllers, and GPS+ receivers to a PC.
- View and edit coordinate, raw data, and TopSURV files.
- Open and view GPS+ Raw Data and Digital Level Observation files.
- Export an Option Authorization File (OAF) from a computer to TPS GPS+ receivers, coordinate data files to a Total Station, or any file to a TPS Controller.
- Edit localization parameters.
- View Linework information and images in a TopSURV job.
- Convert coordinate, raw data, GPS+ Raw Data, and TopSURV files to files of the following formats.

#### Table 1-1. Topcon Link File Formats

	-
Coordinate files	GPS+ Raw Data Files
TopSURV Coordinates (*.txt)	Compact RINEX files (*.??D;
CR-5 Files (*.CR5)	*.??G; *.??N)
Custom Text Format files (*.*)	RINEX files (*.??O; *.??G;
FC-4 Points (*.xyz; *.fc4; *.pnt)	*.??N)
FC-5 Points (*.xvz: *.fc5: *.pnt)	TPD files (*.tpd)
GTS-210/310-10 Points (* xvz:	Road Files
*.pnt)	CLIP Road Files (*.PLT)
GTS-210/310-12 Points (*.xyz;	ISPOL Road Files (*.ALI)
*.pnt)	TDS RD5 (*.RD5)
GTS-7 Points (*.xyz; *.pnt)	Topcon MC Road files (*.RD3)
Name,E,N,Z,Code (*.csv)	Topcon SSS Road files (*.HAL)
Name,Lat,Lon,Ht,Code (*.csv)	TopSURV Road files (*.THL)
Name,N,E,Z,Code (*.csv)	Topcon XML Road files (*.xml)
Topcon XML Points (*.xml)	LandXML Road files (*.xml)
LandXML Points (*.xml)	VGP files (*.vgp)

• Topcon Geoid file (*.gff)	• TopSURV Database Files (*.tlsv)
Cut Sheet files	• TS Raw Data Files
Cut Sheet Standard files (*.css)	Custom TSRaw Format (*.*)
Cut Sheet User Defined files	FC-5 Raw (*.raw; *.dat; *.fc5)
(*.csu)	GTS-210/310 Raw (*.raw; *.dat;
Code Library Files	*.gts; *.gt6)
DBF Code Library files (*.dbf)	GTS-6 No Station Raw (*.raw;
TDD Code Library fles (*.tdd)	*.dat; *.gts; *.gts6; *.gt6)
XML Code Library files (*.sml)	GTS-6 Raw (*.raw; *.dat; *.gts;
Code Library Files	*.gts6; *.gt6)
Shape Files	GTS-7 Raw (*.raw; *.dat; *.gts;
Design Files	*.gts/; *.gt/)
DWG files (*.dwg)	GTS-7+ Raw (*.raw; *.dat; *.gts;
DXF files (*.dxf)	*.gts/; *.gt/)
Land XML files (*.xml)	Resect Sneet (*.snt)
TN3 Surface (*.TN3)	Land XML files (*.xml)
• GPS Obs Files	Topcon XML files (*.xml)
Custom Text Format (* *)	• X-Section Templates
L and XML GPS Obs (* xml)	TDS PT5 X-Section (*.tp5)
Tanaan Vastar (* tuf)	Topcon SSS X-Section (*.xtf)
Topcon Vector (*.tv1)	Topcon XML X-Section Template
T YAL E'L (* 1)	(*.xml)
• Topcon XML Files (*.xml)	TopSURV X-Section (*.xst)
<ul> <li>Localization Files (*.gc3)</li> </ul>	

Table 1-1. Topcon Link File Formats (Continued)

## System Requirements for Topcon Link

Before installing Topcon Link, ensure the computer or laptop has the following requirements.

- Processor compatible with Intel® Pentium® 100 MHz or faster
- 5 MB free disk space
- 16 MB RAM or more (32 MB recommended)
- 32-bit operating system, such as MS Windows 98/2000/XP
- Color monitor with 640x480 screen resolution

## Installing Topcon Link

Topcon Link can be installed onto a computer from the CD included with the package, or from the Topcon website.

- 1. To install Topcon Link, do one of the following:
  - Insert the Topcon Link CD into the CD-ROM drive of the computer. The InstallShield® Wizard starts up.
  - Go to the TPS Survey website and click **Software**. Then click **Utilities** (http://www.topconsurvey.com/software/ index.html#util) and click the **Topcon Link 6.04** link. Download the file and extract the Topcon Link installer. Double-click the **TLinkSetup.6.04.exe** file to start the InstallShield Wizard.
- 2. Click **Next** to start the installation process.
- 3. Click **Yes** on the *License Agreement* dialog box (Figure 1-1 on page 1-4). Clicking **No** terminates the installation.
- 4. On the *Customer Information* dialog box, enter the *User* and *Company* names, then click **Next** (Figure 1-1 on page 1-4).

Topcon Link v.6.04	$\mathbf{X}$
License Agreement	and the second sec
Please read the following license agreement carefully.	
Press the PAGE DOWN key to see the rest of the agreement.	
Plazas read this software license areament executive before pr	Topcon Link v. 6.04
Having pressed the "Yes" button you are agreeined calculus using the having pressed the "Yes" button you are agreeing to be bound by installing, copying, or otherwise using product. If you do not license, press the "Back" button and return the Topcon software obtained or get in touch with your Topcon distributor. If you do not license, press the "Back" button and return the Topcon software obtained or get in touch with your Topcon distributor. If you do not license presses the software	Customer Information Please enter your information.
software from web site, just delete it from the computer.	User Name:
<ol> <li>Software License. All software and documentation accompa Agreement whether on disk, in read only memory, on any other are licensed to you but you can positioning Sustems or its daught</li> </ol>	John Q. Public
Do you accent all the terms of the preceding Licence Agreement	Company Name:
select No, the setup will close. To install Topcon Link, you mu agreement.	TPS
InstallShield	Install this application for:
< Back	Anyone who uses this computer (all users)
	C Only for me
	InstallShield
	<back next=""> Cancel</back>

Figure 1-1. License Agreement and Customer Identification

- On the *Choose Destination Location* dialog box, click **Browse** to select the folder or enter a new folder name in which to install Topcon Link. Click **Next** (Figure 1-2 on page 1-4).
- 6. On the *Select Program Folder* dialog box, select a current folder or type a new program folder name for Topcon Link (Figure 1-2). Then click **Next** to start the installation process.



Figure 1-2. Choose Destination Location and Select Program Folder

7. Click **Finish** to exit the installation (Figure 1-3).



Figure 1-3. Installation Complete

8. Create a Topcon Link shortcut (Figure 1-4) on the computer desktop to quickly start the program.



Figure 1-4. 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" below).

## **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 1-5) has the following components:

- Title bar contains the name of the program.
- System buttons minimizes, maximizes, and closes windows.
- Menu bar contains drop-down menus for the various Topcon Link functions.
- Toolbar contains shortcut buttons to frequently used options.
- Work area displays dialog boxes, job file information, and popup menus.
- Status bar displays informative messages about Topcon Tools and various files.
- File information displays the linear unit, angular unit, type of coordinate system, and coordinate system information used in the open job.



Figure 1-5. Main Window Components

### Menu Bar

The menu bar provides access to most Topcon Link options available using six drop-down menus.

### File Menu

The File menu (Figure 1-6):

- 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

File	
Open File	Ctrl+O
Save File	Ctrl+S
Save As	Alt+Ctrl+S
Import from Device	Shift+F3
Export to Device	Shift+F4
Convert File	F5
Print	Ctrl+P
Print Preview	
Page Setup	
Configuration	Ctrl+F2
File Properties	
1 1014C.tlsv	
Exit	

Figure 1-6. File Menu

#### Edit Menu

The Edit menu (Figure 1-7 on page 1-8):

- allows a redo or undo of the last operation
- cuts, copies, pastes or deletes information
- sets the Pan or Zoom mode
- displays the *Properties* dialog box
- adds a new point

Edit	
Undo	Ctrl+Z
Redo	Ctrl+Y
Cut	Ctrl+X
Сору	Ctrl+C
Paste	Ctrl+V
Delete	Del
Add	•
Zoom	•
Pan Mode	
Properties	Ctrl+Enter

Figure 1-7. Edit Menu

#### View Menu

The View menu (Figure 1-8) provides access to viewing and hiding the Toolbar, the Status bar, the Layer View, and the CAD View, and activates the window for setting the *Point* tab, *GPS Occupation* tab, *TS Obs* tab, *GPS Obs* tab, *Codes* tab and *Tape Obs*.

Ctrl+K	
Ctrl+J	
	۲
	Ctrl+K Ctrl+J

Figure 1-8. View Menu

#### **Process Menu**

The Process menu (Figure 1-9):

- recalculates localization parameters for TopSURV files
- computes coordinates
- sets processing properties

Process	
Localization	Shift+F8
Compute Coordinates	F8
Process Properties	Alt+Ctrl+P

Figure 1-9. Process Menu

#### **Window Menu**

The Window menu (Figure 1-10):

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

W	indow
	Close Close All
-	Cascade
	Tile Vertically
	Tile Horizontally Arrange Tops
-	1 CAD View
~	2 D:\Topcon Tools Data\Job\Cad jobs\050119.tlsv <topsurv files="" pc=""></topsurv>

Figure 1-10. Window Menu

#### Help Menu

The Help menu (Figure 1-11) provides access to the context help and information on the current Topcon Link version and build date.

Help	
Context Help Feedback	×
About Topcon Link	

Figure 1-11. Help Menu

Using the Feedback submenu, you can:

- Send two log files to Topcon Support. These files will be created and attached to e-mail automatically
- Write any question and send an e-mail to Topcon Support
- Visit the Topcon Web Site (http://www.topconpositioning.com/)

### Toolbar

The Toolbar for Topcon Link (Figure 1-12) contains buttons for frequently used functions.

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.

🖻 🖬 🖬 🍃 🖗	않 🖨 🗠 여 🐰	🖻 🔒 📫 🗛 🗚	🔉 🔉 🖑 🔯 😽 🖬 📢
-----------	-----------	-----------	---------------

#### Figure 1-12. Toolbar

Table 1-2 describes the various Toolbar icons.

#### Table 1-2. Toolbar Icon Functions

lcon	Description
( <mark>1</mark>	<ul> <li>Open – Opens a file.</li> <li>1. Click the button to display the Open dialog box.</li> <li>2. Select the name of file and/or select a path or folder on the hard disk drive, local area network, or store media.</li> <li>3. Click <b>Open</b>.</li> </ul>
	Save – Saves files to the current directory
ľ	Save As – Saves files as a different file
* <b>₽</b>	<ul> <li>Import File from Device – Collects the observed files from TPS GPS+ receivers, TPS controllers, CE-based or Conventional or Robotic Total Stations.</li> <li>1. Click the button to display the <i>Import file from device</i> dialog box.</li> <li>2. Select the device and click Next.</li> <li>See "Importing Files" on page 2-1 for more details.</li> </ul>
¢	<ul> <li>Export to Device – Exports data from files to a TPS controller or a CE-based, Conventional, Robotic Total Station, and an Option Authorization File (OAF) to a TPS receiver.</li> <li>1. Click the button to display the <i>Export to Device</i> dialog box.</li> <li>2. Select the device and click Next.</li> <li>See "Exporting an OAF to TPS Receivers" on page 2-32 for more details.</li> </ul>

lcon	Description		
日 で で 日	Convert Files – Displays the Convert File dialog box. See page 3-4 for details.		
Ж	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.		
<b>a</b>	Paste – Places selected text on the Windows clipboard.		
3	Undo – Reverses the results.		
2	Redo – Returns the results.		
° +	<ul> <li>Add Point – Adds a point to the opened file.</li> <li>1. Click the button to display the <i>Add point</i> dialog box.</li> <li>2. Enter the point name, coordinates, and codes.</li> <li>3. Click OK.</li> </ul>		
4	Zoom In – Switches the active CAD view into zoom mode.		
4	Zoom Out – Switches the active CAD view into zoom mode.		
₽,	Zoom Back – Zooms back on the CAD view.		
×	Restore All – Fits all data in the active CAD view into the viewable extents of the active view.		
87	Pan – Changes the cursor to a "hand" to "grab" and move the CAD view.		
$\overline{\mathbf{Q}}$	CAD View - Opens and closes a graphical view of linework with the associated points and lines.		
ő	<ul> <li>Performs a Localization – views, edits and recalculates localization parameters saved in a TopSURV file.</li> <li>1. Click the button to display the <i>Localization</i> dialog box.</li> <li>2. Change the status of a localization point in the Use column, remove a point by pressing Remove Point, or add a point by pressing Add Point.</li> </ul>		

Table 1-2	. Toolbar	lcon	Functions	(Continued)
-----------	-----------	------	-----------	-------------

lcon	Description
	Compute Coordinates of Points – Computes (calculates) the point coordinates in the current file.
9	Print – Prints the current window or table.
<b>R</b> 3	About Topcon Tools – Displays the About Topcon Tools dialog box.

Table 1-2. Toolbar Icon Functions (Continued)

### **Status Bar**

The status bar displays various informative messages about current Topcon Tools activities and data.

Double-click the boxes to display the pop-up lists that provide quick conversion to other units, coordinate types, and systems (Figure 1-13).

- linear and angular units
- coordinate type and coordinate system

Details on file conversion will be described in sections about editing coordinate files, TS raw data files and TopSurv files.



Figure 1-13. Status Bar and Pop-up Lists

# **Transferring Files**

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

## **Importing Files**

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

Topcon Link allows the importing of data from Topcon devices in two ways by using the Topcon Link buttons in the toolbar or commands in main menu.

The installation of Topcon Link to the computer creates three additional folders in the computer (Figure 2-1).



Figure 2-1. Topcon's Devices Folders

To import data from the device using Windows Explorer, click the appropriate folder.

The "Mobile Device" folder is created if Microsoft ActiveSync has been installed in the computer.

### **Importing From a Receiver**

See the Topcon receiver manual for instructions to connect the receiver and the computer.

- Connect the receiver and computer using the RS232 or USB cable, and turn on the receiver.
- If the receiver and the computer are Bluetooth® enabled, connect using Bluetooth.

Before connecting the receiver's USB port to the computer's USB port, the TPS USB driver must be installed on the computer. The driver is available on the TPS website (http://www.topconpositioning.com/software/ updates.html).

#### **Using Windows Explorer**

- 1. Open Windows Explorer and click the Topcon Receiver folder. The right panel of the window displays the automatic start of searching for Topcon receivers connected to any of the computer ports (COM and USB) (Figure 2-2).
- 2. When finished, all receivers connected to the computer ports (Figure 2-2) display.



Figure 2-2. Searching and Finding Topcon Receivers in Windows Explorer

3. To stop searching for receivers when the desired receiver has been found, click **Stop**. Only the discovered receivers will display.



Figure 2-3. Break Of Searching Receivers

- 4. To update information about the receivers connected to the computer port, click *Search for connected receivers*.
- 5. To view information about the receiver (Figure 2-4), right-click the desired receiver and select the *Properties* option.
- 6. To view the collected raw file, click on the desired receiver.

	Properties	
🖄 Topcon Receivers	Receiver properties	1
File Edit View Favorites Tools Help		
🚱 Back 👻 🌍 👻 🏂 Search 🔊 Folders	Receiver: HE_GD	1
Address 🛃 Topcon Receivers 💽 🄁 Go	Model: HE_GD	
Folders ×	ID: 22233388E88	
B     Copcon Receivers       Image: Search for connect       Image: Search for connect </td <td>Port: COMI</td> <td>[ </td>	Port: COMI	[ 

Figure 2-4. Receiver Properties

7. To import the file(s) from the receiver to a folder, select the desired file(s) and copy to the folder using drag-and-drop method (Figure 2-5).

😂 HIPER			
File Edit View Favorites	Tools Help	Progress	
🚱 Back 🔹 🌍 🔹 Ď	Search 💦 Folders	Downloading file log0101e.tps Downloaded 4096 bytes of 5227	
Address 🥔 HIPER		Transfer rate is 4000 butes (eac.	
Folders	× 🝙 🛋		
🗉 🚞 TL_Data			
🗉 🚞 Topcon Link Data	Applie 101b.tps log0101c.tps log01	g0101e.tp	
🗉 🚞 Topcon Tools Data	Mot Oth.tns	- Cancor	
<			

Figure 2-5. Start of File Import from the TPS Receiver/Import in Progress

### **Using Topcon Link**

- 1. To start Topcon Link, click the **Import from Device** button on the Toolbar.
- 2. From the left panel of the *Import from Device* dialog box, double-click *Topcon Receivers* (Figure 2-6).



Figure 2-6. Import From Device Window

3. The program automatically searches for Topcon receivers connected to the computer ports (COM and USB). When finished all receivers connected to the computer ports (Figure 2-7) display.



Figure 2-7. Search for Topcon Receivers

4. To view information about the receiver, right-click the desired receiver and select the *Properties* option (Figure 2-8).

🐔 Import from Device	Properties
Look in Topcon Receive Top Constant Search for connected receivers Test Constant Select Transfer opsions file XS	Receiver properties

Figure 2-8. Receiver Properties

- 5. In the right panel of the *Import From Device* window, navigate to and select, or create, a folder to save the files (Figure 2-9).
- 6. To view the collected raw file, double click (or click *Select* in the pop-up menu) the desired receiver. To import the file(s) from the receiver to the computer and to save in the selected folder, highlight the desired file(s) and click the double arrows (Figure 2-9).
- 7. The import in progress displays (Figure 2-9).



Figure 2-9. Select the Raw Data File to Import and View Import Progress

### **Importing TPS Controller Files**

Before importing data from a TPS Controller or CE-based Total Station to Topcon Link, install Microsoft® ActiveSync® onto the computer. ActiveSync establishes a connection between the computer and a mobile device, such as a TPS Controller or CE-based Total Station. The mobile device must have the Windows® CE operating system. ActiveSync is available as a free download from the Microsoft website (http://www.microsoft.com).

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

- 1. Using an RS-232 interface cable, connect the TPS Controller/CEbased Total Station to the serial interface port on the computer.
- 2. Turn on the TPS Controller/CE-based Total Station and the computer.
- 3. Start Microsoft ActiveSync.
- 4. Click Next on the *Get Connected* dialog box (Figure 2-10).



Figure 2-10. ActiveSync – Get Connected

 The computer establishes a connection with the TPS Controller/ CE-based Total Station. If the TPS Controller/CE-based Total Station is switched on (Figure 2-11 on page 2-7), and the correct COM Port is selected, the following dialog box displays.
Microsoft ActiveSync	
File View Tools Help	
Sync         Stop         Explore         Options	
Guest	
Connected	
Information Type Status	

Figure 2-11. Computer and Controller Connected

6. The system tray also displays a **Green Connection Status** icon, indicating a successful TPS controller/CE-based Total Station-to-computer connection.



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/CE-based Total Station to a computer, Topcon Link converts them to an accessible file format (\*.tlsv) before saving. Topcon Link/ CE-based Total Station must be used to convert the correct \*.tlsv files to the desired format.



To avoid data loss while exporting \*.tsv files from a TPS Controller/CE-based Total Station 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**.
- 3. On the *Connection Settings* dialog box (Figure 2-12), click and enable the following parameters.
  - allow network (Ethernet) and Remote Access Service (RAS) server connection with this desktop computer
  - the show status icon in Task bar

Connection Settings
Click Get Connected to connect your mobile device to this computer.
Status: Waiting for device to connect Get Connected
Allow serial cable or infrared connection to this COM port:
COM1
Status: COM port is available
Allow USB connection with this desktop computer.
Status: USB is available
Allow network (Ethernet) and Remote Access Service (RAS) server connection with this desktop computer.
Status: Network is available
Status icon
☑ Show status icon in Taskbar.
OK Cancel Help

Figure 2-12. Connection Settings



ActiveSync does not request the COM Port after disconnecting the TPS Controller/CE-based Total Station from the computer. The COM Port connects the computer with a TPS GPS+ receiver or Conventional/Robotic 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 (Figure 2-13), set the following parameter.
- 4. Click and enable the "Allow serial cable or infrared connection to this COM port"
- 5. Select the desired COM port from the drop-down list (usually COM 1).



Figure 2-13. Click Get Connected

*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.



Use separate COM Ports for computer-to-TPS controller (or CE-based Total Station) connections and computer-to-TPS Receiver/Conventional/Robotic Total Station connections.

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

### **Using Windows Explorer**

- 1. Follow the manufacturer's directions for connecting the computer and a TPS Controller.
- 2. Be sure (check) that Microsoft ActiveSync is installed on the computer and a successful computer-to-device connection is established. A system tray displays a green **ActiveSync circle**.
- 3. Open Windows Explorer and click the *Mobile Device* folder. The right panel of the window displays the contents of the TPS Controller (Figure 2-14).



Figure 2-14. Search for the (\*. tsv) file on the TPS Controller

- 4. To import the (\*.*tsv*) file(s) from the TPS Controller and to convert to the (\*.*tlsv*) file(s), copy the selected \*.tsv file(s) to the desired folder in which to save the downloaded file(s).
- When the process of sending the file(s) from the TPS Controller to the computer starts, the *Copy & Convert Progress* (Figure 2-15) window displays the import and conversion in progress.



Figure 2-15. Import and Conversion in Progress

6. The downloaded file(s) will be saved in the desired folder.

### **Using Topcon Link**

- 1. Follow the manufacturer's directions for connecting the computer and a TPS Controller.
- Be sure (check) that Microsoft ActiveSync is installed on the computer and a successful computer-to-device connection is established. A system tray displays a green ActiveSync circle.
- 3. Start Topcon Link, then click **File > Import from Device**.
- 4. Double-click the *Mobile Device* in the *Import from Device* window (Figure 2-16).



Figure 2-16. Import From Device

5. Select the folder where the (\*.*tsv*) file(s) is saved in the TPS Controller. To view file properties (Figure 2-17), right-click on the file and select *Properties* on the pop-up menu.

🚼 Import from Device			
ook in:  🔂	Jobs 🔹 🗢 🗈	<u>ش</u>	
🗿 from_tt_job	Select		
	Cut Copy		
	Create Shortcut Delete Rename		
	Properties		

<u>.</u>	from_tt_job2.tsv	I	
Type:	TopSURV SSCE datab	ase	
Location	\CF Card\TPS\TopSU	RV/Jobs	
Size:	1,43MB (1503232 byte	a)	
Modified	02.01.2004 10.5	51:20	
Attributes:	🗖 Read-only	Fidden	
	🔽 Archive	E System	

Figure 2-17. TopSURV File Properties

6. In the right panel of the *Import From Device* window, navigate to and select or create, the folder to save the files.

🔛 Import from Device			? 🔀
Look in: 🔄 Jobs 💽 🗲 💽 🕋		Look in: 🔄 Job	▼ ← 🗈 📸
	>>> <<	Compare Cad jobs.zip File1.txt GP5-TotalStation.tlsv GP5-TotalStation.tlsv.initial	🗿 points_d3.tlsv
1	Close		>

Figure 2-18. Select File

- 7. To import the (\*.*tsv*) file from the TPS Controller, to convert to the (\*.*tlsv*) file, or to save in the selected folder, press the double arrows.
- 8. When the process of sending the file from the TPS Controller to the computer begins, the Status bar displays the import progress.

### **Importing From Total Station**

When importing files from conventional or robotic Total Stations (TS), the file transfer will be initiated from the TS after connecting to the computer. Refer to the Topcon total station's manual for connecting the computer and a total station.

### **Using Windows Explorer**

1. Open Windows Explorer and click the *Topcon Total Stations* folder. The right panel of the window displays the '*Add New Station*' icon. To add a new device, right click this icon and select *Create Station* on the pop-up menu.



Figure 2-19. Creating a New Station in Windows Explorer

- 2. In the *General* tab of the *Create Station* dialog box, enter the following information and click **OK**.
  - Name enter a unique name for the device
  - Notes enter any necessary notes
  - Port select the COM Port the device connects to
  - Model and Software enter model number or software name
- 3. In the *Advanced* tab of the *Create Station* dialog box, enter the baud rate, parity, data bits, stop bits, and protocol used for communication with the TS (Figure 2-20).

<b>Create Station</b>	$\mathbf{X}$	<b>Create Station</b>		×
General Advar	nced	General Adva	nced	
Name	GPT_3005W	Baud Rate	9600	
Note	GTS-7 Raw format	Parity	None	
		Data Bits	8	
Port	COM1 💌	Stop Bits	1	
Model	GPT-3000 💌	Protocol	ONE-WAY	
	OK Cancel Apply		OK Cancel Apply	,

Figure 2-20. Total Station Properties

4. A new icon for the Total Station displays in the right panel (Figure 2-21), and a new sub-folder will be created in the *Topcon Total Stations* folder of Windows Explorer. To change the properties (communication parameters, name, model, and so on) for this Total Station, right-click on the icon and select *Properties* on the pop-up menu. The *Station Properties* dialog box for the Total Station is identical to the *Create Station* dialog box for the new Total Station.

Topcon Total Stations	Station properties
File Edit View Favorites Tools Help	Reneral Advanced
🔇 Back = 🕥 - 🎓 🔎 Search 💫 Folders	Name REF BODGW
Address 暮 Topcon Total Stations	Go Note
Folders X	
Yopcon Digital Levels     Add New     Gen	Pot COM1
B Topcon Total Stations Station Paste	Model GPT-3000
Wy Network Places     Create Station     Delete	
Kecyce bin     Kecyce bin     Properties     Properties	
< > >	UK Cancel Appy

Figure 2-21. Changing Total Station Properties

- 5. To import coordinates or a measurement file from this Total Station, double-click on the icon and *'file.txt'* will be copied to the folder where the downloaded file is saved.
- 6. Follow all the steps given in the *Download File From Total Station* (Figure 2-22) window to prepare the Total Station for importing the file. Select a desired file in the Total Station for downloading to the computer.
- Click the Start button on the *Download File From Total Station* (Figure 2-22) window. When ready to send the data, press the F3 key for "yes" to begin the process.



Figure 2-22. Importing a File From the Total Station

- 8. When the process of sending data from the Total Station to the computer begins, the status changes to "Downloading..." in the *Download File From Total Station* window.
- 9. The downloaded file is saved in the desired folder.

### **Using Topcon Link**

- 1. Start Topcon Link, then click **File > Import from Device**.
- 2. Double-click the *Topcon Total Stations* in the *Import from Device* dialog box (Figure 2-23).



Figure 2-23. Import From Device Window

3. To add a device, right click or double click the icon '*Add New Station*' and select *Create Station* (Figure 2-24) from the pop-up menu.



Figure 2-24. Creating a New Station

- 4. In the *General* tab of the *Create Station* dialog box, enter the following information and click **OK**.
  - Name enter a unique name for the device
  - Notes enter any necessary notes
  - Port select the COM Port the device connects to
  - Model and Software enter model number and software name
- 5. In the *Advanced* tab of the *Create Station* dialog box, enter the baud rate, parity, data bits, stop bits, and protocol used for communication with the TS.

Create Station		<b>Create Station</b>		×
General Adva	nced	General Adva	nced	
Name	GPT_3005W	Baud Rate	9600 💌	
Maka	GTS-7 Raw format	Parity	None	
Note		Data Bits	8	
Port	COM1	Stop Bits	1	
Model	GPT-3000	Protocol	ONE-WAY	
	OK Cancel Apply		OK Cancel Apply	

Figure 2-25. Total Station Properties

6. A new icon for the Total Station displays (Figure 2-26) in the *Import from Device* dialog box. To change the properties (communication parameters, name, model, and so on), right click on the icon and select *Properties* on the pop-up menu. The *Station Properties* dialog box for the Total Station is identical to the *Create Station* dialog box for the new Total Station.



Figure 2-26. Changing the Total Station Properties

- 7. In the right panel of the *Import From Device* dialog box (Figure 2-27), navigate to and select, or create, the folder in which to save the files.
- 8. To import coordinates or measurement file from the Total Station, double-click the icon and select '*file.txt*' and click the double arrows.



Figure 2-27. Select File

 Follow all the steps given in the *Download File From Total Station* dialog box (Figure 2-28 on page 2-17) to prepare the Total Station for importing files. Select a desired file in the Total Station for downloading to the computer.  Click the Start button on the *Download File From Total Station* (Figure 2-28) window. When ready to send the data, press the F3 key for "yes" to begin the process.



Figure 2-28. Total Station Instructions - Preparing for Import

11. When the process of sending data from the Total Station to the computer begins, the status changes to "Downloading..." in the *Download File From Total Station* dialog box.

### **Importing From Digital Level**

When importing files from a Digital Level (DL), the file transfer will be initiated from the DL after connecting to the computer. See the Topcon Digital Level's manual for connecting the computer and Digital Level.

#### **Using Windows Explorer**

1. Open Windows Explorer and click the *Topcon Digital Levels* dialog box (Figure 2-29). The right panel of the window displays the *Add New Digital Level* icon. To add a new device, right click this icon and select *Create Digital Level* on the pop-up menu.



Figure 2-29. Creating a New Digital Level

- 2. Click the *Create Digital Level* dialog box (Figure 2-30) and enter the following information.
  - name enter a name for the device
  - port enter a port to connect the device, usually COM
  - baud rate enter a baud rate to communicate with the DL
  - parity enter a parity to communicate with the DL

Create Digital L	evel		×
General			
Name:			_
Port	<b>-</b>	Baud rate: 9600	-
Parity:	_ न	,	_
Jeven			
[	OK	Cancel	Apply

Figure 2-30. Digital Level Properties

3. A new icon for the Digital Level displays (Figure 2-31) in the right panel, and a new sub-folder will be created in the *Topcon Digital Levels* folder of Windows Explorer. To change the properties (communication parameters, name, model, and so on) for this Digital Level, right-click on the icon and select *Properties* on the pop-up menu. The *Digital Level Properties* dialog box for the Digital Level is identical to the *Create Digital Level* dialog box for the new Digital Level.

<b></b>			Digital Level properties	1
Topcon Digital Levels File Edit View Favorites Back *  Topcon Digital Levels Address	Tools Help Search Poklers		General Name Pot: Band sele (COM1 = 9000 = Parky	
Folders	Add New Digital Level	Copy Paste Create Digital Level Delete Properties		Apply

Figure 2-31. Changing Digital Level Properties

- 4. To import a file from this Digital Level, double-click on the icon and 'file.dl' will be copied to the desired folder to save the downloaded file.
- 5. Follow all the steps given in the *Download File From Digital Level* window to prepare the Digital Level for importing files. Select a desired file in the Digital Level for downloading to the computer.



Figure 2-32. Start of File Import from the Total Station

6. When the process of sending data from the Digital Station to the computer begins, the status changes to "Downloading..." in the *Download File From Digital Level* window. The downloaded file is saved in the desired folder.

### **Using Topcon Link**

- 1. Start Topcon Link, then click **File ▶ Import from Device**.
- 2. Double-click the *Topcon Digital Levels* in the *Import from Device* dialog box (Figure 2-33).

🕷 Import from Device		? 🛛
Look in: 📳 My Compute 💌 🗲 💼 📂		Look in: 🖆 Digital level 💌 🖛 🛍 📸
Mobile Device		🖹 wt_N1_conv.txt
Topcon Receivers Topcon Total Stations	>>	
	<<	
		<
	Close	

Figure 2-33. Import From Device Window

3. To add a device, select *Add New Digital Level*, then select *Digital Level* on the pop-up menu (Figure 2-34).

🖁 Impor	t from Device		? 🛛
Look in: 🙀	🛊 Topcon Dig 🔻 🗲 💼		Look in: 🖆 Digital level 💌 듣 🖆
Add Ne	Select		wt_N1_conv.txt
	Create Digital Level Delete Properties Copy Paste	**	< >>
<i>p</i>		Close	

Figure 2-34. Creating a New Digital Level

- 4. Click the *Create Digital Level* dialog box (Figure 2-35) and enter the following information.
  - name enter a name for the device
  - port enter a port to connect the device, usually COM
  - baud rate enter a baud rate to communicate with the DL
  - parity enter a parity to communicate with the DL

Create Digital Level	$\mathbf{X}$
General	
Name:	
Port.	Baud rate: 9600 💌
Parity:	,
, _	
OK	Cancel Apply

Figure 2-35. Digital Level Properties

5. A new icon for the Digital Level displays (Figure 2-36 on page 2-21) in the *Import from Device* dialog box. To change the properties (communication parameters, name, model, and so on) for this Digital Level, right-click on the icon and select *Properties* on the pop-up menu. The *Digital Level Properties* dialog box for the Digital Level is identical to the *Create Digital Level* dialog box for the new Digital Level.

👫 Import from Device	Digital Level properties
Look in: Topcon Dig C Create Digital Level Create Digital Level Delete Create Digital Level Delete Copy Paste	General Name Costante Costante Costant Parte Costant Parte Even V
	OK Cancel Apply

Figure 2-36. Changing the Digital Level Properties

- 6. In the right panel of the *Import From Device* dialog box, navigate to and select, or create, the folder to save the files.
- 7. To import a file from this Digital Level to the computer, doubleclick on the icon. On the left panel of the *Import from Device* window select the file '*file.dl*' and click the double arrows.
- 8. Follow all the steps in the *Download File From Digital Level* dialog box (Figure 2-37) to prepare the Digital Level for importing the file. Select a file in the Digital Level for downloading to the computer.

Download	I file from Digital Level	
1. Push [S 2. Push [D 3. Push [E 4. Push [R mode, pus 5. If file co	ET] key and enter the set mode. GWN] key any times and select the file out. NT key. EC] key to start the file communication. If escape the file out h [ESC] key. mmunication finishes then the display return to file out.	~
File name:	DL-101C	
Status:	Waiting for start	
	Cancel	

Figure 2-37. Digital Level Instructions – Preparing for Import

 When the process of sending data from the Digital Station to the computer starts, the status changes to "Downloading..." in the *Download File From Digital Level* dialog box.

### Import from a Memory Card

To import data from a Memory Card to the computer insert, the receiver's memory card (SD card) with the label side down into the computer's SD card slot.

### **Using Windows Explorer**

 Open Windows Explorer and click the Topcon Memory Cards folder. If the SD card was formatted in the receiver's file system, the disk, which designates the Topcon Memory Card, will be displayed in red:

If the SD card was formatted in any other system, the icon of the

memory card will be displayed in gray: Topcon Memory Cards In this case, Topcon Link does not read files stored in the card.

2. Click the disk in the left or right panel of Windows Explorer. Topcon Link checks file system of this CD card and displays a list of \*.tps files (Figure 2-38).



Figure 2-38. Checking Topcon Memory Card

- 3. To import file(s) from the Topcon Memory Card to a folder on the computer, select the desired file(s) and copy them to the folder using the drag-and-drop method.
- 4. To format Topcon Memory Cards in the receiver's file system, right-click the disk in the left panel of Windows Explorer, select **Format** from the pop-up menu, and click **Ok** in the *Format flash card* window (Figure 2-39 on page 2-23).

	Format flash card 🛛 🔀
	Capacity 968.5 MB
Open Ht Format	File system v

Figure 2-39. Format Memory Card

#### **Using Topcon Link**

- 1. Start Topcon Link and open a job, then click **File → Import from Device**.
- 2. Click **Memory Card** in the *Import from Device* dialog box. If the SD card was formatted in the receiver's file system, the disk, which designates the Topcon Memory Card, will be displayed in red (Figure 2-40).
- 3. To view the collected raw files stored in the Memory Card, double-click the disk. A list of \*.tps files is displayed after checking the file system of this CD card.



Figure 2-40. Import From Memory Card

- 4. To import the file(s) from the Memory Card to the computer and to save them in the selected folder, highlight the desired file(s) and click the double arrows (Figure 2-41).
- 5. If the SD card was formatted in any other system, the icon of the memory card will be displayed in gray. In this case, Topcon Link does not read the files stored in the card. To format the Memory Card, double-click on the icon and click **Yes**.



Figure 2-41. Unformatted Memory Card

# **Exporting Files To Device**

The following sections describe exporting files from a computer (Figure 2-42).

- coordinate data files to a Conventional/Robotic Total Station
- any files to a TPS Controller
- an Option Authorization File (OAF) to a TPS GPS+ Receiver

Data can be exported to Topcon devices by using the Topcon Tools buttons in the toolbar. Three additional folders are created.

To export data to a Total Station or TPS Controller using Windows Explorer, click the appropriate folder.



Figure 2-42. Topcon's Devices Folders

### **Exporting to a TPS Controller**

- 1. Follow the manufacturer's directions for connecting the computer and a TPS Controller.
- 2. Check that Microsoft ActiveSync is installed on the computer and a successful computer-to-device connection is established. The system tray displays a green ActiveSync circle.

### **Using Windows Explorer**

1. Open Windows Explorer and click the *Mobile Device* folder. The right side of the window displays the contents of the Topcon Controller (Figure 2-43). Select the folder in the TPS Controller where the exported file will be saved, then select the desired file in the computer.



Figure 2-43. Selecting the Folder in the TPS Controller

- 2. To export a file from the computer to the TPS Controller, copy the file to the selected folder in the TPS Controller.
- 3. When exporting a TopSURV database file(s) from the computer to the TPS Controller, Topcon Tools converts (\*.tlsv) job files to the \*.tsv job format for TopSURV database files.

 In the process of sending the file(s) from the computer to the TPS Controller, the *Copy & Convert Progress* window displays (Figure 2-44) the export and conversion progress.

Copy & Convert to mobile device for	mat 🔀
<b>)</b>	
points_d3	
Converting (from 'TopSURV Access database	' to 'TopSURV SSCE database')
Copying (from desktop computer to 'Jobs')	
	Cancel

Figure 2-44. Export and Conversion Progress

### **Using Topcon Link**

- Start Topcon Link. To export information to the device, click File → Export to Device.
- 2. Double-click the *Mobile Device* in the right panel of the *Export* to *Device* dialog box (Figure 2-45). Select the folder in the TPS Controller where the exported file will be saved. In the left panel of the *Export to Device* window, select a file for export. Click the double arrows.

🐔 Export to Device				? 🗙
Look in: 🔁 Topcon Link Data 💌	🗢 🗈 💣		Look in: 🔄 Jobs	1
Base_TS _data File	🗿 0304GPS.		😚 from_tt_job2.tsv	
from_yser	👰 0304TS.tl:			
🗀 Jobs	🗿 0304TS.ts	>>		
🚞 test	🗿 1014C.tls			
🛅 tps_st&go_file	🖻 1014C.tls	11		
🛅 TS raw	ᅙ 1014C_ok	``		
👮 0304GP5.tlsv	👼 1123_GPS			
🗟 0304GPS.tlsv.initial	🛅 1199.pnt			
<	>			
		Close		

Figure 2-45. Export of the desired data to Device

## **Exporting to a Total Station**

See the Topcon Total Station's manual for connecting the computer and a total station.

### **Using Windows Explorer**

1. Open Windows Explorer. The *Topcon Total Stations* dialog box displays (Figure 2-46). To add a new device, right-click on the *Add New Station* icon, and select **Create Station** on the pop-up menu.



Figure 2-46. Creating a New Station in Windows Explorer

- 2. In the *General* tab of the *Create Station* dialog box (Figure 2-47 on page 2-29), enter the following information and click **OK**.
  - Name enter a unique name for the device
  - Notes enter any necessary notes
  - Port select the COM Port that the device connects to
  - Model and Software enter model name and software type
- 3. In the *Advanced* tab of the *Create Station* dialog box (Figure 2-47 on page 2-29), enter the baud rate, parity, data bits, stop bits, and protocol used for communication with the TS.

Create Station	ı 🛛	Create Station	1	X
General Adva	nced	General Adva	inced	
Name	GPT_3005W	Baud Rate	9600 💌	
	GTS-7 Raw format	Parity	None	
Note		Data Bits	8	
Port	COM1	Stop Bits	1	
Model	GPT-3000	Protocol	ONE-WAY	
				_
	OK Cancel Apply		OK Cancel App	y

Figure 2-47. Total Station Properties

4. A new icon for the Total Station displays (Figure 2-48 on page 2-29) in the right panel. A new sub-folder is created in the *Topcon Total Stations* folder of Windows Explorer. To change the properties (communication parameters, name, model, and so on) for this Total Station, right-click on the icon and select **Properties** on the pop-up menu. The *Station Properties* dialog box for the Total Station is identical to the *Create Station* dialog box for a new Total Station.

😂 Topcon Total Stations			Station p	properties
File Edit View Favorites Tools	Help	<b></b>	General	Advanced
🌀 Back 🔹 🌍 - 🎓 🔎	iearch 💫 Folders		Name	ISPT 3006W
Address 🛔 Topcon Total Stations		💌 🄁 Go	Note	
Folders ×				
🗉 🄹 Topcon Digital Levels 🛛 🔺			Port	C0M1 •
🛃 Topcon Receivers	Add New GPT 3 CODY		Model	CPT-2000
🖃 🎍 Topcon Total Stations	Paste			u=1-000
🔮 GPT 3005W				
🗉 🧐 My Network Places 👘 👘	Create Sta	ation		
😨 Recycle Bin	Delete			OK Carrol Arch
🗉 💈 My Bluetooth Places 🛛 🗸	Properties	N		OK Carter Assy
< >		45		

Figure 2-48. Changing the Total Station Properties

- 5. To export a coordinate file from the computer to the Total Station, copy the selected file to the Total Station.
- 6. Follow the instructions in the *Upload File(s) to Total Station* dialog box (Figure 2-49 on page 2-30) to prepare the Total Station for exporting the file.

 When ready to send the file, press the F3 key for "yes" on the Total Station. Click the Start button on the *Upload File(s) To Total Station* dialog box (Figure 2-49) to begin the process.



Figure 2-49. Exporting a Coordinate File to the Total Station

- 8. When the process of the sending data from the computer to the Total Station starts, the status changes to "Performing the transfer..." in the *Upload File(s) to Total Station* window.
- 9. The exported file is saved in the Total Station.

### **Using Topcon Link**

- 1. Start Topcon Link. To export a coordinate file to a Total Station, click **File → Export to Device**.
- Double-click the *Topcon Total Stations* in the right panel of the *Export to Device* dialog box, select the desired Total station and double click the icon (Figure 2-50 on page 2-31). In the left panel of the *Export to Device* window select a coordinate file for export.

😭 Export to Device				? 🔀
Look in: 🖆 Coordinate file 🔽 🗲 🗈 📸	-	Look in:	暮 GPT 3005W	👻 🛨 💌
b2002_cTS_7.pnt         cm_btlo_f11.csv         cm_up22.xyz         cm_from_3000.pnt         cm_from_at4_finland1_prj.csv	>>> <<	file1.	txt	
	Close			

Figure 2-50. Export From Device Window

- 3. Follow all the steps given in the *Upload File(s) to Total Station* dialog box (Figure 2-51) to prepare the Total Station for exporting file.
- 4. When ready to send the file, press the **F3** key for "yes" on the Total Station. Click the **Start** button on the *Upload File(s) To Total Station* (Figure 2-28) window to begin the process.



Figure 2-51. Exporting a Coordinate File to the Total Station

- 5. When the process of sending data from the computer to the Total Station starts, the status changes to "Performing the transfer..." in the *Upload File(s) to Total Station* window.
- 6. The exported file is saved in the Total Station.

# 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 the computer to a TPS receiver.

1. Open Windows Explorer and click the Topcon Receiver folder. The right panel of the window displays (Figure 2-52) and automatically begins searching for Topcon receivers connected to any of the computer ports (COM and USB).



Figure 2-52. Searching for Topcon Receivers in Windows Explorer

2. When finished, all receivers connected to computer ports will display (Figure 2-53). Right-click on the desired receiver and select the *Transfer options file* option.



Figure 2-53. Selecting 'Transfer Options File' option

3. On the *Open* dialog box, navigate to and select the OAF file for this TPS receiver, then click **Open**. The new receiver option will load onto the receiver and the **Option Manager** table will update (Figure 2-54 on page 2-33).

Ope	n					? 🛛
	Look in:	🗀 oaf-1		•	🗢 🗈 💣 🗉	•
N D	ty Recent ocuments	AEBQ3P6ZU	D0.tpo			
My	Documents					
Mj	y Computer					
м	Iv Network Places	File name: Files of type:	AEBQ3P6ZUD0 Topcon Options	).tpo : file (*.tpo; *.jpo)	• •	Open Cancel

Figure 2-54. Select OAF to Upload

# **Notes:**

# **Converting Files**

Topcon Link<sup>TM</sup> converts files from:

- Coordinate file formats:
  - Topcon Total Station (GTS-7, FC-4, 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)
  - TopSURV Coordinates
  - TDS (CR5)
  - Topcon XML Points (\*.xml)
  - Land XML Points (\*.xml)
- Measurement file formats from Topcon Total Station raw data formats (GTS-6, GTS-6 No Station Raw, GTS-7, GTS-7+, FC-5, GTS-210/310, Custom TSRaw)
- TS Raw Data Files
  - Land XML files (\*.xml)
  - Topcon XML files (\*.xml)
- TopSURV PC Job
- Topcon XML file format (XML)
- GPS Obs file
  - Topcon Vector
  - Custom Vector Format
  - TDS RW5 GPS Obs
  - Topcon XML GPS Obs
- GPS+ raw measurements file formats
  - RINEX
  - Compact RINEX

- TPD (Topcon Positioning Data)
- TPS / JPS
- TDS Raw Data Files
- Geoid file
- Localization file
- Road files
- Design (\*.tn3, \*.dwg, \*.dxf, \*.xml)
- Topcon DL Obs
- X-Section Template
- SHP file
- Code Library (\*.dbf, \*.tdd, \*.xml)

Topcon Link converts files to:

- Any coordinate file to:
  - Any other coordinate file
  - Topcon XML
  - TopSURV PC
  - DXF, DWG, LandXML
  - SHP
- Any measurement file to:
  - Any other measurement file
  - Any coordinate file
  - DXF, DWG, LandXML
  - SHP
  - Topcon XML
  - TopSURV PC
- TopSURV Job PC file to:
  - Any coordinate file
  - Any measurement file
  - SHP

- DXF, DWG, LandXML
- Topcon XML
- GPS Vector file
- Localization file (if the TopSURV file contains pairs of point coordinates in WGS84 and local system for each Control point)
- Cut Sheet file (if the TopSURV file includes Stakeout points)
- Any Road file (if the TopSURV file includes road data)
- An X-Section Template file (if the TopSURV file includes an X-section template)
- Topcon XML file to:
  - Any coordinate file
  - Any measurement
  - DXF, DWG, LandXML
  - SHP
  - TopSURV PC Job
- GPS+ TPS / JPS files and TPD files to
  - RINEX file
  - Compact RINEX file
- RINEX file to:
  - TPD file
  - Compact RINEX file
- Compact RINEX file to:
  - TPD file
  - RINEX file
- TSD Raw Data File containing measurement file from a Total Station:
  - Any coordinate file
  - Any measurement file
  - GIS (Shape, LandXML, DXF)
  - Topcon XML

- TopSURV PC Job
- TDS Raw Data File containing RTK data:
  - Any coordinate file
  - Any measurement file
  - DXF, DWF, LandXML
  - SHP
  - Topcon XML
  - TopSURV PC Job
  - Surface file
- Geoid file to Topcon Geoid file
- Localization file to TopSURV PC Job
- Surface file to DXF, DWG, LandXML, TopSURV PC Job
- Feature File to TopSURV PC Job file
- Road file to a TopSURV file or other road file format
- X-Section Template file to a TopSURV PC Job file or other x-section template file format
- DXF, DWG, LandXML
  - Any coordinate file
  - Any other DXF, DWG, LandXML file
  - TopSURV PC Job
  - Surface file
- 1. To convert a file from one format to another, click **File → Convert** to **File**. The *Convert File* dialog box displays (Figure 3-1).

👫 Convert	File			? ×
From		To		
Source:	· · · · · · · · · · · · · · · · · · ·	Destination:		<b>•</b>
File format	📲 GTS-7 Points (*.pnt;*.xyz)	File format	DXF files (*.dxf)	•
	Adv	anced options		
	Convert		Close	

Figure 3-1. Convert File Dialog Box

- The left panel displays the source file information.
- The right panel displays the destination file information after the conversion.

2. In the left panel, select file type (Figure 3-2).



Figure 3-2. File Format List

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

🚝 Open for I	Convert	<u>? ×</u>				
Look in:	🔁 Topcon Link Data					
b2002_GT	b2002_GT5_7.pnt					
Test.xvz	Latovihic					
File name:	Cont_data_GTS7.pnt					
Format name:	🗗 GTS-7 Points (*.pnt;*.xyz	)				
	Open	Cancel				

Figure 3-3. Open for Convert

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

1	B ℃ Convert File				
	From				
	Source:	:\TL_Data\Cont_data_GTS7.pnt 💌 🛛			

Figure 3-4. 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 3-5).



Figure 3-5. Select A File

7. Click **Advanced Options** to display further conversion parameters. Enter the desired information (Figure 3-6).

Convert File	<u>?×</u>		
From	То		
Source: C:\Topcon Link Data\Control_data1.c 💌	Destination: c:\topcon link data\cont_gis.shp 💌		
File format Name,N,E,Z,Code (*.csv)	File format Shape (*.shp)		
Adv 🗸	nced options		
Projection Alabama (East)	Coordinate type Lat, Lon, h		
Linear Unit USFeet	Projection Vone Custom.		
Orthometric Height	Datum NAD83 Custom.		
Control	Grid->Ground Parameters		
	Linear Unit USFeet		
	Geoid g1999u03 Ceoids List		
	Conthometric Height		
Convert	Close		

Figure 3-6. Convert File – Advanced Options

The left panel displays parameters and values used in the field operations. The right panel displays parameters and values after the conversion.

8. Click **Convert** in the *Convert File* dialog box to start the file conversion (Figure 3-6 on page 3-6).

Conversion operations depend on the format type of the source and the destination files. See "Converting Coordinate Files" on page 3-10 for specific conversion parameters information.

# **Creating a Custom Projection**

When converting data formats, you can use a projection from a predefined list or create a user-defined projection.

- 1. To create a user-defined projection, in the projection field of the *Convert File* dialog box, click **Custom**.
- 2. In the *Custom Projection List* dialog box, click Add (Figure 3-7).

Custom Projections List					
Name	Region	Datum	Note		
•					
Add	Re	move	Close		

Figure 3-7. Custom Projection List

- 3. In the *New Custom Projection* dialog box, enter the following information for the new projection (Figure 3-8 on page 3-8):
  - enter a new projection name
  - select a projection type
  - select the desired datum
  - enter the parameters of the user-defined projection
  - enter the region name and note
- 4. To add the user-defined projection to the list of projection, click **Ok**.

		-	Name	Projection_Name
📆 New Custom	Projection : Projection No	ne 🖊 🥐 🕻	Projection Type	Transverse-Mercator
General				Transverse-Mercator
Name				Lambert Double Sterographic
Projection Type	Transverse-Mercator		Ī	[
Name	Value		Name	Value
Central meridian	0°00'00.000		Central meridian	0°00'00.000
Scale	1		Scale	1
Latu	0°00'00.000		Lat0	0°00'00.000
Eastu (m)	0		East0	0
Norcio (III)	0		North0	0
Region			Note	
	/			
Note			Datum	WGS84
Datum OK	WGS84 -	Apply		SWBASE
				TOKYO_4 TOKYO_5 TRISTAÑ TWD67

Figure 3-8. Enter Custom Projection Parameters

## **Creating a Custom Datum**

When converting data formats you, can use a datum from a predefined list or create a user-defined datum.

- 1. To create a user-defined projection, in the datum field of the *Convert File* dialog box, click **Custom**.
- 2. In the *Custom Datums List* dialog box, click Add (Figure 3-9).

😴 Custom D	atums List		? ×
Name	Note	Ellipsoid	i D×
4			► ►
Add	ł	Remove	Close

Figure 3-9. Custom Projection List
- 3. In the *New Custom Datum* dialog box, enter the following information for the new projection (Figure 3-10).
  - enter the new datum name
  - select the desired ellipsoid
  - Enter the values of DX, DY, DZ, RX, RY, RZ and Scale (which are all zeros by default)



Figure 3-10. Enter Custom Datums Parameters



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

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

4. To add the user-defined projection to the list of projections, click **Ok**.

### **Converting Coordinate Files**

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

• The file format (Figure 3-11).



Figure 3-11. Coordinate File Formats

• In the left panel, enable *Orthometric Height* when the file uses orthometric heights (Figure 3-12).

Crthometric Height

Figure 3-12. Orthometric Height Checkbox

• In the left panel, enable *Control* to fix the coordinates of points when converting the file to a \*.tlsv file (Figure 3-13).

🔽 Control

Figure 3-13. Control Checkbox

• In the right panel, enable *Orthometric Height* to calculate orthometric heights for the converted points (Figure 3-14).

Orthometric Height

Figure 3-14. Orthometric Height

- In the right panel, set the Geoid model.
  - 1. Click Geoids List (Figure 3-15).

Geoids List...

Figure 3-15. Geoids list button

2. On the *Geoids List* dialog box, click Add (Figure 3-16).

🚰 Geoids I	List			? ×
Name	Path	Minimum Latitude	Minimum Longit	
				Add
L				
				Remove
L				
L				Liose
•			Þ	

Figure 3-16. Geoids List Dialog Box

3. Select the desired \*.bin file in *Open* dialog box and click **Open** (Figure 3-17).

File name:	"g2003u02.bin" "g1999u02.bin" "g1999u03.bin" "g2003u01.bin" "g1999u01.bin"
Format name:	All files (*.*)
[	Open Cancel

Figure 3-17. Open window

4. Click **Close** (Figure 3-18).

Name	Path	Minimum Latitude	Minimum	
🥵 g1999uO1	E:\geoid\g19	40°00'00.000N	130°0(	Add
🥵 g1999uO2	E:\geoid\g19	40°00'00.000N	113°00	
🥬 g1999uO3	E:\geoid\g19	40°00'00.000N	96°0(	
🥵 g2003u01	E:\geoid\g20	40°00'00.000N	130°0(	
🥵 g2003u02	E:\geoid\g20	40°00'00.000N	113°0(	Remove
				Close

Figure 3-18. Geoids List

• In the right panel, select a geoid model (Figure 3-19).

Geoid	
	g1999u01 g1999u02 g1999u03 g2003u01 g2003u02

Figure 3-19. Select Geoid Model

#### **TopSURV Coordinates and Custom Text Format Parameters**

To convert TopSURV Coordinates or Custom Text formats, select the following.

• A projection name for the coordinate type (Figure 3-20).



Figure 3-20. Projection List

• Or a Datum for Lat,Lon,H coordinate type (Figure 3-21).

Datum	NAD83
Datum	NAD83 NAD83 WG584 ADINDAN ADINDAN ADINDAN_B ADINDAN_C ADINDAN_C ADINDAN_C ADINDAN_E
	ADINDAN F ADINDAN_M AFG AGD84

Figure 3-21. Datum List

• Linear units (Figure 3-22).



Figure 3-22. Linear Units List

#### Name,Lat,Lon,H,Code Format Parameters

To convert Name,Lat,Lon,H,Code formats, select the following:

• Datum (Figure 3-23).

Datum	NAD83
	NAD83
	WGS84
	ADINDAN
	ADINDAN_A
	ADINDAN_B
	ADINDAN_C
	ADINDAN_D
	ADINDAN_E
	ADINDAN_F
	ADINDAN_M
	AFG
	AGD84

Figure 3-23. Datum List

• Linear units (Figure 3-24).

Linear Unit	Meters	<b>-</b>
	IFeet	ľ
	Meters	N
	USFeet	hà l

Figure 3-24. Linear Unit List

#### Other Coordinate File Types Format Parameters

To convert GTS-7 Points, FC-4, 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 3-25).

Projection	🖷 Alabama (East)	-
	🕀 🖷 Middle East	
		_
	🚊 🖷 North America	
	😥 📲 Minnesota	
	由 番 SPC27	
	□	
	Alabama (East)	
	Alabama (West)	•

Figure 3-25. Projection List

• Linear units (Figure 3-26).



Figure 3-26. Linear Unit List

When converting from (the left panel) GTS-7 Points, FC-4, 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 3-27).



#### Figure 3-27. For Ground Coordinate Type, Enable Grid->Ground Parameters

- 2. Click the Grid to Ground Parameters button.
- 3. Enter the applicable transformation parameters (Figure 3-28).

🖑 Grid->Ground	Parameters		? ×
Scale Factor			
Scale Factor		-	
Avg Job Height (m)	0		
Scale Factor	<b>I</b>		
Mapping Scale	1		
Northing Offset (m)	0		
Easting Offset (m)	0		
Azimuth Rotation	0°00'00.0000		
OK		Cancel	

Figure 3-28. Grid to Ground Parameters

Depending on the set of known data, the transformation parameters can be computed in two modes:

- using the Control points' average height
- using the scale factor
- 4. Click OK.

When converting to (the right panel) GTS-7 Points, FC-5 Points, GTS-210/310-10 Points, and GTS-210/310-12 Points file formats, a coordinate file that contains Ground coordinates is created. To convert Ground coordinates to Grid coordinates, see the above procedure.

## **Converting a TopSURV PC Job**

If converting a TopSURV file, specify the following parameters in left/right panels.

In the left panel,

F

• the File Format (Figure 3-29).

ile format	P TopSURV PC Job (*.tlsv)
	⊟ All files (*.*)
	😟 📳 Code Library (*.dbf;*.tdd;*.xml)
	E - P Coordinates (*.txt;*.xml;*.cr5;*.csv;*.xyz;*.fc4;*.pnt;*.fc5;*.*)
	😟 👘 Cut Sheet (*.csu;*.css)
	😥 🖶 Design (*.TN3;*.xml;*.dwg;*.dxf)
	Topcon Geold files (*.gff)
	i
	庄 👘 GPS+ Raw Data (*.tpd;*.??O;*.??G;*.??N;*.??D)
	Localization GC3 (*.gc3)
	Roads (*.rd3;*.rd5;*.hal;*.plt;*.ali;*.thl;*.vgp;*.xml)
	TopSURV PC Job (*.tlsv)
	IS Obs (*.sht;*.xml;*.raw;*.dat;*.fc5;*.gts;*.gt6;*.gts6;*.gts7;*.gt7;*.*)

Figure 3-29. File Format List

In the right panel,

• the File format (Figure 3-30).

File format	TopSURV PC Job (".tisv)
	⊕ Gode Library (*.dbf;*.tdd;*.xml)
	Coordinates (*.txt;*.xml;*.cr5;*.csv;*.xyz;*.fc4;*.pnt;*.fc5;*.*)
	🗓 📲 Cut Sheet (*.csu;*.css)
	E Pesign (*.TN3;*.xml;*.dwg;*.dxf)
	Topcon Geoid files (*.gff)
	GP5 Obs (*.xml;*.tvf;*.*)
	GPS+ Raw Data (*.tpd;*.??O;*.??G;*.??N;*.??D)
	Roads (*.rd3;*.rd5;*.hal;*.plt;*.ali;*.thl;*.vgp;*.xml)
	Topcon XML (*.xml)
	TS Obs (*.sht;*.xml;*.raw;*.dat;*.fc5;*.gts;*.gt6;*.gts6;*.gts7;*.gt7;*.*)
	X-Section Templates (*.tp5;*.xtl;*.xst;*.xml)

Figure 3-30. File Format List

• the Projection type (Figure 3-31).



Figure 3-31. Projection List

- the relation between the Grid and Ground coordinates:
  - 1. Click and enable the *Grid->Ground Parameters* check box (Figure 3-32).

Grid->Ground Parameters

#### Figure 3-32. For Ground Coordinate Type, Enable Grid->Ground Parameters

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

🖶 Grid->Ground	Parameters		<u>?</u> ×
Scale Factor			
Scale Factor		-	
Avg Job Height (m)	0		
Scale Factor	<b>I</b>		
Mapping Scale	1		
Northing Offset (m)	0		
Easting Offset (m)	0		
Azimuth Rotation	0*00'00.0000		
OK		Cancel	

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

Depending on the set of known data, the transformation parameters can be computed in two modes:

- the Control points' average height
- the scale factor
- the Linear units (Figure 3-34)



Figure 3-34. Linear Units List

• the Angular units (Figure 3-35)



Figure 3-35. Angular Units List

- Set the Geoid model.
  - 1. Click Geoids List.
  - 2. On the *Geoids List* dialog box, click Add (Figure 3-36).

🚝 Geoids	List			<u>?</u> ×
Name	Path	Minimum Latitude	Minimum Longit	
<u> </u>				Add
L				Bomoura
				Tienlove
L				Close
1		- I	Þ	
J				

Figure 3-36. Geoids List Dialog Box

3. Select the desired \*.bin file in the *Open* dialog box and click **Open** (Figure 3-37).

File name:	"g2003u02.bin" "g1999u02.bin" "g1999u03.bin" "g2003u01.bin" "g1999u01.bin"
Format name:	All files (*.*)
	Open Cancel

Figure 3-37. Open Window

4. Click **Close** (Figure 3-38).

Name	Path	Minimum Latitude	Minimum	
🦻 g1999uO1	E:\geoid\g19	40°00'00.000N	130°0(	Add
🞐 g1999u02	E:\geoid\g19	40°00'00.000N	113°0(	
🦻 g1999u03	E:\geoid\g19	40°00'00.000N	96°0(	
🦻 g2003u01	E:\geoid\g20	40°00'00.000N	130°00	
🦻 g2003u02	E:\geoid\g20	40°00'00.000N	113°0(	Remove
				Close

Figure 3-38. Geoids List

• Select the geoid model (Figure 3-39).

Geoid		•
	g1999u01 g1999u02 g1999u03 c2002u01	
	g2003u02	

Figure 3-39. Select Geoid Mode

• Set the order of the coordinates (Figure 3-40).



• Select the Coordinate type (Figure 3-41).

Coordinate type	Datum Lat, Lon, Ell.H	-
1	Ground	
	Grid	
	Datum Lat, Lon, Ell.H	
	WGS84 Lat, Lon, Ell.H	
	Datum Lat, Lon, Elevation	

Figure 3-41. Coordinate Type 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 3-42).



Figure 3-42. File Format List

• the Projection type (Figure 3-43).



Figure 3-43. Projection List

- the relation between the Grid and Ground coordinates
  - 1. Click and enable the *Grid->Ground Parameters* check box (Figure 3-44).



#### Figure 3-44. For Ground Coordinate Type, Enable Grid->Ground Parameters

- 2. Click the Grid to Ground coordinates button.
- 3. On the *Grid->Ground Parameters* dialog box, enter the transformation parameters (Figure 3-45).

dig Grid->Ground	Parameters		<u>?</u> ×
Scale Factor			
Scale Factor		•	
Avg Job Height (m)	0		
Scale Factor	1		
Mapping Scale	1		
Northing Offset (m)	0		
Easting Offset (m)	0		
Azimuth Rotation	0*00'00.0000		
OK		Cancel	

Figure 3-45. Grid->Ground Parameters Dialog Box

Depending on the set of known data, the transformation parameters can be computed in two modes:

- the Control points' average height
- the scale factor
- the order of the coordinates (Figure 3-46).



Figure 3-46. Coordinate Order List

In the right panel,

• the File format (Figure 3-47).



Figure 3-47. File Format List

• the Projection type (Figure 3-48).

Projection	None None	•
	🗉 🖷 Australia	
	🗄 🚟 Europe	
	🖅 🖽 Middle East	
	🗄 🖷 North America	
	🖻 🏣 South America	
	🗉 🎟 UPS	
	i - 囁 UTMNorth	
	🗄 🎟 UTMSouth	_
	Land .	•

Figure 3-48. Projection List

- the relation between the Grid and Ground coordinates:
  - 1. Click and enable the *Grid->Ground Parameters* check box (Figure 3-49).

Grid->Ground Parameters

Figure 3-49. For Ground Coordinate Type, Enable Grid->Ground Parameters

2. Click the **Grid to Ground coordinates** button.

3. On the *Grid->Ground Parameters* dialog box, enter the transformation parameters (Figure 3-50).

dig Grid->Ground	Parameters	<u>?</u> ×
Scale Factor		
Scale Factor		-
Avg Job Height (m)	0	
Scale Factor	<b>I</b>	
Mapping Scale	1	
Northing Offset (m)	0	
Easting Offset (m)	0	
Azimuth Rotation	0°00'00.0000	
OK		Cancel

Figure 3-50. Grid->Ground Parameters Dialog Box

Depending on the set of known data, the transformation parameters can be computed in two modes:

- the Control points' average height
- the scale factor
- the Linear units (Figure 3-51).



Figure 3-51. Linear Units List

• the Angular units (Figure 3-52).

Ar

ngular Unit	DMS	-
	DMS Gons	
	Radians	

Figure 3-52. Angular Units List

• the Coordinate order (Figure 3-53).

Coordinate order	Northing,Easting,Height	•
	Northing,Easting,Height Easting,Northing,Height	

Figure 3-53. Coordinate Order List

#### **Converting to Custom TSRaw Format**

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

1. Select the file format in the right panel (Figure 3-54).



- Figure 3-54. Select TSRaw File Format
- 2. Enter other desired settings (see "Converting Total Station Raw Data Files" on page 3-18 for details). Press **Convert**.
- 3. On the *TSRaw custom format properties* dialog box, select the desired delimiter (Figure 3-55).
- Select the elements to include in the format from the left column and click the move right button (>>) to add it to the right column (Figure 3-55). Use the move left button (<<) to remove elements from the format.
- 5. To arrange included elements, select an element in the right column and use the **Move Up/Move Down** buttons.
- 6. Enter the format name and the format's file extension.



Figure 3-55. Select Delimiters and Add Elements

7. Click **OK** to export the selected file to the created TSRaw file format. Topcon Link will store this format description in the Formats folder.

## **Converting Topcon XML Files**

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

• Select the File format (Figure 3-56).

File format	📲 Topcon XML (*.xml)

Figure 3-56. File Format List

If the Topcon XML file contains *Ground* or *Grid* coordinate types, set the Projection, Linear unit, and Angular unit (Figure 3-57).



Figure 3-57. Projection, Linear Unit, Angular Unit Lists

If the Topcon XML file contains the *Lat,Lon,H* coordinate type, set the Datum, Linear unit, and Angular unit (Figure 3-58).

Datum	NAD83		•	
	NA083 WGS84 ADINDAN ADINDAN_A ADINDAN_B ADINDAN_C ADINDAN_C ADINDAN_E ADINDAN_F ADINDAN_M AFG	Linear Unit	Meters IFeet Meters USFeet	<b>▼</b> k
	AGD84 Angular Unit	DMS		
		DMS Gons Mils Badian	2	

Figure 3-58. Datum, Linear Unit, and Angular Unit Lists

- For Ground coordinates enter the relation between the *Grid* and *Ground* coordinates:
  - 1. Click and enable the *Grid->Ground Parameters* check box (Figure 3-59).

	Coordinate tune	Ground	-	-
ľ	coordinate type	La round	•	Grid->Ground Parameters

Figure 3-59. For Ground Coordinate Type, Enable Grid->Ground Parameters

- 2. Click the Grid to Ground coordinates button.
- 3. On the *Grid->Ground Parameters* dialog box, enter the transformation parameters (Figure 3-60).

dig Grid->Ground	Parameters		<u>?</u> ×
Scale Factor			
Scale Factor		-	
Avg Job Height (m)	0		
Scale Factor	<b>I</b>		
Mapping Scale	1		
Northing Offset (m)	0		
Easting Offset (m)	0		
Azimuth Rotation	0°00'00.0000		
OK		Cancel	

Figure 3-60. Grid->Ground Parameters Dialog Box

Depending on the set of known data, the transformation parameters can be computed in two modes:

- the Control points' average height
- the scale factor

#### **Converting Design Files**

If converting LandXML, DWF, DWG, or TN3 (Surface) files, select the correct file format in the left/right panel (Figure 3-61).



Figure 3-61. File Format List

### **Converting Localization Files**

If converting a Localization file, select the correct file format in the From panel (Figure 3-62).

File format	Localization Files (*.GC3)
	□         □
	Figure 3-62. File Format List

In the right panel,

• Select the file format (Figure 3-63).



Figure 3-63. Format List

• Specify linear units (Figure 3-64).



Figure 3-64. Linear Unit Lists

### Converting GPS+ Raw Data Files

If converting a GPS+ Raw Data file (TPS, JNS, RINEX, Compact RINEX, TPD), select the correct file format in the *From* panel (Figure 3-65).



Figure 3-65. File Format List

### **Converting to SHP Files**

If converting a SHP file, specify the following parameters in the left panel.

• Select the file format (Figure 3-66).



• Set the Projection and Linear units (Figure 3-67).

Projection	Alabama (East)		•	
	None	Linear Unit	Meters	•
	More Annesota     Press SPC27		IFeet Meters UISEeet	
	SPC83 Alabama (East Alabama (Wes	) <b>()</b>		
	Alaska (Zone 1	.) IN	-	

Figure 3-67. Projection and Linear Unit Lists

• For Ground coordinates, set the relation between the Ground coordinates and Grid coordinates. See steps 1 through 3 on page 3-24 for this procedure.

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

• Select the file format (Figure 3-68).



Figure 3-68. File Format List

• Set the Projection and Linear units (Figure 3-69).



Figure 3-69. Projection and Linear Unit Lists

- For Ground coordinates, set the relation between the Ground coordinates and Grid coordinates. See steps 1 through 3 on page 3-16 for this procedure.
- Enable *Orthometric Height* to calculate orthometric heights for the converted points (Figure 3-70).

Figure 3-70. Orhtometric Height

• Enable export of points without codes to the created file and export of linework named vertices as points to the created file (Figure 3-71).

Export points without code

Figure 3-71. Enable Point/Linework Export

- If needed, open a geoid model.
  - 1. Click Geoids List.
  - 2. On the *Geoids List* dialog box, click Add (Figure 3-72).

🚝 Geoids	List			<u>? ×</u>
Name	Path	Minimum Latitude	Minimum Longit	
				Add
				Remove
L				
				Close
•	1		Þ	

Figure 3-72. Geoids List Dialog Box

3. Select the desired \*.bin file in *Open* dialog box and click **Open** (Figure 3-73).

File name:	"g2003u02.bin" "g1999u02.bin" "g1999u03.bin" "g2003u01.bin" "g1999u01.bin"
Format name:	All files (*.*)
	Open Cancel

Figure 3-73. Open Window

4. Click **Close** (Figure 3-74).

🐔 Geoids List				<u>? ×</u>
Name	Path	Minimum Latitude	Minimum	
🥵 g1999u01	E:\geoid\g19	40°00'00.000N	130°0(	Add
🥵 g1999u02	E:\geoid\g19	40°00'00.000N	113°00	
😰 g1999u03	E:\geoid\g19	40°00'00.000N	96°0(	
🥵 g2003u01	E:\geoid\g20	40°00'00.000N	130°00	1
😰 g2003u02	E:\geoid\g20	40°00'00.000N	113°0(	Remove
				Close
•			►	

Figure 3-74. Geoids List

• Select a geoid model (Figure 3-75).



Figure 3-75. 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 3-76).



Figure 3-76. File Format List

### Converting to RINEX/Compact RINEX GPS+ Raw Data Files

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

• Select the File format (Figure 3-77).

File format	Compact RINEX (*.??D,*.??G,*.??N)	•
	⊡ĒAll files (*.*)	
	📴 🚰 GPS+ Raw Data (*.tpd;*.??O;*.??G;*.??N;*.??D)	

Figure 3-77. File Format List

- Click **GLONASS** to include or exclude raw GLONASS data measurements/ephemeris data (Figure 3-78).
- Click L1 and/or L2 to include or exclude L1 or L2 raw data measurements (Figure 3-78). If both fields are disabled (unchecked), Topcon Link creates only a navigational file (\*.0?o).

•	GLONASS
☑	L1
☑	L2

Figure 3-78. RINEX/Compact RINEX Advanced Options – Enabled

### **Converting Geoid Files**

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

File format	🖆 Geoid File (*.byn;*.bin;*.rgm;s*.dat;*.glc;*.01;*.gft;*. 💌
	⊡ 🗗 All files (*.*)
	Coordinate File (*.txt;*.CR5;*.csv;*.xyz;*.fc4;*.pnt;*.fc5;*.*)
	庄 📲 DTM File (*.dxf;*.dwg;*.TN3)
	😑 📄 Geoid File (*.byn;*.bin;*.rgm;s*.dat;*.glc;*.01;*.gff;*.jff;*.geo;Swen*L.grd;g*.
	Canadian Geoid Files (*.byn;*.bin)
	GeoidDenmark Files (*.01)
	Global Geoid File (*.glc)
	Regional Geoid Model Files (*.rgm)
	Topcon Geoid files (*.gff;*.jff)

Figure 3-79. Geoid File Format

### Converting to 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 3-80).



Figure 3-80. Geoid File Format

• Specify positions for the points limiting the use of this geoid model (Figure 3-81).

Minimum Latitude	30 40 55
Minimum Longitude	22 33 44
Maximum Latitude	34 40 55
Maximum Longitude	24 33 44
	Close

Figure 3-81. Point Limits

NOTE: Enter latitudes and longitudes in the following format (Figure 3-82).

dd° mm' ss''

Figure 3-82. Latitude and Longitude Format



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

### **Converting Code Library Files**

If converting a Code Library file, select the correct file in the *From* and *To* panels (Figure 3-83).

File format	🖻 Feature File (*.tdd)
	□       □

Figure 3-83. Feature File Format

### **Converting to GPS Observation** Files

A TopSURV PC Job can be converted to any GPS Obs file.

#### **Converting to GPS Observation Files**

If converting to a Topcon Vector format, in the *To* panel, select the file format and set linear units (Figure 3-84).

File format	E LandXML GPS Obs (*.xml)			
	All Files (*.*)     G = P Obs (*.xml)     Custom Text Format (*.*)     G = Custom Text Format (*.*)     G = Custom Text Format (*.*)     G = Custom Text Format (*.*)     Topcon Vectors (*.kvf)     Topcon Vectors (*.kvf)     Topcon XML GPS Obs (*.xml)	Linear Unit	Meters IFeet Meters USFeet	

Figure 3-84. GPS Vector File Format and Linear Units

See Appendix C for more details.

#### **Converting to Custom Vector Files**

To create an arbitrary text Vector File, take the following steps:

1. Set the File format and linear units (Figure 3-85).



Figure 3-85. Custom Vector File Format and Linear Units

- 2. Press Convert.
- 3. On the *Custom vector format properties* dialog box, select the *Delimiters* from the drop-down lists (Figure 3-55 on page 3-22).
- Select the elements to include in the format from the left column and click the move right button (>>) to add it to the right column (Figure 3-55 on page 3-22). Use the move left button (<<) to remove elements from the format.

5. To arrange included elements, select an element in the right column and use the **Move Up/Move Down** buttons.

Con	mma 🔽
Comma	o nicolon
Elevation Point From dN Point To dE dH >> dK' dY	Custom vector format properties
Cov(X/Z)         SigmaX           Cov(Y/Z)         SigmaY           Start Time         SigmaY           Duration         Cov(X/Y)           Method         Cov(X/Y)	Lomma Distance Azmuth A
Vet. Precision	db         kg         dL           dH         SigmaX         SigmaX           Cov(K2)         SigmaZ         Cov(K2)           SigmaX         Cov(K2)         Cov(K2)
File extension	Duration Method Solution Type
-	Format name My_GPS_Vector File extension * txt
	OK Cancel

Figure 3-86. Select Delimiters and Add Elements

6. Click **OK** to export the selected file to the created GPS vector file format. Topcon Link will store this format description in the Formats folder.

#### **Converting Cut Sheet Files**

You can convert a TopSURV PC Job, to a Cut Sheet Standard File and to a Cut Sheet User Defined File.

#### **Creating Cut Sheet Standard Files**

In converting to Cut Sheet Standard File, set the following parameters in the *To* panel.

• Select the File format (Figure 3-87).

File format	Cut Sheet Standard files (*.css)
	□ 🗗 All files (*.*)
	Coordinate File (*.txt;*.CR5;*.ttt;*.csv;*.xyz;*.fc4;*.pnt;*.fc5;*.*)
	E Cut Sheet File (*.csu;*.css)
	Cut Sheet Standard files (*.css)
	- Cut Sheet User Defined files (*.csu)

Figure 3-87. Cut Sheet File Format

• Select the Coordinate type (Figure 3-88).

Coordinate type	Grid
	Ground Grid
	Lat, Lon, h

Figure 3-88. Coordinate Type List

• If Ground or Grid coordinate type is selected, set the Projection and Linear unit (Figure 3-89).

Projection	🖷 Alabama (East)	•	
	Middle East None North America Minnesota SPC27 Minnesota SPC83 Alabama (West) Alabama (West) Alabama (Cone 1)	ear Unit Meters IFeet Meters USFeet	L k

Figure 3-89. Projection and Linear Unit Lists

• If the *Lat,Lon,H* coordinate type is selected, set the Datum and Linear units (Figure 3-90).

Datum	NAD83		•	
	NAD83 WGS84 ADINDAN ADINDAN_A			
	ADINDAN_B ADINDAN_C ADINDAN_D	Linear Unit	Meters IFeet	
	ADINDAN_E ADINDAN_F		USFeet	k
	ADINDAN_M AFG AGD84		v	

Figure 3-90. Datum and Linear Unit Lists

- If Ground coordinates selected (Figure 3-50 on page 3-21), enter the relation between the Grid and Ground coordinates:
  - 1. Click and enable the *Grid->Ground Parameters* check box (Figure 3-91).

Coordinat	e tune	Ground	-	1
Coordinat	o gpc	landana		Grid->Ground Parameters

Figure 3-91. For Ground Coordinate Type, Enable Grid->Ground Parameters

2. Click the Grid to Ground coordinates button.

3. On the *Grid->Ground Parameters* dialog box, enter the transformation parameters (Figure 3-92).



Figure 3-92. Grid->Ground Parameters Dialog Box

Depending on the set of known data, the transformation parameters can be computed in two modes:

- using the Control points' average height
- using the scale factor
- Set linear units (Figure 3-93).



Figure 3-93. Linear Units List

• Enable *Orthometric Height* to calculate orthometric heights for the converted points (Figure 3-94).

Orthometric Height

Figure 3-94. Orthometric Height

- Set the Geoid model.
  - 1. Click Geoids List.
  - 2. On the *Geoids List* dialog box, click Add (Figure 3-95).

🖬 Geoids List			<u>?</u> ×	
Name	Path	Minimum Latitude	Minimum Longit	
				Add
				Bemove
				Close
•			Þ	

Figure 3-95. Geoids List Dialog Box

3. Select the desired \*.bin file in *Open* dialog box and click **Open** (Figure 3-96).

File name:	"g2003u02.bin" "g1999u02.b	in" "g1999u03.bin" "g2003u01.bin"	"g1999u01.bin"
Format name:	All files (*.*)		•
	Open	Cancel	

Figure 3-96. Open window

4. Click Close (Figure 3-97).

Name	Path	Minimum Latitude	Minimum	
🥵 g1999uO1	E:\geoid\g19	40°00'00.000N	130°0(	Add
🞐 g1999uO2	E:\geoid\g19	40°00'00.000N	113°0(	
👎 g1999uO3	E:\geoid\g19	40°00'00.000N	96°0(	
🥵 g2003u01	E:\geoid\g20	40°00'00.000N	130°00	-
🏓 g2003u02	E:\geoid\g20	40°00'00.000N	113°0(	Remove
				Close

Figure 3-97. Geoids List

• Select a geoid model (Figure 3-98).

Geoid	
	g1999u01 g1999u02 g1999u03 g2003u01 g2003u02

Figure 3-98. Select Geoid Model

#### Creating a Cut Sheet User Defined File

To create an arbitrary Cut Sheet File, take the following steps:

1. Set the File format (Figure 3-99).



Figure 3-99. Cut Sheet User Defined File Format

- 2. Enter the desired settings (see "Creating Cut Sheet Standard Files" on page 3-34).
- 3. Press Convert.

- 4. In the *Cut Sheet User Defined format properties* dialog box, enter the file's parameters (Figure 3-100).
  - Delimiters the separating character type; either Comma, Space, Tab, Semicolon, Tilde, Exclamation, Percent, Bar, Asterisk, or Cap.
  - Design point coordinates, stake out point coordinates, differences between these coordinates, offset direction, offset distance etc.
    - Use the Move Right button (>>) to move selected entries from the left field to the right field. The order of names in the right field must correspond to the order of names in the created file.
    - Use the Move Left button (<<) to move entries out of the right panel
    - Use **Move Up** and **Move Down** to move names in the right panel up and down.





5. Click **Ok**. Topcon Link will store the user-defined format description in the Formats folder.

### **Converting Road and X-Section Templates File**

If converting a Road file and X-Section Templates file, set the following parameters in the *From* and *To* panels.

Select the correct file format in the *From* and *To* panel (Figure 3-101).



Figure 3-101. Road File Format

# **Notes:**

# **Maintaining Files**

The following sections discuss opening, viewing, and editing files.

# **Opening Files**

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

- Coordinate file formats:
  - Topcon Total Station (GTS-7, FC-4, 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)
  - TopSURV Coordinates
  - TDS (CR5)
- Measurement file formats from Topcon Total Stations (GTS-6, GTS-6 No Station, Custom, GTS-7, GTS-7+, FC-5, GTS-210/ 310)
- TopSURV file format (TopSURV files)
- Code Library file
- 1. To open a file, click **File ▶ Open File**.
- 2. To select the file format, use the *Format name* drop-down list select the file format, if known (Figure 4-1).



Figure 4-1. File Format

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

Selecting an incompatible file name and file format displays an error message (Figure 4-2). Select the correct file name or format and repeat the process.



Figure 4-2. Unknown File Format Error Message

#### **Creating User-defined File Formats**

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

1. In the *Open* or *Save as* 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 4-3). Click **Open/Save**.

File name:	user_format.tst					
Format name:	Custom Text Format (*.*)					
Advanced options						
	Open	Cancel				

Figure 4-3. Custom Text Format

- 2. In the *Custom format properties* dialog box, enter the file's parameters (Figure 4-5 on page 4-3).
  - Delimiters enter either a Comma, Space, Tab, or Semicolon.
  - Coordinate system Grid, Ground, or BLH (Lat Lon Format for BLH coordinate system).
  - Coordinate order, codes, notes and fullcodes.
  - Select the desired entry (names, coordinates, codes, notes and FullCodes), 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 to 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.
- Select which FullCodes (Figure 4-4) are used in the file to be opened:



Figure 4-4. FullCodes Structures

• Enter the format name and the format's file extension.

🔑 Custom fo	rmat properties	?×				
Delimiters	Comma	-				
Coordinate syste	m Grid	•				
Code Note FullCodes Northing Easting Height	>> Point	Number Move Up				
	<<	Move Down				
Ignore first line FullCodes include Code, String and ControlCode FullCodes include Code and Attribute						
Format name FullCode_Coord_ENH						
File extension *.txt						
OK Cancel						

Figure 4-5. 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 4-6 on page 4-4).



Figure 4-6. Format Name Stored in File Format List

• Open the selected file.

NOTE the following:

- 1. Points Number should always exist in the right panel.
- 2. Depending on the type of codes included in the custom format, select the desired option.
  - For fullcodes that contain codes, strings and control codes, use the string code shown in Figure 4-7.

#### Figure 4-7. Example of Coordinate File Format Including Codes, String and Control Code

 After importing this coordinate file to a job, the following information will be displayed (Figure 4-8) at this point in the *Cad* tab.

▲ Properties : Point 1								
General Coordinates CAD Adjust			ent   String   Quality co	ntrol				
Codes								
Code	String	Control Code	Attribute	Value				
• 20	lamp	corner						
• 30								
<		>						
OK Cancel Apply								

Figure 4-8. Point Properties - CAD tab
• Figure 4-9 shows fullcodes that contain codes and attributes.

P1,660.343,257.340,180.903, Base station: Hiper\_H\_Vert\_1\_58.TEXT = "",

#### Figure 4-9. Coordinate File Format Including Code and Attribute

• After importing this coordinate file to a job, the following information is displayed (Figure 4-10) for this point in the *CAD* tab:



Figure 4-10. Point Properties - CAD tab

If a custom format has mixed fullcodes, click both checkboxes (Figure 4-11).



#### Figure 4-11. Mixed FullCodes

- 3. If the file format contains FullCodes, it should be the last in the list of the right panel in the *Custom Format Properties* window.
- 4. Do not set the space delimiter for files containing codes with attributes. For this file, use the comma, tab, semicolon delimiters



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.

# **Opening a File Using Drag-and-drop**

Topcon Link supports the drag-and-drop technique for opening files. Topcon Link can be either open or closed.

- 1. Run Windows Explorer on the computer.
- 2. Navigate to the location of the desired files, then select and highlight the files to open.
- 3. Drag-and-drop files or folders into either Topcon Link or onto the software shortcut. Dropping files onto the shortcut opens Topcon Link.



Figure 4-12. Open file using drag-and-drop technique

- When using the left mouse button, Topcon Link automatically detects the file type and format.
- When using the right mouse button, the *Drop options* dialog box displays from which to set the format and the type of selected files in the *Format name* drop-down list.



Figure 4-13. Drop Options

 Enable *Recurse folders* to open selected folders/ subfolders and have Topcon Link open all files located in the folders/subfolders.  For example: If *Recurse folders* is enabled after the folder "TS data" (Figure 4-14) was dragged-and-dropped, Topcon Link opens all the files located in the folders "coord file" and "raw data".

🚉 C:\TS data	
File Edit View Favorites Too	ils H
🗢 Back 🔹 🔿 👻 🔂 Search	6
Address 🛄 C:\TS data	
Folders	×
🖻 🔄 TS data	
coord file	
raw data	-
	<u>۲</u>

Figure 4-14. Selected Folder for Opening in Topcon Link

# **Viewing Files**

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

- Sort column data in decreasing/increasing order.
  - Click on the column's title (Figure 4-15)

	Grid Northing
45	16.995
	15.981
	15.221
	13.914
	13.376
	13.371

<b>∧</b> ≜	Grid Northing
45	1.442
	2.553
	3.569
	3.714
	7.047
	7.047

Figure 4-15. Sorting Data

 Right-click the column's title and click Sort from the pop-up menu (Figure 4-16)



Figure 4-16. Sorting Data

• Swap the order of data columns using the drag-and-drop technique (Figure 4-17). Click and hold on the column title, then "drag" to the new location and release.

	C:\TL_Data\b2002_0	GTS_7.pnt <ascii ,<="" th=""><th></th><th></th></ascii>		
	•° Points		before	
ł	Name	Grid Northing		
	▲ 1	13.376	C:\TL_Data\b2002_GT5_7.pnt <ascii< th=""><th></th></ascii<>	
			•° Points	during
			Name Grid Northing Grid Northing	
			A 1 13.376	
	C:\TL_Data\b2002_(	GTS_7.pnt <ascii< th=""><th></th><th></th></ascii<>		
	•° Points		after	
	Grid Northing	Name	ĺ	
	13.376	Δ 1		

Figure 4-17. Swapping Data

- Hide a column or reduce the size of a column by moving the right side of the column to the left side.
- Return a table to the initial state. For this, right-click a column's title and click **Reset Columns**.
- Any table view changes are automatically saved for future use.

# **Coordinate File Data Tables**

Coordinate Files display information on a *Point* tab in the data table (Figure 4-18).

<sup>o</sup> Points	h Link Data\Jobs	s\pti.txt <gts-7 points=""></gts-7>				
Icon	Name	Ground Northing	Ground Easting	Elevation Code	Note	
Δ	10004	1111270.844	1234566.821	0.141		
Δ	10005	1111270.845	1234566.817	0.109		
Δ	10006	1111270.854	1234566.830	0.109		
Δ	10007	1111270.850	1234566.831	0.109		
Δ	10008	1111270.856	1234566.830	0.109		
Δ	10009	1111270.856	1234566.831	0.109		
Δ	10010	1111270.857	1234566.831	0.109		
<del>(*)</del>	10011	1111275.316	1234565.948	1.441		
<b>(*)</b>	10012	1111275.315	1234565.948	1.440		
<del>(*)</del>	10013	1111275.315	1234565.948	1.440		
Δ	10014	1111274.582	1234567.122	0.560		
Δ	10015	1111274.583	1234567.086	0.560		
A	20000	1111271-008	1234562-086	0.556		-

Figure 4-18. Coordinate File

The *Points* tab (Figure 4-18 on page 4-8) has the following default columns.

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

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

Location	Symbols	Description
	•	Unknown point
Point Tab	Δ	Fixed coordinates point
	<del>(*)</del>	Offset point (only for GTS-7 Points)

Table 4-1. Coordinate File Symbols

Every coordinate file (except the FC-5 format file) does not allow recording information about coordinate units and coordinate system. After opening a coordinate file, the Status Bar displays that the units are unknown and the coordinate system is undefined. Depending on the type of coordinates in the file, the following information will be displayed (Figure 4-19).



Figure 4-19. Status Bar Information about Coordinate File

Linear units and coordinate system can be changed. To do this, double-click on the appropriate box and select the desired unit or coordinate system (Figure 4-20).



Figure 4-20. Status Bar-> Linear Unit List and Coordinate System List

When changing the units or the coordinate system, the coordinate values will not be transformed according to the specified unit. The selected units and coordinate system will be assigned to the coordinates left unchanged. Figure 4-21 displays the coordinate file displaying various setting of linear units and unchanged values of the coordinates.

C:\Topcon Link Data\1199.pnt <gt5-210 310-12="" points=""></gt5-210>												
I	•° Po	ints										
	Icon Name Ground Northing Ground E		Easting	Ele	vation 🔺							
	۸	10	5000.000	50	000.000		0.000		near	units –	Unkno	wn
	Δ	11	4692.137	52	277.200		0.000					
	Δ	12	4395.435	48	375.195		0.025					
	Δ	20	4851.025	51	152.000		1.395					
	Δ	50	5017.235	54	184.005		0.565					
			Unkno	own	Ground	None		//				
					C:\T	opcon Lii	nk Data\1	199.pnt <	GTS-210/	'310-12 Point	s> 💶	
					•° Po	ints						
					Icon	Name	Ground N	orthing (Ift)	Ground	Easting (Ift)	Elevation (I	ift 🔺
		Line	ear units – IF	eet	Δ	10		5000.000		5000.000	0.0	0()
					Δ	11		4692.137		5277.200	0.0	0
					Δ	12		4395.435		4875.195	0.0	125
					Δ	20		4851.025		5152.000	1.3	195
					▲	50		5017.235		5484.005	0.5	65
							IFe	et 📃	Ground	SPC83-Alaba	ma (East)	
I	C:\T	opcon Lir	nk Data\1199.pnt <6	TS-210/31	0-12 Poir	nts>	_ 🗆 🗵					
Iſ	•° Po	ints									Motor	_
Ш	Icon	Name	Ground Northing (m)	Ground Ea	asting (m)	Eleva	tion (m 🔺	- L	mear	units –	weter	5
Ш	▲	10	5000.000		5000.000		0.00(					
Ш	Δ	11	4692.137	2.137 5277.200			0.00					
Ш	Δ	12	4395.435		4875.195 0.025							
1	Δ	20	4851.025		5152.000 1.39							
U	Δ	50	5017.235		5484.005		0.565					
	Meters Ground SPC83-Alabama (East)											



To assign linear units and coordinate systems (Figure 4-22 on page 4-11) when opening a coordinate file, do the following:

1. Click Advanced options in the Open window.

2. Set the desired projection/datum, linear units, orthometric height and control.

File name:	Coord_file_11_30_04.pnt
Format name:	Coordinate File (*.txt;*.CR5;*.csv;*.xyz;*.fc4;*.pnt;*.fc5;*.*)
Advanced	options
Projection	None Custom.
Datum	WGS84 Custom.
🗖 Grid->Grou	und Parameters
Linear Unit	USFeet
C Orthometric	: Height
Coordinate typ	e Datum Lat, Lon, Ell.H
🔽 Control	
	Open Cancel

Figure 4-22. Parameters for Opened Coordinate File

## Displaying Total Station Raw Data File Data Table

The *TS Obs* tab displays only if the opened file contains TS raw data. Total Station (TS) raw data files display information in two tabs in the data table (Figure 4-23).

C:\Topcon Link Data\M062502.raw <gt5-6 raw=""></gt5-6>									
• Points 🗛 TS Obs									
Icon	Name	Ground Northing (m)	Ground Easting (m)	Elevation (m)	Code	Control	Note		
•	1	9.938	13.391	1.122	TREE	None			
•	10	18.474	15.984	-0.086	TREE	None			
•	2	3.111	15.239	4.290	TREE	None			
\$	3	4.000	9.992	-0.095	TREE	None			
•	4	6.913	7.632	0.407	TREE	None			
•	5	2.554	3.574	0.731	TREE	None			
•	6	12.070	3.740	-0.889	TREE	None			
\$	7	15.848	1.402	2.238	TREE	None			
\$	8	21.133	2.555	0.443	TREE	None			
•	9	17.476	8.531	-1.408	TREE	None			
Δ	MARK	10.000	10.000	0.500	STAT	Both			
Δ	ST1	13.845	7.055	-0.256	STAT	Horizontal			
	ST2	14.859	10.678	-0.202	STAT	Vertical			
L									
•							•		

Figure 4-23. Total Station Raw Data File

The *Points* tab (Figure 4-23) has the following default columns for measured (not calculated) points.

- Icon the symbol of the point
- Name the name of the point

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

The TS Obs tab consists of two panels.

The left panel of the *TS Obs* tab (Figure 4-24) has the following default columns for points with known coordinates.

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

ľ	C:\Topcon Link Data\M062502.raw <gt5-6 raw=""></gt5-6>								
Γ	• <sup>o</sup> Poir	nts	🛇 TS Obs 📔						
	Icon	#	Point Name	Instrument Height					
	۰,	1	MARK	1.520					
	�,	2	ST1	1.460					
I	\$,	3	ST2	1.410					

Figure 4-24. TS Obs Tab – Left Panel

The right panel of the *TS Obs* tab (Figure 4-25 on page 4-13) has the following default columns for points with unknown coordinates measured from the point in the left panel.

- Icon the symbol of the point
- # the number of the point
- Point From the beginning of the vector
- Point To the end of the vector
- Reflector Height the height of the reflector

- Azimuth, Horizontal Circle, Zenith Angle, Slope Distance angular and linear measurements in the selected units (DMS, qon, mil, radian, ft, m)
- Note any notes associated with the point
- Code any code associated with the point
- Type the type of point.
  - SS: side shot point
  - BS: backsight point (the previous occupation point)
  - FS: foresight point (the next occupation point)
  - BKB: backsight bearing point
  - Horizontal/Vertical Resection: plane or vertical coordinates of station point are computed using measurements from two (or more) points with known coordinates
  - Resection: plane and vertical coordinates of station point are computed using measurements from two (or more) points with known coordinates.

C:\To	C:\Topcon Link Data\M062502.raw <gt5-6 raw=""></gt5-6>									
•° Poin	its 🛉	🛇 TS Obs								
Icon	#	Point From	Point To	Reflector Heig	Azimuth	Horizontal Circle	Slope Distance	Vertical An		
<b>\$</b> ,	1	MARK	ST1	1.600		322°33'16.0000	4.902	352°02'54.00		
<b>\$</b> ,	2	MARK	ST1	1.600		322°33'16.0000	4.904	352°02'54.00		
<b>\$</b> ,	3	MARK	ST2	1.600		7°56'17.0000	4.956	352°46'14.00		
Φ,	4	MARK	ST2	1.600		7°56'17.0000	4.956	352°46'13.00		
<b>\$</b> ,	5	MARK	1	1.600		91°02'23.0000	3.448	11°41'57.00		
<b>\$</b> ,	6	MARK	2	1.600		142°44'56.0000	9.448	24°05'38.00		
<b>\$</b> ,	7	MARK	3	1.600		180°04'31.0000	6.029	355°05'34.00		
<b>\$</b> ,	8	MARK	4	1.600		217°29'35.0000	3.892	359°48'35.00		
•										

Figure 4-25. TS Obs Tab – Right Panel

Table 4-2 lists the symbols that represent different Topcon Link parameters in the data table.

Location	Symbols	Description
	$\diamond$	TS station
Points Tab	•	TS point
Tomas Tab	Δ	Fixed coordinates point
	Δ	Fixed Horizontal control
		Fixed Vertical control
TS Obs Tab, Left Panel	♦,	TS station
	$\diamond_{\mathbf{x}}$	ForeSight measurement
TS Obs Tab, Right Panel	Φ,	SideShot measurement
	٠,	BackSight
TS Obs Tab, Right Panel	٠	BackSightBearing point measurement
(Continued)	Ф,	TS Resection Observation

Table 4-2. Total Station Raw Data File Symbols

TS raw data file do not allow recording information about the coordinate system. After opening a TS raw data file, the Status Bar displays that the coordinate system is undefined (Figure 4-26).



Figure 4-26. Status Bar Information about TS Raw File

Only the linear/angular units and coordinate system can be changed for TS raw data files. To do this, double-click on the appropriate box and select the desired unit or coordinate system (Figure 4-27).



Figure 4-27. Status Bar-> Linear Unit List and Coordinate System List

When changing the units or the coordinate system, the linear and angular measurements will be transformed according to the specified unit, but the coordinate system will not be transformed. The coordinate system assigned to the coordinates are left unchanged. Figure 4-28 displays a TS Raw file with various projections and unchanged values of the coordinates.

ļ	C:\To	opcon Link	: Data\M06	2502.	raw <0	iTS-6 Raw	>				_ 🗆 ×	1					
	•° Poi	ints 🛇	TS Obs														
	Icon	Name	Ground N	orthing	(USft)	Ground Eas	ting (USft)	Eleva	ation (USft)	Code	<b></b>	∥р	roie	ction -			
	•	1		;	32.605		43.934		3.681	TREE			l lnk	nown			
	\$	10			60.610		52.441		-0.282	TREE			UNK	nown			
	◆	2			10.207		49.997		14.075	TREE							
							USFeet	DMS	Ground	None		1.					
			1									-					
Р	India	ction .	_	🗖 C:	\Topco	n Link Dat	a\M06250	12.raw <	GTS-6 Ra	w>							
',				•°	Points	🔷 TS O	os										
C	Joiur	mbia -	-	Ico	n Nai	me Gn	ound Northi	ng (USft)	Ground B	Easting (L	JSft) Ele	evation (USft)	vation (USft) Code 🔺				
	Colu	ımbia		•	1			32.605		43	.934	3.681	TREE				
				•	10			60.610		52.441		-0.282	TREE				
				•	2			10.207		49	.997	14.075	TREE	<b>_</b>			
									USFeet	DMS	Ground	Colombia-C	olombia				
											_						
C:\To	opcon Lir	nk Data∖M	1062502.ra	w <g< th=""><th>TS-6 Ra</th><th>w&gt;</th><th></th><th></th><th></th><th></th><th>×</th><th></th><th></th><th></th></g<>	TS-6 Ra	w>					×						
•° Poi	ints 🔷	TS Obs									_ P	rojectio	on –	SPC83			
Icon	Name	Ground	d Northing (U	ISft)	Ground B	Easting (USF	t) Eleva	ation (USF	t) Code			Ålaha	ma	(Fast)			
•	1		32.	605		43.93	4	3.68	1 TREE	-	-1	Alabe	ina	(East)			
Φ	10		60.	610		52.44	1	-0.28	2 TREE								
\$	2		10.	207		49.99	7	14.07	5 TREE		<u>  </u>						
•																	
				USFe	eet D	MS Grou	ind SPC	83-Alabar	na (East)		11.						

Figure 4-28. Example of changing projection for TS Raw Data File

To assign a coordinate system when opening a TS raw data file (Figure 4-29), do the following:

1. Click Advanced options in the Open window.

2. Set the desired projection, coordinate order, and mode of vertical angle.



Figure 4-29. Parameters for Opened TS Raw Data File

### **About Vertical Angles**

When measuring, you can select TS raw data file and save into the raw data file the vertical angle read from zenith (zenith mode) or from horizontal (level mode).

- 1. After opening a TS raw data file, the *TS Obs* tab displays the values of vertical angle in two different columns:
  - Zenith Angle the vertical angle from Zenith.
  - Vertical Angle the vertical angle from Horizontal. For the point, the sum of the Zenith Vertical Angles equals n\*90.
- 2. TS raw data files do not allow recording information about vertical angle mode. However, you can set it when opening a TS raw data file: on the Vertical Angle field (Figure 4-30), set the mode which was enabled for the survey in the Total Station.



#### Figure 4-30. Vertical Angle field in the Open Window for TS Raw Data File

3. Select **Auto** if there is no information on the VA mode. In this case, the angles from 0 to 45 degrees are automatically considered as Horizontal, and the angles from 45 degrees and more as Zenith.



Figure 4-31. A) Vertical Angle is from Horizontal Level B) Vertical Angle is from Zenith

When opening a TS raw data file containing vertical angles that exceeds 45 degrees, you must set the Vertical Angle mode the same as for measuring with the Total Station. If a different mode or Auto mode is set, then for these vertical angles, the Vertical Angle column will display the values read from zenith, and the Zenith Angle column will display the values read from the horizontal level.

### **Displaying Digital Level Observation**

The *DL Obs* tab displays only if the opened file contains data collected on Topcon's Digital Level. Figure 4-32 shows an example of digital level data.



Figure 4-32. Example of Digital Level Data – Level Measurements

Click the **DL Obs** tab to view digital level information (Figure 4-33 on page 4-19).

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

The left panel of the DL Obs tab has the following columns.

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

The right panel of the DL Obs tab has the following columns.

- Icon displays any image associated with turning points.
- *#* the number of measurement.

- Point the name of the turning point.
- BS the measurement for backsight point.
- FS the measurement for foresight point.
- Distance measured distance.
- Elevation the orthometric heights of the point (or the height of the point is calculated from a point with known height).
- Vert. Offset displays the vertical offset from the horizontal plane for traverse and sideshot points.
- Note any comment for the level measurement.
- Std Dev standard deviation for the level measurement. This value is created in the Digital Level.
- Date the date and time of level measurement.
- Level Run the name of the leveling job created in a Topcon Digital Level

		I	# Fro	m To	Level Rur	i Date		Note	Distance (m)	Balance (m)	•		
		В,	1 PIC	DN1 51	PION230	3 22.0	04.2005						
_													
n	3	Point	BS (m)	Instrument I	1 55 (m)	FS (m)	Elevation (m)	Distance (m)	Vert.Offset (m)	Note	Std Dev (m)	Date	Level Run
n	8	Point PIONI	BS (m) 0.407	Instrument I	3 55 (m) 407	FS (m)	Elevation (m) 0.000	Distance (m) 13.653	Vert.Offset (m) 0.000	Note	Std Dev (m) 0.000	Date 22.04.200	Level Run P10N2303
n	8 1 2	Point PIONI CP	BS (m) 0.407	Instrument I 0 0	3 55 (m) 407 407	P5 (m)	Elevation (m) 0.000 -1.826	Distance (m) 13.653 19.001	Vert.Offset (m) 0.000 0.000	Note	Std Dev (m) 0.000 0.000	Date 22.04.200 22.04.200	Level Run P10N2303 P10N2303
n	1 2 3	Point PIONI CP CP	BS (m) 0.407 1.481	Instrument I 0 0 -0	3 55 (m) 407 345	F5 (m)	Elevation (m) 0.000 -1.826 -1.826	Distance (m) 13.653 19.001 4.783	Vert.Offset (m) 0.000 0.000 0.000	Note	Std Dev (m) 0.000 0.000 0.000	Date 22.04.200 22.04.200 22.04.200	Level Run P10N2303 P10N2303 P10N2303
n	1 2 3 4	Point PIONI CP CP N1	B5 (m) 0.407 1.481	Instrument I 0 0 -0 -0	3 55 (m) 407 407 345 345	P5 (m) 2.232 1.514	Elevation (m) 0.000 -1.826 -1.826 -1.858	Distance (m) 13.653 19.001 4.783 4.328	Vert.Offset (m) 0.000 0.000 0.000 0.000	Note	Std Dev (m) 0.000 0.000 0.000 0.000	Date 22.04.200 22.04.200 22.04.200 22.04.200	Level Run P10N2303 P10N2303 P10N2303 P10N2303
m	1 2 3 4 5	Point PIONI CP CP N1 N1	B5 (m) 0.407 1.481 1.572	Instrument I 0 0 -0 -0 -0 -0	3 55 (m) 407 407 345 345 286	P5 (m) 2.232 1.514	Elevation (m) 0.000 -1.026 -1.826 -1.858 -1.858	Distance (m) 13.653 19.001 4.783 4.328 8.514	Vert.Offset (m) 0.000 0.000 0.000 0.000 0.000 0.000	Note	Std Dev (m) 0.000 0.000 0.000 0.000 0.000	Date 22.04.200 22.04.200 22.04.200 22.04.200 22.04.200	Level Run P10N2303 P30N2303 P30N2303 P30N2303 P30N2303

Figure 4-33. DL Obs Tab

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



Any entered changes cannot be saved in the file.

Table 4-3 lists the symbols that represent different Topcon Link parameters in the data table.

Location	Symbols	Description
		Traverse Point for digital level observation
Points Tab	₽	Side Shot
	Δ	Fixed coordinates point
	4	Fixed Horizontal control
		Fixed Vertical control
DL Obs Tab, Left Panel	8,	Leveling job
	J,	BackSight level measurement
DL Obs Tab, Right Panel	•,	ForeSight level measurement
	Φ,	SideShot level measurement

Table 4-3. DL OBS File Symbols

# **TopSURV** File Data Table

TopSURV database files display information in the following tabs (Figure 4-34).

🔲 C:	\Topcon Link	Data\081202a.tl	sv. <topsurv file<="" th=""><th>s&gt;</th><th></th><th></th><th><u>_     ×</u></th></topsurv>	s>			<u>_     ×</u>
•°	Points 🧬	GPS Occupations	🔷 TS Obs 🛛 🦂	GPS Obs 🛛 🌲 Code	s 🚺 🗖, Tape	Dimensions	
Ico	n Name	Grid Northing (r	m) Grid Easting (	m) Elevation (m)	Code 🛛 🔻	Control Not	te 🔺
•	1000	235252.10	80 559029.9	18 244.423	Nor	ie	
•	1001	235255.86	68 559044.8	86 244.619	Nor	ie	
•	1100	235236.3	78 559020.8	44 245.866	Nor	ne -	
•	1101	235236.2	18 559018.8	40 246.114	Nor	ne	
•	1102	235236.2	19 559018.8	50 245.860	Nor	ne	
•	1110	235236.33	74 559020.8	58 245.870	Nor	ie 🛛	
•	1111	235236.3	81 559020.8	78 245.471	Nor	ie 🛛	
•	1112	235236.3	79 559020.8	48 245.471	Nor	ne 🛛	
•	2000	235229.3	74 559056.1	19 243.832	Nor	ne	
•	2001	235229.3	74 559056.1	19 241.832	Nor	ne 👘	
0	88	235238.86	62 559052.1	02 242.673	Nor	ie 👘	
▲	89	235255.86	63 559044.9	05 242.619	Bot	h	
•	90	235255.86	64 559044.9	05 244.619	Nor	ne	
�	E4				Nor	ne 👘	
₽	Office_2				Nor	ne 👘	
•	Office_3				Nor	ie 👘	
•	Office 4				Nor	ne 🛛	
브							

Figure 4-34. TopSURV Database File

The Points tab (Figure 4-34) has the following default columns.

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

# NOTICE NOTICE

If a geoid was used to calculate orthometric heights for the points in the TopSURV file, and this geoid model was not pre-defined in Topcon Link, the point heights will be calculated incorrectly when opening the file. In this case the following warning will be displayed (Figure 4-35).

Topcon Li	ink 🔀
⚠	g1999a04 : Geoid model is not in the list. Height calculations will work incorrectly if you do not load this geoid
	ОК

Figure 4-35. Warning-Geoid Model is not in the List

To calculate the orthometric heights in Topcon Link, it is necessary to add the geoid model. For details on adding geoid models, see page 5-17.

The *GPS Occupations* tab displays only when an opened file contains GPS data. The *GPS Occupations* tab displays a table that can contain the following informational columns (Figure 4-36 on page 4-23).

- Icon displays a symbol associated with the occupation.
- Point Name displays the name of the occupation.
- Original Name displays the original occupation name.
- Antenna Type the antenna type used on the occupation.
- Antenna Height the antenna height.
- Antenna Height Method the method used to measure the antenna height, either Vertical or Slant.
- Start Time and Stop Time- displays the beginning and end dates (day/month/year) and starting and stopping epoch time of the occupation.
- Duration the duration of time in which the observational data was acquired (duration = start time stop time).
- Method the surveying method used at the occupation; either Static or Kinematic.
- Note displays user comments.

- Source displays the path of the source information on the computer disk drive, local area network, or storage media.
- Interval displays the occupation logging interval.
- Receiver displays the TPS receiver serial number used for the occupation.
- Offset Azimuth defines the direction from occupation other horizontal offsets (distance and cross) are given.
- Offset Dist displays the occupation's distance offset.
- Offset dHt displays the occupation's height offset.
- Offset Across displays the occupation's across offset.

🔗 ଭ	25 Occupatio	ns											
Icon	Point Name	Original Name	Antenna Type	Antenna Height	Ant Height Met	Start Time	Stop Time	Durat	Method	Note	Receiver	Interval	^
•	100	100	PG-A1	2.536	Slant	13.04.2	13.04.200	0:02:00	Static	NEpoch=24	0Q4II030NR4	5000	-
٥,		100_K1	PG-A1	2.536	Slant	13.04.2	13.04.200	0:00:50	kinem	NEpoch=10	8Q4II836NR4	5000	
•	101	101	PG-A1	2.536	Slant	13.04.2	13.04.200	0:01:55	Static	NEpoch=23	8Q4II838NR4	5000	
0		101_K1	PG-A1	2.536	Slant	13.04.2	13.04.200	0:00:35	Kinem	NEpoch=7	8Q4II838NR4	5000	
	102	102	PG-A1	2.536	Slant	13.04.2	13.04.200	0:02:00	Static	NEpoch=24	0Q4II030NR4	5000	
0		102_K1	PG-A1	2.536	Slant	13.04.2	13.04.200	0:00:55	Kinem	NEpoch=11	8Q4II838NR4	5000	
	103	103	PG-A1	2.536	Slant	13.04.2	13.04.200	0:02:00	Static	NEpoch=24	8Q4II8JBNR4	5000	
0		103_K1	PG-A1	2.536	Slant	13.04.2	13.04.200	0:00:55	Kinem	NEpoch=11	8Q4II83ENR4	5000	¥

Figure 4-36. GPS Occupations Tab

NOTICE

Any changes entered cannot be saved in the file.

The *TS Obs* tab displays only when the file contains TS raw data file and consists of two panels.

The left panel of the *TS Obs* tab (Figure 4-37 on page 4-24) has the following default columns for points with known coordinates.

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

The right panel of the *TS Obs* tab (Figure 4-37 on page 4-24) has the following default columns for points with unknown coordinates measured from the point in the left panel.

- Icon the symbol of the point.
- # 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 (DMS, qon, mil, radian, ft, m).
- Code any code associated with the point.
- Type the type of point (SS, BS, FS, Horizontal/Vertical Resection, Resection, BKB).
- Note any notes associated with the point.
- Date date and time of the point measurement.

	C:\Topco	in Link	Data\0812	02a.tlsv <	TopSUR¥ files>						_1	
	° Points	🧞	GPS Occupat	ions 🛇	TS Obs 🔗 GP	5 Obs	🄱 Codes 🛛 🗖	, Tape Dimension	ns			
II	Icon	#	Point From	Point To	Reflector Heig	Azi	Horizontal C	Slope Distan	Vertical Angle	Zenith Angle	Date	
Ш	Φ,	3	TGLA	88	1.770		129°26'24	34.130	358°58'45	91°01'15.0	8/12/2002 11:14:39	9
Ш	۰	4	TGLA	88	1.770		129°26'22	34.130	358°58'27	91°01'33.0	8/12/2002 11:14:39	9
Ш	Φ,	5	TGLA	88	1.770		148°42'42	5.830	359°02'47	90°57'13.0	8/12/2002 11:14:39	9
Ш	Φ,	6	TGLA	88	1.770		148°42'32	5.830	359°03'00	90°57'00.0	8/12/2002 11:14:39	9
Ш	Φ,	7	TGLA	88	1.770		129°26'23	34.130	358°58'35	91°01'25.0	8/12/2002 11:14:39	9
Ш	Φ,	8	TGLA	88	1.770		129°26'27	34.130	358°58'25	91°01'35.0	8/12/2002 11:14:39	9
	î	٩	TGLA	88	1 770		149947'94	5 830	350002/36	Q∩957'94 ∩	8/12/2002 11:14:30	الحن

Figure 4-37. TS Obs Tab

The *GPS Obs* tab displays only when the file contains GPS data. The *GPS Obs* tab (Figure 4-38 on page 4-25) has the following default columns for baseline measurements from the Base station to the Rover point:

- Icon the symbol of the point.
- Point From the starting point of the baseline measurement.
- Point To the ending point of the baseline measurement.
- Start Time the date and time of the start of the measurement.
- Duration the time during which the measurement was taken.
- Note any note for the baseline measurement.
- Horizontal Precisions, Vertical Precisions displays horizontal and vertical precisions of the measurement.
- dN, dE, dU displays coordinate increments of the measurement in the current projection.

- Method displays the measurement method (RTK Topo or RTK AutoTopo).
- Solution type displays the type of solution used for the measurement.
  - Float, Phase Diff: float phase difference measurement
  - FixeMd, Phase Diff: fixed phase difference measurement
  - *Float,Phase Diff, mm GPS*: float phase difference measurement with mm GPS
  - *Fixed,Phase Diff, mm GPS*: fixed phase difference measurement with mm GPS

	:\Topcon L	ink Data'	1014C.tlsv	<topsurv< th=""><th>files&gt;</th><th></th><th></th><th></th><th></th><th></th><th></th><th>_ O ×</th></topsurv<>	files>							_ O ×
•	Points	💡 GPS C	ccupations	🔷 TS Ob	s 🔗 (	GPS Obs  🎄 🕞	des					
I.	Point F	Point To	Start Time	Duration	Note	Horizontal Pre	Vertical Pre	dN (m)	dE (m)	dHt (m)	Method	Solution Type
	0	Topo1	10/14/	0:00:00	pipe	0.004	0.002	26.118	-19.522	3.809	RTK Topo	Fixed,Phase Diff
	0	Topo2	10/14/	0:00:00		0.004	0.002	26.119	-19.523	3.804	RTK Topo	Fixed,Phase Diff
	0	Topo3	10/14/	0:00:00		0.004	0.002	26.121	-19.524	3.801	RTK Topo	Fixed, Phase Diff
0	0	Auto1	10/14/	0:00:00		0.005	0.003	26.116	-19.522	3.907	RTK Aut	Fixed, Phase Diff
	0	Auto2	10/14/	0:00:00		0.005	0.003	26.121	-19.526	3.913	RTK Aut	Fixed, Phase Diff
	0	Auto3	10/14/	0:00:00		0.005	0.003	26.117	-19.522	3.911	RTK Aut	Fixed, Phase Diff
	1	1	1									

Figure 4-38. GPS Obs Tab

To view the information about an observation (vector), right-click the vector on the *GPS Obs* tab and click **Properties** on the pop-up menu. On the *Properties* dialog box, click the *Observation* tab (Figure 4-39).

Properties : GPS (	)bs 0-Topo2	? ×
General Observal	ion	
Horizontal Precision (m)	0.004	
Vertical Precision (m)	0.002	
d⊠ (m)	-3.501	
ďY (m)	-27.322	
dZ (m)	17.862	
Azimuth	323*13'26.1652	
Elevation Angle	6°39'13.2064	
Distance (m)	32.830	
dN (m)	26.119	
dE (m)	-19.523	
dHt (m)	3.804	
Solution Type	Fixed,Phase Diff	
OK	Cancel Apply	

Figure 4-39. GPS Obs Properties – Observation Tab

The *Codes* tab displays only when the file contains a code(s) and consists of two panels.

The left panel of the *Codes* tab (Figure 4-40) lists available (\*.*tslv*) file codes and has the following columns.

- Icon the symbol of the object
- Code the code of the object
- Layer display the layer in which the code is used

The right panel displays all possible attributes for the object highlighted in the left panel of the *Codes* tab (Figure 4-40 on page 4-26) has the following columns.

- Icon the symbol of the attribute
- Name a unique name for the attribute
- Default value the value of the attribute
- Type the type of attribute (integer, real number, text, or menu)

	D:\code	s_for_linework.	tlsv <topsurv p<="" th=""><th>С</th><th>files &gt;</th><th></th><th></th><th></th></topsurv>	С	files >			
ſ	Points	🛛 🖉 Linework 🕯	Codes					
	Icon	Code	Layer	۲	Icon	Attribute Name	Default Value	Туре
	•	C-1	For Line1		E	List for ob18	pipe	Menu
	•	C-2	for_Points		1.2	exam	4	Real Number
	•	C-3	For Points 3		ab	quiz	lamp	Text
					<u>1</u> 2	test	6	Integer
L	ļ							

Figure 4-40. Codes Tab

The *Linework* tab displays only when the file contains a linework file, and displays CAD information contained in the open file (Figure 4-41 on page 4-27).

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

- Icon displays the symbol associated with the line or line segment.
- Code displays the primary code used for the line or line segment.
- Layer displays the layer for the selected line.

- Color/Line Style/ Point Symbol/Line Width displays the plotting style of the selected line.
- Order lists the order of points associated with the line segment.
- From lists the beginning point of the line segment.
- To lists the end point of the line segment. If the line is closed, the "To" point for the last segment will be the same as the start point of the line.
- Control Code displays the control code of the point.
  - Arc Start: the starting point of the arc
  - Arc End: the ending point of the arc
  - Close: the last point in a closed line

To view the String (in left panel) and Control Code (in right panel) columns, enable the alphanumeric code output for describing surveyed points during job configuration.

E	D:\fr		lsv <top< th=""><th>SURV PO</th><th>files&gt;</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></top<>	SURV PO	files>											
[	Poin	° Points 🖸 Linework 🎄 Codes														
1	Icon	Code	String	Layer	Color	Line Style	Line Width	Point Symbol	•	Icon	Order	From	To	Control Code	Control Code 2	
	•	1	2	Line_L2	BYLAYER	BYLAYER	BYLAYER 5 pt	BYCODE .		•	1	User10	User13			
										•	2	User13	User12			
										•	3	User12	User11			
										•	4	User11	User10	Close		
IJ																

Figure 4-41. Linework Tab

The *Tape Dimensions* tab displays only when the file contains a tape dimension measurement. The *Tape Dimensions* tab displays the results of measurements of lines perpendicular to a reference line. The reference line is defined using two points with known coordinates. Figure 4-42 shows an example of measurements relative to the reference line 1-2, performed in Tape Dimensions mode.



Figure 4-42. Example of Tape Dimension Task

The Tape Dimensions tab consists of two panels.

- The left panel of the *Tape Dimensions* tab (Figure 4-43 on page 4-29) shows the symbol of the start reference line, the names of the start and end points of this line.
- The right panel of the *Tape Dimensions* tab (Figure 4-43 on page 4-29) has the following default columns for tape measurements from the End point to the Start point:
  - Icon: the symbol of the point
  - #: measurement sessions
  - Point to: measurement direction
  - Distance: the length of the line. The "-" sign stands for the left turn, and the "+" sign stands for the right turn relative to the direction of the measurement the last line.
  - Date: the date and time of the measurement finished
  - Note: any notes associated with the measurement

1	C:\T	opcon Link D	ata\Jobs\tape.tlsv	<topsu< th=""><th>RV file</th><th>2<b>5</b>&gt;</th><th></th><th></th><th></th></topsu<>	RV file	2 <b>5</b> >			
ſ	•° Po	oints 🛛 🤗 G	PS Occupations \mid 🛇	TS Obs	8	GPS Obs	🌲 Codes 🗖,	Tape Dimensions	
	Icon	Start Point	End Point	Icon	#	Point To	Distance (m)	Date	Note
		100	А		1	1	-10.000	3/30/2004 09:	
					2	2	20.000	3/30/2004 09:	
					3	3	20.000	3/30/2004 09:	
					4	4	20.000	3/30/2004 09:	
L				<u> </u>					

Figure 4-43. Tape Dimensions Tab

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

The data file and the image folder must reside in the same directory for the images to display correctly in Topcon Link.

# NOTICE NOTICE

Topcon Link expects the associated images to reside in a folder with the same name as the data file. For example, data from the "050119.tlsv" file will be associated with images in the "050119" folder.

The Images tab displays the following two panels.

- The left panel displays thumbnail images for all images in the file. Image identification in the panel begins with the lowest image title (either alphabetically or numerically) and increases incrementally.
- The right panel displays the selected image with measured points and linework inside the picture area. The symbols of the points correspond to the settings selected in the *Line and Code properties* dialog boxes. The size of the symbol depends on the distance from the station.

Click a thumbnail in the left panel (Figure 4-44) to view the image in the right panel.



Figure 4-44. Images Tab

The *X-Section Templates* tab displays only if the job contains road data. Click the *X-Section Templates* tab to view the information about existing templates in the opened file (Figure 4-45 on page 4-31).

- The left panel of the *X-Section Templates* tab displays the name of the template(s) and values of the cut and fill slopes in percent. The right panel displays the segment(s) of the selected template in table and graphic mode.
- The right panel of the *X*-Section Templates tab has the following default columns for segments used in the selected template:
  - Icon: the symbol of the segment.
  - Order the order of the template segment.
  - Code: the code used for the segment.
  - Hz. Dist: the horizontal offset from the central line for the segment.
  - V.Dist: the vertical offset from the horizontal plane for the segment. If this parameter is selected, the Grade will be automatically calculated.
  - Grade%: the ratio of Hz. Dist and V.Dist multiplied by 100%. If this parameter is selected, the V.Dist will be automatically calculated.

- Hz. Offset from CL (m): horizontal offset from the central line for the segment start point. Calculated using the corresponding values of previous the segment(s) and is not editable.
- V. offset from CL (m): vertical offset from the horizontal plane for the start point of the segment. Calculated using the corresponding values of previous the segment(s) and is not editable.

D:\road_03.tlsv <topsurv files="" pc=""></topsurv>										
🔹 Points 🕼 Roads 🗁 X-Section Templates 🛔 Codes										
L. Name	Cut Slope (1:n)	Fill Slope (1:n)	· I.	Order	Code	Hz. Dist	V. Dist (m)	Grade (%)	Hz. Offset from	V. Offset from
r Station-121	0.000	0.000	E	1		1.000	-0.020	-2.000	0.000	0.000
right-left	0.000	0.000	E	2		4.000	-0.200	-5.000	1.000	-0.020
			Ŀ							
				. Offset	-1					
				from CL,	1					
				m						
					-1					
					1					
					┥──					
					1					
										1
							1 2		4 H	z. Offset from CL, m

Figure 4-45. X-Section Template Tab

The *Roads* tab displays only if the file contains road data. Click the *Roads* tab to view the information about existing roads in the current job (Figure 4-46).

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

road1	L. Order	Type	Armith	~	Number 1	
2 Horizontal alignment	11	Live	4520000.0000		100.00 000	
Table	Ca	Curve	45*00/00.0000		1	×110 ×115
2 Graphic	C 3	Curve	72*12'55.7830		0	10 (sat
Vertical alignment	14	Line	118903/07.6280		-	
-IIII Table	C 5	Curve	118*03'07.6280		1	×505 72655
	6	Curve	165*47'54.9665		1	12725
- IIII Table	C 7	Curve	209*52'20.2021	~	Ll	
11110.0000	C 8	Curve	242*36'45.8056			
	4		3			-250 0 250 500 750 East
	I. Type	StalChainage (m)	Order		Devation:	
	∠ Grade	100.000	1		n -	100-100-100-100
	🔬 Grade	325.000	2		-1	55
	🖌 Grade	425.000	3		1	
	🖉 Grade	525.000	4		-	.885
	∠ Grade	955.000	5		100 1	1055
	🖉 Grade	1055.000	6			
	∠ Grade	1255.000	7			
	<			2		0+0 2+50 5+0 7+50 10+0 CL Posts
	1. Sta/Chainage (m	U Sale	Template	-	V. Offset	
	0.00	0 Left	right-left.	_	from CL,	
	0.00	0 Right	right-left		n -	
	100.00	0 Left	Station-121			

Figure 4-46. Roads Tab

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

• Icon – displays an image associated with the elements.



- Order the order of the element in the horizontal alignment.
- Type the type of element (line, curve, spiral, or intersection).
- Azimuth the azimuth of the element.
- Length the length of the element; editable for all types of elements except Intersection, where the length is calculated for the compound curve consisting of two spirals and one curve.
- Turn the direction of the turn for a curve, a spiral, and intersection. The "Right" value stands for clockwise direction; the "Left" value stands for counter-clockwise direction.
- Start Radius/End Radius the radius of the curve or spiral.
- Nothing /Easting the grid/ground coordinates of the intersection point.
- Spiral 1 Len/Spiral 2 Len the length of the spiral at the intersection point.
- End Station the number of the end station for the element.
- Intersection Pt the name of the intersection point.
- Tangential to prev element displays "True" or "False". True is set if the azimuth for this element is the end azimuth for the previous element; False is set if the azimuth for this element is arbitrary.
- End Northing /End Easting the grid/ground coordinates of the end station of the element.

- End Azimuth the azimuth that sets the tangent to the end station of the element.
- Spiral Dir the spiral direction.
- Delta the angle between the radii corresponding to the curve.
- Chord the length of the segment joining start and end points of a curve.
- Tangent the length of the segment which touches the given curve.
- Mid Ord the distance from the midpoint of a chord to the midpoint of the corresponding curve.
- External the distance from the midpoint of the curve to the intersection point of the tangents.
- Spiral Const the square root of the product of the length and the radius of the spiral.
- Spiral Const 1/Spiral Const 2 the spiral constants used to define a compound curve.
- Start Deg Chord/End Deg Curve the angle in degrees used to compute the radius of curve whose chord is 100 units long.

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

• Icon – displays an image associated with the elements.



- Type the type of the element (grade, parabola, or long section).
- Sta/Chainage the number of the start station or chainage for the grade, parabola, and long section element.
- Order the order of the element in the vertical alignment.
- Length the length of the vertical element for the grade and parabola, and the length of the curve of the long section.

- Start Grade / End Grade the starting and ending percentages of grade of the element. If the grade is rising, the value should be set to positive; if the grade is falling, the value should be set to negative.
- Elevation the elevation value on the end station for the grade and parabola and the elevation value of the station used for creating of the long section.

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

- Station the station at which the template is applied.
- Side the left or the right side of the road relative to the central line where this template is used
- Template the name of the template (selected from the list of existing templates in the current job).

Table 4-4 lists the symbols that represent different Topcon Link parameters on the data table.

Location	Symbols	Description
	<b>◇</b>	TS station
	$\Phi$	TS point
	•	TS BackSight point
	•	Point coordinates input manually
Points Tab	•	Point coordinates calculated by means of COGO
	<b></b>	Design point
	Φ	Stakeout point
	Δ	Fixed coordinates point
	Δ	Fixed Horizontal control
		Fixed Vertical control
	۲	Base station
	0	Topo point <sup>a</sup>
Points Tab	٥	Auto Topo point <sup>b</sup>
(Continued)	<del>(*)</del>	PTL (point to line) offset point
	•	GPS offset point
		Tape Measurement Point
TS Obs Tab, Left Panel	\$_	TS station

Table 4-4. TopSURV File Symbols

Location	Symbols	Description
	٥,	ForeSight measurement
	Ф,	SideShot measurement
TS Obs Tab,	�,	BackSight measurement
Right Panel	٠	BackSightBearing point measurement
	Ф,	TS Resection Observation
		TS MLM Observation
	•	Base station occupation
GPS Occupation Tab	9	Auto Topo occupation <sup>c</sup>
	o,	Topo occupation <sup>d</sup>
GPS Obs Tab	0,	Baseline from the base station to a Topo point
	0,	Baseline from the base station to an Auto Topo point
Tape Dimensions Tab Left Panel	44	Start reference line
Tape Dimensions Tab Right Panel		Tape Measurement Point

Table 4-4. TopSURV File Symbols (Continued)

- a. Topo point the point collected during a static RTK measurement
- b. Auto Topo point the point collected during a kinematic RTK measurement
- c. Auto Topo occupation the kinematic occupation in the RTK survey
- d. Topo occupation the static occupation in he RTK survey

Every TopSURV database file allows recording information about the linear and angular units, the coordinate type, and the coordinate system. After opening a TopSURV file, the Status Bar displays the following information from this file (Figure 4-47).

You can change any units, coordinate type, and coordinate system. To do this, double-click on the appropriate box and select the desired unit or coordinate system (Figure 4-47).



Figure 4-47. Status Bar Drop-down Lists

When changing the units or the coordinate type and coordinate system, the file parameters will be transformed.

# **CAD** View

- Use the CAD View to view graphic information in an open TopSurv file. To open CAD View for the TopSURV file, open the Topsurv file and click View ► CAD View.
- 2. The CAD view is a graphical view (Figure 4-48 on page 4-38) of linework roads and surfaces with the associated points. Unless filtered, the following information displays:
  - Points and their symbols display on the CAD view. If the point does not have a symbol, its survey symbol will be used.
  - Lines display using the code's/layer's color, style, and width.
  - If a line contains valid /AS, /AE, /C control codes, it will display as an arc or closed polyline, respectively.
  - If a code includes a polygon entity type, it will display as closed and filled (if a fill color has been set).
  - Surfaces and roads are displayed in the color applied to the corresponding layer(s).



Figure 4-48. CAD View with Linework

### **Displaying CAD View Options**

View options for the CAD View include displaying a coordinate grid and selecting labels to display for points.

- 1. Right-click on an empty portion of the CAD view and click **Options** on the pop-up menu.
- 2. To show grid, select the *Show* tab, and click the *Show grid box* (Figure 4-49 on page 4-39).
- 3. On the *Labels* tab, enable the desired settings. Click **Apply** to save the settings (Figure 4-49 on page 4-39).
  - Name enable to display the point's name on selected map, the cursor, and status bar positions.
  - Code enable to display the point's code on selected map, the cursor, and status bar positions.
  - Height enable to display the point's height on selected map, the cursor, and status bar positions.
- 4. Click **OK** to save the settings and close the *Cad View Options* dialog box.

🚰 CAD View Options 🛛 💽 🔀	😭 CAD View Options 🛛 💽 🗙
Show   Labels   ⊽ Show grid	Show Labels State points Show on map Name Code Height Show on cursor Code Height Show on status bar Code Height Height Height
OK Cancel Apply	OK Cancel Apply

Figure 4-49. CAD View Options

## **Viewing File Properties**

To view an open file's properties, click **File > File properties** (Figure 4-50).

🚝 Topcor	ı Link				
File Edit	View	Process	Window	Help	
Open Fi	le		Ctrl	+0	
Save Fil	e		Ctrl	+S	
Save As			F4		
Import f	rom De	vice	Shif	t+F3	
Export t	o Devi		Shift+F4		
Convert	File		F5		
Print			Ctrl	+P	
Print Pre	sview				
Print Sei	tup				
Configu	ration.		Ctrl	+F2	
File prop	perties.				

Figure 4-50. File Properties

• Coordinate files – displays the path to the opened file and the file format (Figure 4-51).

🖹 Properties : Coordinate File C:\Program Fil ? 🗙						
General						
Name	C:\Program Files\Topcon\TopconLink\D					
Format	GTS-210/310-12 Points					
ОК	Cancel Apply					

Figure 4-51. Properties for Coordinate File

• TopSURV files – displays the file name, path to the opened file, file format, job name and surveyor's name (Figure 4-52).

E	📑 Properties : TopSUR¥ Database File C:\To 🙎 🗙						
	General						
N	lame	C:\Topcon Link Data\081202a.tlsv					
F	ormat	TopSURV files					
N	lote						
	OK	Cancel Apply					

Figure 4-52. Properties for TopSURV File

- Total Station raw data files
  - displays the name and format data in the General tab (Figure 4-53)
  - displays the date and end time of survey, instrument, job, survey's name, and note in the Session tab

Properties :	15 Raw Data File C:\Topcon Li <mark>?</mark> 🗙		📑 Propert	ies : T	5 Raw Data File C:\Topcon Li <table-cell> 🗙</table-cell>
General Sess	ion	l i	General	Sessi	on
Name	C:\Topcon Link Data\M062502.raw	[	Date		10/26/2004 00:00:00
Format	GTS-6 Raw	1	Instrument		TS
		J	Job		C:\Topcon Link Data\M062502.raw
		9	Surveyor		TopconTools
		1	Note		
ОК	Cancel Apply		OK		Cancel Apply

Apply		OK	Cancel	A
	1			

Figure 4-53. Properties for TS Raw Data File
# **Editing Files**

You can edit, save, and convert files opened in Topcon Link to a corresponding file format.

# **Saving Files**

When saving the 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.

To save changes to the current file, click **File > Save 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.
- 3. Click Save.

# **Converting Opened Files to Other File Formats**

A currently open file can be converted to a corresponding file format using the *Save As* dialog box.

Note: See page 3-2 for the list of file formats that Topcon Link can convert.

- 1. Click File ▶ Save As.
- 2. Select or create a destination folder and enter a name for the new file in the *Save As* dialog box.
- 3. Select a file format for the new file.
- 4. Click **Advanced options** to display further conversion parameters. Enter the desired information.

The characteristics of file conversion will be described in detail in further sections about editing coordinate files, TS raw data files and TopSURV files.

## **Editing Coordinate Files**

Topcon Link saves a coordinate file with possibility of transforming coordinates into different coordinate system and units. A coordinate file can be converted into another coordinate file and the format of TopSURV file.

To convert one file to another file, do the following:

- 1. Click **File ► Save As**.
- 2. Select or create a destination folder and enter a name for the created file in the *Save As* dialog box.
- 3. Select '*Coordinate File*' or '*TopSURV Database File*' format for the created file.
- 4. Click **Advanced options** to display further conversion parameters. Enter the desired information.
- 5. When saving a file as a coordinate file, it is possible to set the desired projection/datum, linear units, and to select or add a geoid file (Figure 4-54).

Format name:	Name,E,N,Z,Code (*.csv)	•
Advanced option	IS	
Projection	Alabama (East)	Custom.
Linear Unit	USFeet	•
Geoid	g1999u03	<ul> <li>Geoids List</li> </ul>
🔽 Orthometric Heig	ht	
Coordinate type	Grid	
S	ave	Cancel

Figure 4-54. Parameters for Created Coordinate File

6. When saving a file as a TopSURV file, you can set the desired projection/datum, linear and angular units, coordinate type and coordinate order, and select or add a geoid file (Figure 4-55 on page 4-43).

Format name:	TopSURV Database File (*.tlsv)		•
Advanced options			
Preinction	(E set)		Custom
Dature			Custom
Datum D. Crid & Crowned Day			
	ameters		
Linear Unit	USFeet		<u> </u>
Angular Unit	DMS		<u> </u>
Geoid	g1999u03	•	Geoids List
Coordinate order	Northing,Easting,Height		•
Coordinate type	Datum Lat, Lon, Elevation		•
Sav	/e	Cancel	

Figure 4-55. Parameters for Created TopSURV File

7. Click Save.

The difference between the created TopSURV file and the coordinate file is that the Status Bar for a TopSURV file displays linear and angle units, coordinate type, and coordinate system. For a coordinate file, these values are undefined in the Status Bar. Coordinate values are the same for both files (Figure 4-56).

0	opcon Lin	k Data (1199-test-	Job.tisv	< TOPSURY HIE	s>	1
, PO	incs   💭	GPS Occupations		o ODS   🎯 GPS	Obs   & Codes	;
Icon	Name	Latitude		Longitude	Ell.Height (USft)	Code
۸	10	30°38'01.87215N	87°	44'54.05252W	-356.628	
Δ	11	30°38'30.82850N	87°	'45'32.54677W	-356.629	
Δ	12	30°37'47.48021N	87°	46'08.23199W	-355.745	
Δ	20	30°38'17.78660N	87°	45'12.71667W	-307.363	
Δ	50	30°38'53.44079N	87°	44'52.94571W	-336.672	
4						
		USFeet	DMS	Datum Lat. Lon	ELH CH1954	

Created TopSURV File

	🗖 C:\1	opcon Lir	nk Data\from_1199 -	-coord-test.csv <na< th=""><th>me,Lat,Lon,Ht,Cod</th><th>e&gt; 💶</th></na<>	me,Lat,Lon,Ht,Cod	e> 💶
reated Coordinate File	•° Po	oints				
	Icon	Name	Latitude	Longitude	Ell.Height	Code
		10	30 38 01.87215N	87 44 54.05252W	-356.628	
	▲	11	30 38 30.82850N	87 45 32.54677W	-356.629	
		12	30 37 47.48021N	87 46 08.23199W	-355.745	
		20	30 38 17.78660N	87 45 12.71667W	-307.363	
		50	30 38 53.44079N	87 44 52.94571W	-336.672	
			Unknown	Datum Lat, L	on, Ell.H None	

#### Figure 4-56. Examples of Created TopSURV and Coordinate Files

In coordinate files, the following parameters can be edited.

- Point name C
  - Code
- Point coordinate
- Coordinate point order
- Note
   Offsets for GTS-7 Point file format

8. To edit coordinate file information, right-click one of the point rows to display the coordinate file pop-up menu (Figure 4-57).



Figure 4-57. Coordinate File Pop-up Menu

- Cut cuts the information.
- Copy copies the information.
- Delete deletes the information.
- Properties displays the *Properties* dialog box.
- Options opens the *Option* window (Figure 4-58) where you can change the columns order or hide any column.

🔁 Options		? ×
Display Show Columns Available columns	Selected columns Icon Name Latitude\Nothing Englitude\Easting EILHY\Elevation Code Control Note	Move Up
		Move Down
ОК	Cancel	Apply

Figure 4-58. Options Window For Points Tab

#### **Edit Name and Note Properties**

To edit the point name and note 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 4-59 on page 4-45).
- 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.

▲ Propert	ties : Point 10001	×
General	Coordinates CAD	
Name	10001	
Note		
Code	#1201	
OK	Cancel Apply	

Figure 4-59. Point Properties – General Tab

#### **Edit Coordinate Properties**

To edit the point coordinates in a coordinate file:

- 1. Right-click the point and click **Properties** on the pop-up menu.
- 2. On the *Properties* dialog box, click the *Coordinates* tab (Figure 4-60).

Ground Northing         1111277.205           Ground Easting         1234568.896           Elevation         0.665	
Ground Easting   1234568.896 Elevation   0.665	
Elevation 0.665	_
	_

Figure 4-60. Point Properties – Coordinates Tab

- 3. Depending on the type of the coordinate file, edit the *Ground Northing/Grid Northing, Ground Easting/Grid 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.

#### **Edit CAD Properties**

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

- 1. Right-click the point and click **Properties** on the pop-up menu.
- 2. On the *Properties* dialog box, click the *CAD* tab (Figure 4-61).

A Properties : Point 100	01	×
General Coordinates	CAD	
Code		
• #789_AB		
OK	Cancel	Apply

Figure 4-61. Point 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.



For coordinate files, only one code can be created per point. But if a coordinate file is created by converting from TopSURV file to custom coordinate file format with fullcode option, this coordinate file can contain an unlimited number of codes for a point.

#### **Edit Offset Properties**

Topcon Link allows editing/adding offsets for TS measuring with using point to line (PTL) method. For details on this, see "Offset Point to Line" on page A-3. To edit offset properties for a point in a GTS-7 Point file:

- 1. Right-click the point and click **Properties** on the pop-up menu.
- 2. On the *Properties* dialog box, click the *Offset* tab (Figure 4-62 on page 4-47).
- 3. Edit the *Offset* 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.

Properties : Po	int 200	<u>?</u> ×
General Coord	inates CAD String Offset	
From Point	101	
Offset Dist (USft)	-65.61667	
Offset Across (USft)	-49.2125	
Offset Ht (USft)	32.80833	
Height is		
C Relative		
Absolute		
To Point	1001	•
OK	Cancel	

Figure 4-62. Point Properties – Offset Tab

5. After editing offset values, to obtain new coordinates of the point, click the **Compute Coordinates** button on the toolbar to recalculate coordinates.

#### Saving Note and Code Changes in Coordinate Files to a Different Coordinate File



Topcon Link cannot save edited information if the file currently lacks the information fields. If Note or Code information is 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 4-63).

Topcon Link	×
Some fields cannot be saved to this format. Do you wish to save to another forma	t?
Yes No Cancel	

Figure 4-63. Save to Another Format?

Click No or Cancel to continue without saving.

1. To save the file to a different format, click **Yes**.

On the *Save as* dialog box, select a user-defined format in the *Format File* field that includes Note and Code columns (Figure 4-64). See "Creating User-defined File Formats" on page 4-2 for more information.



Figure 4-64. Format Name

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

# **Editing Total Station Raw Data Files**

Topcon Link allows saving TS raw data file through transforming linear units, angular units and coordinates into a different coordinate system. A TS raw data file can be converted into another TS raw data file and into a TopSURV file format.

To convert a file to another file type, do the following:

- 1. Click **File** > **Save As** or click the **Save as** button on the Toolbar.
- 2. Select or create a destination folder and enter a name of the created file in the *Save As* dialog box.
- 3. Select '*TS Raw Data File*' or '*TopSURV Database File*' format for the created file.
- 4. Click Advanced options in the Save As window.
- 5. When saving a file as a TS raw data file, it is possible to set the desired projection, linear units, angular units, coordinate type and coordinate order, mode of vertical angle, and type of distance (Figure 4-65 on page 4-49).

Format name: GT	S-6 Raw (*.raw;*.dat;*.gts;*.gts6;*.gt6)
Advanced options	
Projection	Arizona (West)
Grid->Ground Param	eters
Linear Unit	Meters
Angular Unit	DMS
Coordinate order	Northing,Easting,Height
Coordinate type	Ground
-Vertical Angle is	
Zenith	
C Horizontal Level	
- Distance is	
Auto	
C SD	
C HD	
Save	Cancel

Figure 4-65. Parameters for Created TS Raw Data File

- 6. Using the settings in the *Vertical Angle is* and *Distance is* fields, these measurements can be converted and saved in the file.
- 7. In Total Station (TS) raw data files (Figure 4-66 on page 4-50), the following information can be edited.
  - In the *Point* tab:
    - Point name Note
    - Point coordinate Code
    - Control
  - In the left panel of the TS Obs tab:
    - Point name and point number
    - Instrument height
  - In the right panel of the TS Obs tab:
    - Point to and point notes
    - Reflector height
    - Azimuth (only for BKB points measured from the point with unknown coordinates)
- Offsets
- CAD information
- String properties
- Type of measured point (except BKB points)

Points 🖏 TS Obs													
Icon	\$	Point Name	Instrument Hei	Icon	#	Point Fr	Point To	Reflector Heig	Azimuth	Horizontal Circle	Slope Di	Zenith Angle	Date
٥.	1	A1	1.500	÷.	1	B1	LEV11		0°00'00	359°59'56.0000			
0	2	A1	1.500	8	2	81	LEV11		0°00'00	0°00'00.0000			
0	3	B1	0.999	۰.	3	B1	LEV1	2.123		340*37'37.0000	9.699	87°38'16.0000	
				Φ,	4	81	LEV2	2.123		349°18'00.0000	9.117	86°20'40.0000	
				Φ.	5	81	ZEN1	2.123		340°37'35.0000	9.700	87*36/29.0000	
				Φ.	6	B1	ZEN2	2.123		349°17'55.0000	9.116	86°20'33.0000	

Figure 4-66. Total Station Raw Data File

- 8. To edit TS raw data file information in the left or right panels, right-click a point row to display the pop-up menu.
  - Cut cuts the information
  - Copy copies the information
  - Delete deletes the information
  - Properties displays the *Properties* dialog box
  - Options displays the Option window



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

#### **Editing Name, Instrument Height, and Number Properties**

Do the following to edit name, instrument height, and number properties of a point in a TS raw data file:

- 1. Right-click the 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 4-67).



Figure 4-67. Properties

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

#### **Editing Point To, Notes and Codes Properties**

Do the following to edit the point to, note, and codes of a point in a TS raw data file:

- 1. Right-click the point in the right panel and click **Properties** on the pop-up menu.
- 2. On the *Properties* dialog box, click the *General* tab (Figure 4-68).
- 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.

• Properties : TS 0	bs 3.B1-3.LE¥1	? ×
General Observa	tion Offset	
Point From	B1	
Point To	LEV1	•
Date		
Note		
#	3	
Code		
Туре	SS	•
OK	Cancel Apply	

Figure 4-68. TS Properties – General Tab

#### **Editing Reflector Height and Azimuth Properties**

In TS raw data files, edit the reflector height for any point and azimuth for BKB points measured from the point in the following cases.

- the coordinates are unknown coordinates.
- the point's coordinates can not be calculated.
- 1. Right-click the point in the right panel and click **Properties** on the pop-up menu.

2. On the *Properties* dialog box, click the *Observation* tab (Figure 4-69).

Properties : TS Obs 3.B1-3.LEV1	? X
General Observation Offset	
Reflector Height (m) 2.123	General Observation
Horizontal Circle 340*37'37 0000	Horizontal Circle 359°59'56.0000
Harinental Distance (m) 9 691	Horizontal Distance (m)
Horizontal Distance (m) [3:631	Vertical Angle
Vertical Angle  2*21'44.0000	Zanith Angle
Zenith Angle 87*38'16.0000	Zeniar Angle
Slope Distance (m) 9.699	Slope Distance (m)
Vertical Distance (m) 0.400	Vertical Distance (m)
,	Azimuth 0°00'00.0000
OK Cancel Apply	OK Cancel Apply

Figure 4-69. 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.

#### **Editing Offset Properties**

Topcon Link allows editing/adding offsets for TS measurements using the "from observation line" method. For details on this, see "Offsets From an Observation Line" on page A-2.

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

- 1. Right-click the point in the right panel and click **Properties** on the pop-up menu.
- 2. On the *Properties* dialog box, click the *Offset* tab (Figure 4-70).

• Properties : TS 0	bs 1.MARK-2.5T1	? ×
General Observa	tion Offset String	
Offset Along (m)	1	
Offset Across (m)	0.5	
Offset dHt (m)	2.20	
Offset Type	From Observation Line	
OK	Cancel Apply	

Figure 4-70. TS Properties – Offset Tab

- 3. Edit the *Offset* 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. After editing offset values, to obtain new coordinates of the point, click **Calculate Coordinates** on the toolbar to recalculate coordinates.

#### **Editing String Properties**

To edit the string property of a point in a TS raw data file (only available when *Display String and Control Code* is enabled; see "Editing Point Code Description" on page 4-55) do the following:

- 1. Right-click the point in the right panel and click **Properties** on the pop-up menu.
- 2. On the *Properties* dialog box, click the *String* tab (Figure 4-71 on page 4-53). If the point code has been specified in the *Code* field, the fields *String* and *Control Code* will be enabled for editing.

Propert	ies : TS Obs	LMARK-2.9	5T1		? ×
General	Observation	Offset	String		
String	Powe	er Pole			
Control Code	#132				
OK		Cancel		Apply	

Figure 4-71. TS Properties – CAD Tab

- 3. Edit String and Control 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.

#### **Editing TS Observation Display Properties**

To change the columns order or hide any column in TS Obs tab:

- 1. Right-click the point in the right or left panel and click **Options** on the pop-up menu.
- 2. On the *Options* window (Figure 4-72) select the desired entry (icon, point from, point to, reflector height, etc.), 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 to the order of names in the opened TS raw 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.
- 3. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.

💋 Options			? ×
Display			
- Show columns in r	ight pane ——		
Available columns		Selected columns	
Horizontal Distance Vertical Angle Vertical Distance Offset Along Offset dHt Offset Across Offset Type	>>	Icon # Point From Point To Reflector Height Azimuth Horizontal Circle Slope Distance	Move Up
	~~	Zenith Angle Date Note Code Type	Move Down
- Show columns in le	eft pane		
Available columns	>>	Selected columns # Point Name Instrument Height	Move Up
	~~		Move Down
OK	Car	cel	Apply

Figure 4-72. Options Window For TS Obs Tab

#### **Editing Point Code Description**

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

- 1. Click **File > Configuration**.
- 2. On the *Configuration* dialog box, click *Display* and then the *Strings* tab (Figure 4-73).

🖉 Configuration				?	?)	? ×
Display Coordinate Systems	Precisions Angles Strin	<b>gs</b>   ode				
Save						

Figure 4-73. 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.

#### **Editing the Type of Point**

To edit the type of measured point, double click in the *Type* column of the point and select a type from the drop-down list (Figure 4-74).

Туре
ВКВ
SS 🔹
55
FS
BS
Horizontal Resection
Vertical Resection
Resection
12

Figure 4-74. Edit Type of Measured Point

#### **Editing 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 4-75).
- 2. Enter the new information to any selected row (Figure 4-75).
- 3. Press Enter to apply the edited data to all the selected rows.

#	Point From	Point To	Reflector Height (m)
🔷 21	ST2-2	9	1.60000
🔷, 22	ST2-2	10	1.60000
<b>\$</b> , 23	ST2-2	11	1.60000
4, 24	ST2-2	12	1.60000
<b>\$</b> , 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)
Ф,	21	ST2-2	9	1.60000
Ф,	22	ST2-2	10	1.60000
Ф,	23	ST2-2	11	1.60000
Ф,	24	ST2-2	12	1.60000
Ф,	25	ST2-2	13	2.1
Ф,	26	ST2-2	14	1.60000
Ф,	17	ST2-2	MARK2	1.60000

Figure 4-75. Select and Edit Multiple Rows of Data

# **Editing TopSURV Files**

In TopSURV files (Figure 4-76 on page 4-57), the following information can be edited.

- Point parameters (in *Point* tab).
  - Name, point coordinates, note, control and codes string and control code and offsets offset point)
- GPS occupations parameters (in GPS Occupation tab):
  - Name, antenna type and height, and method of height measurement, offsets
- TS observation parameters (in TS Obs tab).
  - Point name and point number, instrument height
  - Point to and point notes, reflector height, azimuth (only for BKB points measured from the point with unknown coordinates), offsets, CAD information, string properties
- GPS observation parameters (in GPS Obs tab).
  - Vector notes

- Road parameters (in *Roads* tab).
  - Road name, start station/chainage, layer
  - Delete any alignment and x-section
- X-Section Templates parameters (in the X-Section Templates tab).
  - X-section templates name
  - Delete any segment used for creating the template
- Linework parameters (in the *Linework* tab).
  - Plotting style of the line
  - Delete any line segments for the selected line
  - Change the control code

📰 C:	\Topcon	Link	< Da	ata\081202a	a.tlsv <	TopSUR!	/ files>							
•°	Points	R	GF	PS Occupation:	s   👌	TS Obs	୍ 🔗 ଜ	∘s obs	4 Codes	; <b>D</b> ,	Tape D	imensions	1	
Ico	n Nam	e		Grid Northin	ig (m)	Grid Eas	ting (m)	Ele	vation (m)	Code		Control	Note	<b></b>
\$	100	)		23525	2.180	5590	29.918		244.423		Non	e		
•	100	1		23525	5.868	5590	044.886		244.619		Non	е		
•	110	)		23523	5.378	5590	020.844		245.866		Non	e		
•	110	1		23523	5.218	5590	018.840		246.114		Non	е		
•	110	2		23523	5.219	5590	018.850		245.860		Non	e		
•	111	)		23523	5.374	5590	120.858		245.870		None	e		
•	111	1		23523	5.381	5590	20.878		245.471		Non	e		
$\Phi$	111	Z		23523	5.379	5590	20.848		245.471		Non	е		
$\Phi$	200	)		23522	9.374	5590	056.119		243.832		Non	e		
$ \Phi $	200	1		23522	9.374	5590	056.119		241.832		Non	е		
$\diamond$	88			23523	3.862	5590	052.102		242.673		Non	e		
▲	89			23525	5.863	5590	044.905		242.619		Both			
$\Phi$	90			23525	5.864	5590	044.905		244.619		Non	е		
<b>\</b>	E4										Non	e		
•	Offi	:e_2									Non	e		
•	Offi	:e_3									Non	e		
•	Offi	:e 4									Non	e		
<b>–</b>					_					_	_			

Figure 4-76. Sample TopSURV File

To edit TopSURV file information in any tabs, right-click a point or row to display the a pop-up menu.

- Cut cuts the information
- Copy copies the information
- Delete deletes the information
- Properties displays the properties dialog box
- Options displays **Option** window

#### **Editing Point Name and Note Properties**

Coordinates of any points contained in the TopSURV file display in the *Point* tab.

- 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 4-77).

• Propert	ties : Point O	<u>? ×</u>
General	Coordinates CAD	
Name	0	
Note		
Code	base#899	•
Control	Both	•
OK	Vertical Horizontal Both	

Figure 4-77. Point Properties – General Tab

- 3. Edit the *Name*, *Note*, *Code*, and *Control* 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.

#### **Editing Point Coordinates**

- 1. Click the Point tab.
- 2. To edit point coordinates, right-click the point and click **Properties** on the pop-up menu.
- 3. On the *Properties* dialog box, click the *Coordinates* tab (Figure 4-78 on page 4-59).
- 4. Depending on the type of coordinate file, edit the *Ground Northing/Grid Northing/ Latitude*, *Ground Easting/Grid Easting/ Longitude*, and *Elevation/Ell. Height* 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.

• Properties : Po	int Auto1	? ×
General Coord	inates CAD	
WGS84 Latitude	55*41'00.000N	
WGS84 Longitude	37*33'00.111E	
WGS84 Ell.Height (r	n) 234.77777	
ОК	Cancel App	ly

Figure 4-78. Point Properties – Coordinates Tab

#### **Adding a New Point Code**

- 1. Click the *Point* tab.
- To add a new point code, right-click the point and click **Properties** on the pop-up menu. On the *Properties* dialog box, click the *CAD* tab.
- 3. Right-click in the *Name* field and click **New Code** on the pop-up menu (Figure 4-79).

• Properties : Po	int Auto2			? ×
General Coord	inates CAD	String		
Codes				
ode	String	Attribute		Value
	New Code			
	Cut Ct	NG+X		
	Copy Ct	rl+C		
	Paste Ct	rl+V		
	Delete De	4		
ок –		Cancel	Appl	y

Figure 4-79. Code Pop-up Menu in Point Tab

- 4. Type the new code Name or select from the Code drop-down list and press **Enter**.
- 5. After entering a code for the point, the string parameters for this point can be entered.

Note: Code attributes can be added/edited only in the Codes Tab.

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



In TopSURV files, a point can have more than one code.

#### **Editing Offset Properties**

In TopSURV files, Topcon Link allows editing/adding offsets with using point to line (PTL) method and offsets from the line with known azimuth. For details on this, see "Offset Point to Line" on page A-3.

To edit offset properties for a point in TopSURV file:

- 1. Click the Point tab.
- 2. Right-click the point and click **Properties** on the pop-up menu.
- 3. On the *Properties* dialog box, click the *Offset* tab (Figure 4-80).

	Properties : Point 201	? ×
Properties : Point 200     X	General Coordinates CAD String Offset	
General Coordinates CAD String Offset From Point Offset Dist (USR) -65.61667 Offset Across (USR) 49.2125 Offset Ht (USR) 32.80833 Height is Relative Asculue To Point 1001  OK Cancel Apply	From Point         101           Offset Azimuth         66/0000.0000           Offset Dist (m)         30           Offset Actions (m)         0           Offset Hit (m)         0           Height is         © Relative           © Absolute	
	OK Cancel Apply	

Figure 4-80. Point Properties – Offset Tab

- 4. Depending on the offset type, 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.
- 6. After editing offset values, to obtain new coordinates of the point, click **Calculate Coordinates** on the toolbar to recalculate coordinates.

#### **Editing GPS Occupation Point Name**

- 1. Click the GPS Occupations tab.
- 2. To edit the names of base and topo points, right-click the point and click **Properties** on the pop-up menu.
- 3. On the *Properties* dialog box, click the *General* tab (Figure 4-81).

Edit the *Point Name* for the base and *topo points* field as needed.

🔶 Propert	ies : GPS Occupation Topo1	<u>?</u> ×
General	Antenna Offset	
Original Nar	ne Topo1	
Point Name	Topo1	•
Start Time	10/14/2002 08:55:33	
Stop Time	10/14/2002 08:55:33	
Duration	0:00:00	
Method	Торо	
Note	pipe #124	
Receiver		
OK	Cancel Apply	

Figure 4-81. GPS Occupations 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.

#### **Editing GPS Occupation Antenna Parameters**

- 1. Click the GPS Occupations tab.
- 2. To edit the 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 4-82 on page 4-62).
- 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.



If the base station has an "Unknown" antenna type, Topcon Link will not recalculate the coordinates of the points after editing base station coordinates or antenna height. To recalculate the coordinates of the points, specify the antenna type for the base station.

Properties : GPS Occupation Topo1	? ×
General Antenna Offset	
Antenna Type 🛛 🐳 HiPer GD/GGD 🔽 Custom	
Antenna Height (m) 1.55	
Ant Height Method Vertical	•
OK Cancel Apply	

Figure 4-82. GPS Occupation Properties – Antenna Tab

# Adding Antennas Using the Custom Antenna List

Each antenna type has unique phase center parameters obtained through calibration and stored in an ANTENNA.XML file.

These parameters are not viewable or editable. However, the **Custom Antennas List** adds user-defined antenna types to the antenna list, as well as displays, edits, and removes antennas from the antenna list.

- To add a new antenna type to the antenna list or to edit an existing antenna type, click Custom in the *Properties* dialog box for a GPS Occupation (Figure 4-82).
- To remove an antenna, click on the antenna's row and click Remove (Figure 4-83 on page 4-63). Click Add to display the *New Custom Antenna* dialog box.

🚝 Custom Ant	ennas List		<u>? ×</u>
NGS Name	Name	Radius (	(m) L1 Base offset(
♦ <sup>Y</sup> PGA_1	PG-A1	0.0	90 0.054
•			Þ
Add		Remove	Close

Figure 4-83. Custom Antenna List

- 3. On the *General* tab, edit the NGS Name, Name, Manufacturer, and Note fields (Figure 4-84). Then click **Apply** to save the information.
- 4. Click the *Parameters* tab and enter the radius of antenna, offsets of the phase center from the antenna reference point (ARP) for L1 and L2 frequencies, and height measuring method for the antenna (Figure 4-84).

🐠 New Custom Anteni	na	<u>? ×</u>	
General Parameters		💉 New Custom Anten	na <u>?X</u>
Name	ANT_01	General Parameters Radius (m)	s    0.09
Manufacturer	Anywhere,Inc	L1 Base offset(A1) (m)	0.054
Note		L2 Base offset(A2) (m)	0.06
		L1 Plane offset(C1) (m)	0.027
		L2 Plane offset(C2) (m)	0.033
		L1 Easting offset(E1) (m)	0.002
		L2 Easting offset(E2) (m)	
		L1 Northing offset(N1) (m)	0.001
		L2 Northing offset(N2) (m)	
OK	Cancel /	Measured Height Method	Vertical
		OK	Cancel Apply

Figure 4-84. New Custom Antenna – General and Parameters Tabs

Figure 4-85 shows how Topcon Link interprets antenna parameters.



Figure 4-85. Antenna Parameters

- 5. Click **OK** on the *Properties* dialog box.
- 6. To edit the parameters of an existing antenna right-click the antenna and click **Properties** on the pop-up menu. You can edit any parameters in the *General* and *Parameters* tabs.

#### **Edit GPS Occupation Offsets**

Topcon Link allows editing/adding offsets for GPS measurements with using the "offsets from the line with known azimuth" method. For details on this, see "Offsets From a Line with Known Azimuth" on page A-5.

- 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 4-86).

🌖 Propert		? ×			
General	Antenna	Offset			
Offset Azimu	uth 🚺	0000.0000			
Offset Dist (	m) 1				
Offset dHt (i	m) 0				
Offset Acros	ss (m) 0.3	7			
ОК		Cance	el	Apply	

Figure 4-86. GPS Occupation 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.

#### **Editing GPS Occupations Display Properties**

To change the column order or hide any column in *GPS Occupation* tab, use the **Options** dialog box (Figure 4-87).

🚰 Options	?	×
Display Show Columns		_1
Available columns	Selected columns	
	Original Name     Antenna Type     Antenna Heigr     Ant Height Me     Start Time     Stop Time     Duration	)
	Method Move Dov     Note     Receiver     Offset Azimuth ▼	vn
ОК	Cancel	

Figure 4-87. Options Window For GPS Occupation Tab

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

#### **Editing TS Obs Parameters**

- 1. Click the **TS Obs** tab.
- 2. For editing TS Obs tab properties, see "Editing Total Station Raw Data Files" on page 4-48.

#### **Editing GPS Obs Point Notes**

- 1. Click the GPS Obs tab.
- 2. To edit the observation (vector) notes, right-click the observation and click **Properties** on the pop-up menu.
- 3. On the *Properties* dialog box, click the *General* tab (Figure 4-88 on page 4-66).
- 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.

• Proper	ties : G	PS Obs 0-Topo2	<u>?</u> ×
General	Obser	rvation	
Point From		0	
Point To		Topo2	
Start Time		10/14/2002 08:55:43	
Duration		0:00:00	
Note			
Method		RTK Topo	
	OK	Cancel Apply	<u> </u>

Figure 4-88. Observation Properties – General Tab

#### **Editing GPS Observation Display Properties**

To change the column order, or add a column from the left panel, or hide any column in the *GPS Obs* tab, click the *Options* dialog box (Figure 4-89).

🚰 Options			? ×
Display Show Columns		Selected columns	[
dX dY dZ Azimuth Distance Elevation Angle	>> <<	Icon Point From Point To Start Time Duration Note Horizontal Precision dN dV ettical Precision dN dE dHt Method Solution Type	Move Up
ОК	Cano	cel	Apply

Figure 4-89. Options Window For GPS Obs Tab

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

#### **Editing 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 4-90).

D:\code	s_for_linework.	tlsv <topsurv< th=""><th>PC</th><th>files &gt;</th><th></th><th></th><th></th><th></th></topsurv<>	PC	files >				
•° Points	🛛 🖉 Linework 🛛	Codes						
Icon	Code	Layer	ŀ	Icon		Attribute Name	Default Value	Туре
•	C-1	For Line1		E		List for ob18	pipe	Menu
•	C-2	for_Points		1.2		exam	4	Real Number
*	C-3	For Delete O	1	abl	1	quiz	lamp	Text
		New Code				h a sh	6	Integer
		New Attrib	ute		Integ	ger		
		Cut Kg		Ctrl+X	Real	Number		
		Copy		Ctrl+C	Text			
		Delete		Del	Menu	1		
		Properties.						
					-			

Figure 4-90. Select Code Attribute

- 3. On the *Attributes* dialog box, enter the parameters for the code's attribute (Figure 4-91).
- 4. Click **OK**.

2 Properties : Attribute New At	Integer Attribute	
General	-	
Name Attribute_Integer		
Default Value	🛂 Properties : Attribute New Att <u>?</u> 🗙	
Type Integer	General	Real Number
	Name Attribute_Real Number	Attribute
	Default Value	
	Type Real Number	
	OK Cancel Apply	
Properties : Attribute New At	t ? X	
General	Text Attribute	
Name [Attribute_Lext		
Name  Attribute_Text Default Value	Properties : Attribute New A? X	
Name  Attribute_Text Default Value Type Text	Properties : Attribute New A? X	
Name  Attribute_ Lext Default Value Type Text OK Cancel //	General Attribute_Menu	Menu Attribute
Name Attribute_Lext Default Value Type Text OK Cancel A	General Attribute_Menu Default Value	Menu Attribute
Name Attribute_Lext Default Value Type Text OK Cancel /	General       Name     Attribute_Menu       Default Value       Add	Menu Attribute
Name Attribute_Lext Default Value Type Text OK Cancel	General         Name         Attribute_Menu         Default Value         Image: Add         Remove         Type	Menu Attribute

Figure 4-91. Edit Code Attributes



Later, double-click the attribute to edit it.



Codes and attributes already in use for a point cannot be deleted or edited.

 To edit the code name, right-click the code's name and click Properties on the pop-up menu. Edit the code's name and click OK (Figure 4-92).

• Properties : Code C-3			
General	Plotting style	es	
Code	C-3		
Layer	For Point	s 3	•
ОК	Ca	ancel	Apply

Figure 4-92. Edit Code Name

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

# **Using Files**

This chapter discusses file functions available in Topcon Link.

# **Changing Localization Data**

You can use Topcon Link to edit localization data in TopSURV files.

# **Localization Basics**

Localization involves comparing and computing local jobsite coordinates with a global reference system.

A GPS+ system is capable of precise positioning, but the positions it computes are relative to a global reference system defined in terms of a geographic latitude, longitude, and height above the earth's surface. To be useful for local site work, global GPS coordinates need to be converted into local site coordinates, defined in terms of a distance north and east of some origin point and some distance above an elevation datum. These north, east, and elevation coordinates (often abbreviated to NEZ coordinates) can be regional coordinates system—for example, a state plane system in the United States—or the project's survey crew may arbitrarily define these coordinates for the specific site. NEZ coordinates must be defined in terms of the construction design data. In either case, a mathematical conversion is necessary to turn global GPS coordinates into NEZ coordinates relative to the locally defined coordinate system.

The basic approach to calculating the mathematical conversion is to provide pairs of point coordinates for each Control Point on the project. A point pair consists of:

- local NEZ coordinates for the point (obtained from the project's survey crew), and
- global latitude, longitude, and height coordinates for the point.

These pairs of points are needed to calculate a precise mathematical conversion formula for converting all global GPS coordinates (generated in the GPS+ or GPS receiver) to local NEZ coordinates for a particular project.

Use the following guidelines to ensure high-quality localization:

- The surveyor's local Control Points must be precisely measured. The quality of measurements directly affects accuracies.
- The Control Points should be located more or less evenly around the site. Generally, the more Control Points the better, but if they are clustered together or are all at one section of the site, then localization results will be less than ideal.

A good rule of thumb is to locate Control Points evenly distributed around a perimeter of the site or grading area. While not directly related to quality of localization, the location of Control Points should be elevated, easily accessible, and are not frequently obstructed by trees, buildings, other structures, moving vehicles, etc.

## Horizontal and Vertical Localization Determinations

In Topcon Link (and Topcon Tools and TopSURV), horizontal localization and vertical localization are performed separately.

 Horizontal localizations use two-dimensional conformal transformations. This kind of transformation is also known as a four-parameter similarity transformation (rotation (α), scale and two translation parameters (DX, DY)). To relate the points' ellipsoidal geodesic coordinates (measured with GNSS receivers) to local plane coordinates (obtained with total stations, etc.), an oblique stereographic map projection is used as an intermediate step:

$$\begin{bmatrix} X \\ Y \end{bmatrix}_{Local} = Scale \cdot \begin{bmatrix} \cos \alpha - \sin \alpha \\ \sin \alpha \cos \alpha \end{bmatrix} \cdot \begin{bmatrix} N \\ E \end{bmatrix}_{Stereo} + \begin{bmatrix} DX \\ DY \end{bmatrix}$$

• Vertical localizations use a three-parameter transformation (one shift (HO) and two slopes (Hx, Hy)) to convert between the points' ellipsoidal or orthometric heights and the elevations in the

local height system. These three parameters are necessary in order to specify the plane that would adequately model the difference between the local geoid and the WGS84 ellipsoid in the given local area:

$$H_{Local} = U + Ho + Hx \cdot N_{Stereo} + Hy \cdot E_{Stereo}$$

Topcon Tools (and Topcon Link and TopSURV) uses an algorithm for localization that computes parameters for conversion from WGS84 to a local system using one, two, or more Control Points with known coordinates in both systems. If a geoid is present in the job, Topcon Tools will use the geoid to during the localization. The geoid model is used to correct local heights for the geoid before computer localization parameters; consequently, localization parameters will be different with or without a geoid in the job. The presence of a geoid will not significantly affect localization results when using three or more vertical controls, but will improve localization quality if using less than three vertical controls.

• When using ONE control point, the following assumptions have already been determined (Table 5-1):

For Horizontal Localization	The system is oriented to North. The Horizontal scale factor $(K_h)$ is set to one. The horizontal offsets (DX, DY) are computed.	
For Vertical Localization	The components of the deflection of vertical are set to zero. The vertical offset is determined.	
For Horizontal and Vertical Localization	The system is oriented North. The combined scale factor is set to $K_{comb} = K_h \cdot K_v = (1 \cdot (1 + U/R))$ , where R is the average radius of curvature. The components of deflection of vertical are set to zero. The horizontal (DX, DY) and vertical (DH) offsets, azimuth (rotation), and scale factor are computed.	

Table 5-1. Localization	with	One	Control	Point
-------------------------	------	-----	---------	-------

- When using TWO control points, the following have already been determined for horizontal and vertical localization:
  - The components of deflection of vertical are set to zero.
  - The horizontal (DX, DY) and vertical (DH) offsets, azimuth (rotation), and scale factor are computed.
- When using THREE or more control points, the horizontal (DX, DY) and vertical (DH) offsets, azimuth (rotation), scale factor, and components of deflection of vertical are computed for horizontal and vertical localization.

## Accuracy Estimation for Localization Parameters

Localization parameters are estimated using the least-mean-square method in the following two instances:

- When three or more control points are used for horizontal localization.
- When three or more control points are available for horizontal and vertical localization.

The Localization dialog box will display the residuals for all control points (Figure 5-1).



Figure 5-1. Residuals for Control Points

When using fewer than three control points for localization, the residual are computed with the following values:

- When using ONE control point, the horizontal and vertical residuals will equal zero.
- When using TWO control points, the horizontal residuals are equal to zero, but the vertical residual can have a value different from zero.
- When using THREE control points, the horizontal residuals are equal to zero, but the vertical residual can have a value different from zero.

## **Editing Localization Parameters**

Use the *Localization* dialog box to edit and save localization parameters in an open TopSURV file.

To open the *Localization* window for the TopSURV file, open a TopSURV file click **Process ▶ Localization**.

The localization parameters contained in the TopSURV file will be shown in the *Localization* dialog box (Figure 5-2).

🐔 Localization	1			?×
WGS Point	Local Point	Use	Rotation	0*02'20.1856
▲ CPW1	CPL1	Horizontal and Vertical	Scale	0.9998928149
🔺 CPW2	CPL2	Horizontal and Vertical	Deflection North	110*21*48 0534
▲ CPW3	CPL3	Horizontal	Denection	110 21 40.0004
△ CPW7	CPL7	Horizontal	Deflection East	J-2°20'12.5354
CPW11	CPL11	Vertical	Origin Lat	59°43'31.57852N
L			Origin Lon	151*19'53.78643W
			Origin Ell. H (USft)	760.927
L			Origin Northing (USft)	11321.398
			Origin Easting (USft)	7354.622
			Origin H (USft)	450.000
	Keep Scale 1.000			0
Add	Point	Remove Point	Compute parameters Close	

Figure 5-2. Localization Data in the TopSURV File

The left panel of the *Localizatio*n window displays pairs of points used for localization:

- WGS Point Control Point in the WGS-84 coordinate system.
- Local Point Control Point in the Local coordinate system.

- Use shows the localization status of the Control Point (No, Vertical, Horizontal, Horizontal and Vertical)
- *NResidual / EResidaul / HResidual –* display the residuals along N, E, H axes for all Control Points

The right panel displays the localization parameters for the Control Points.

Using the Localization dialog box, you can:

#### • Remove a Control Point

To remove a pair of Control Points, the select desired row in the *Localization* window and click **Remove Point**.

#### • Add a new Control Point

To add a new Control Point (Figure 5-3), click **Add Point** and select the desired point from the drop-down list in *WGS Point* column. Then select the corresponding point from the drop-down list in *Local Point*.



Figure 5-3. Add a New Control Point

#### • Change a Control Point

To change a Control Point, do one the following:

- Click in the *WGS Point / Local Point* column and select the corresponding point (Figure 5-4).



Figure 5-4. Change Control Point

 Right-click the Control Point and click **Properties** on the pop-up menu. Select the corresponding WGS Point/Local Point from the drop-down list (Figure 5-5).

Properties		? ×
General		
WGS Point	CPW1	•
Local Point	CPL1	•
Use	Horizontal	•
N Residual (USft)	0.063	
E Residual (USft)	-0.164	
Ht Residual (USft)		
Distance Residual (USft)		
OK	Cancel Apply	

Figure 5-5. Control Point Properties

#### • Change the Localization Status of the Control Point.

To change a Control Point's status, do one the following:

- Click in the *Use* column and select the corresponding localization type (Figure 5-6).

Horizontal	•
No Vertical	
Horizontal	
Horizontal and Vertical	

Figure 5-6. Change Localization Status

 Right-click the Control Point and select **Properties** from the pop-up menu. Select the corresponding *WGS Point/ Local Point* from the drop-down list (Figure 5-7).

<ul> <li>Properties</li> </ul>	<u>?</u> ×
General	
WGS Point	CPW1
Local Point	CPL1
Use	Horizontal
N Residual (USft)	No Vertical
E Residual (USft)	Horizontal Horizontal and Vertical
Ht Residual (USft)	
Distance Residual (USft)	
OK	Cancel Apply

Figure 5-7. Control Point Properties – Select of the Localization Type

#### • Edit the Coordinates of a Control Point

To edit the coordinate of the Control Point do the following:

- 1. For editing WGS Control Point, set the WGS-84 system. For editing Local Control Point set the local coordinate system.
- 2. Open the Point tab.
- 3. Right-click the Control Point and click **Properties** on the pop-up menu.
- 4. On the *Properties* dialog box, click the *Coordinates* tab (Figure 5-8).

A Properties : Point C	PW1	<u>? ×</u>
General Coordinate	S CAD	
WGS84 Latitude	11°22'33.44550N	
WGS84 Longitude	55°44'33.22110E	
WGS84 Ell.Height (USft)	101.202	
OK	Cancel	Apply

Figure 5-8. Point Properties – Coordinate Tab

- 5. Depending on the type of the coordinate file edit the *WGS84 Latitude* or *Ground Northing/Grid Northing*, *WGS84 Longitude* or *Ground Easting/Grid Easting*, and *WGS84 Ell.Height* or *Elevation* fields as needed.
- 6. Click **OK** to set the changes and close the dialog box. Click **Apply** to set the changes and continue editing the point.



After editing any of the localization parameters, the localization is automatically recomputed. However, you can click OK to make absolutely sure it has been recomputed.
## **Computing Coordinates**

To compute the coordinates of the points in a raw data file or TopSURV file using the information the file contains:

- 1. Open a raw data or TopSURV file.
- 2. Click **Process > Compute Coordinates**.

## NOTICE 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/writes them to the Total Station raw data file or TopSURV file (Figure 5-9).

C:\Topcon Lin	k Data∖M062502m.	'aw <gts-7+rav< th=""><th>ı&gt;</th><th></th><th></th><th></th><th>_ 🗆 ×</th></gts-7+rav<>	ı>				_ 🗆 ×
📍 Points 🔷	TS Obs						
Name	Ground Northin	Ground Easting	Elevation (m)	Code	Note	Control	<b></b>
12	5.712	7.693	-0.514	TREE		None	
	6.367	8.566	-3.396	TREE		None	
14	8.665	6.314	-0.793	TREE		None	
	15.231	3.148	2.873	TREE		None	
<b>Ф</b> 3	15.794	8.417	-1.500	TREE		None	
<b>◆</b> 4	13.608	11.469	-0.997	TREE		None	_
	18.867	14.231	-0.676	TREE		None	
<b>\$</b> 6	9.676	16.616	-2.299	TREE		None	_
<b></b> 7	6.645	19.809	0.811	TREE		None	
<b>4</b> 8	1.249	20.144	-0.964	TREE		None	
<b>\$</b> 9	3.141	13.456	-2.833	TREE		None	
🛆 MARK	10.001	10.006	-0.904	STAT		Both	
♦ 5T1	7.069	13.877	-1.662	rr		None	-
1				1	1	1	

Figure 5-9. Raw Data File



If the base station has an "Unknown" antenna type, Topcon Link will not recalculate the coordinates of the points after editing base station coordinates or antenna height. To recalculate the coordinates of the points, specify the antenna type for the base station.

## NOTICE NOTICE

When editing data (point coordinates, antenna/instrument/ reflector heights, antenna types, antenna height measuring methods, point types, BKB azimuths, offsets), coordinate recomputation will be performed after clicking the Calculate Coordinate button.

### **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.

### **Setting the 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 (Figure 5-11) and choose one of the following Adjustment types (Figure 5-10).
  - None requires apriori values
  - Least Squares requires apriori values; see "Least Squares Method" on page 5-13 for details
  - Compass Rule see "Compass Rule" on page 5-13 for details
  - Transit see "Transit Rule" on page 5-14 for details
  - Crandall see "Crandall Method" on page 5-14 for details
  - Angle Balance see "Interior Angle Balancing Method" on page 5-15 for details



Figure 5-10. Adjustment Type

The adjustment type determines whether or not the point coordinates will be fixed. When adjusting with Least Squares, or computing without adjustment (None), coordinates of the network points can be fixed. When adjusting with Angle Balance, Transit, Crandall, or Compass Rule, coordinates of the first network point and the first and last azimuths of the network are automatically fixed.

🔑 Process properties	<u>? ×</u>						
Compute Coordinates	TS-Computations						
Adjustment Type None							
Points Fixing by User							
EDM 3 mm + 3	EDM 3 mm + 3 ppm						
HA Sigma, (sec) 5							
VA Sigma, (sec) 10							
OK	Cancel						

Figure 5-11. Process Properties – Compute Coordinates

- Select an azimuth balancing parameter (Figure 5-11 on page 5-11). See "Azimuth Balancing Method" on page 5-15 for details.
- 4. For None or Least Squares adjustment types, select the apriori values of error of linear and angular measurements (Figure 5-12). The None method is used only for computing a resection.
- 5. Click OK.



Figure 5-12. Assign Apriori Values for Least Squares Method

### **Setting the 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 5-13).

💯 Process properties		<u>?</u> ×
Compute Coordinates Refraction Coefficient © 0 © 0.14 © 0.2	TS-Computations	
OK	Cancel	

Figure 5-13. 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:

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

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

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. Adjustments can be computed using the following formulas:

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

AdjustmentInDepartureAB	_	DepartureOfAB
DepartureMisclosure	-	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 data representation in the open file, click **File ► Configuration**.
- 2. Click **Display** on the *Configuration* dialog box (Figure 5-14).

Configuration		? 🛛
Coordinate Systems	Precisions Time Digita after decimal — Distances Coordinates(N.E) Heights Angles (seconds) Lat.Lon (seconds) Lat.Lon (Dec. degrees) Area Volumes	Roads         Angles         Strings           3
OK		Cancel

Figure 5-14. Job Configuration – Click Display

- 3. Edit the following parameters.
  - The *Precisions* tab (Figure 5-15 on page 5-16) defines the number of digits after decimal.

Precisions	
Digits after decimal	
Distances	3
Coordinates(N,E)	3
Heights	3
Angles (seconds)	4
Angles (Dec.degrees)	7
Lat,Lon (seconds)	5
Lat,Lon (Dec.degrees)	8
Area	0
Volumes	0



• The Time tab (Figure 5-16) set the GPS time zone offset.



Figure 5-16. Time Tab

• The Roads tab (Figure 5-17) sets the type of number to use for the centerline position.

	Roads	
Display CL Pos as	Chainage	<b>_</b>
	Chainage	
	Station	

Figure 5-17. Roads Tab

• The Angles tab (Figure 5-18) defines an angle representation.

	Angles			
Angles		dd*mm'ss.s''		•
Lat,Lon		dd*mm'ss.s''		•

Figure 5-18. Angles Tab

• The *Strings* tab (Figure 5-19) contains the field that switches on/off the output alphanumeric code describing surveyed points on the screen.



Figure 5-19. Strings Tab

4. To view, add, or remove available geoid files, click Coordinate Systems in the *Configuration* dialog box (Figure 5-20).

Configuration							? 🛛
Display	Ge	oids List					
Coordinate Systems	I	Name	Path	Minimum Lon	Minimum Lat	Maxim	
t= Save	6	EGM96	C:\TOP	180°00'00.0	90°00'00.00	180°C	bhA
t Process	6	g2003u01	D:\Geoi	130°00'00.0	40°00'00.00	111°0	
	1	g2003u02	D:\Geoi	113°00'00.0	40°00'00.00	94°00'	
	1	g2003u03	D:\Geoi	96°00'00.00	40°00'00.00	77°00'	
	6	g2003u04	D:\Geoi	79°00'00.00	40°00'00.00	60°00'	
	19	g2003u05	D:\Geoi	130°00'00.0	24°00'00.00	111°C	Remove
					1		
					J	1	
ОК					Cancel		

Figure 5-20. Configuration – Coordinate Systems

To add a geoid file click **Add** and select the desired \*.bin file in *Open* dialog box and click **Open**.

5. To change autosave time intervals when editing a file, click **Save** in the *Configuration* dialog box and type the desired interval (Figure 5-21).



Figure 5-21. 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 when the edited file was not saved, Topcon Link opens a reserve copy of the edited file and marks it as "Recovered".

6. To change the adjustment type click **Process** (Figure 5-22).

Configuration	
Display Coordinate Systems Save Process	Compute Coordinates     TS-Computations       Adjustment Type     Least Squares       Points Fixing by User       EDM     3       Max     3       HA Sigma, (sec)     5       VA Sigma, (sec)     10
OK	Cancel

Figure 5-22. Configuration – Set Process

### **Layers View Options**

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

The Layers view lists all layers and their plotting style used in the file (Figure 5-23):

- Name the name of the layer.
- Visible shows (select Yes) or hides (select No) the layer on the *Cad View* and *3D View*.
- Line Style/Line Width/Line Color/Point Symbol displays the plotting style (attributes) of the layer.
- Note displays user comments.

🚄 Layers : D:\c	🖬 Layers : D:\codes_for_tinework.tlsv								
Name	Visible	Line Style	Line Width	Color	Point Symbol	Note			
<i>🛃</i> o	Yes		1 pt		•				
🕖 For Line1	Yes		1 pt		$\diamond$				
🥖 For Line2	Yes		2 pt		•				
🕖 For Points 3	Yes		1 pt			for GPS_Base			
🕖 For_Points2	Yes		1 pt		•				
🕖 for_Points	No		1 pt		•				

Figure 5-23. Layers View

## **Tabular View Options**

To change the column order or hide any column in any tab click **View → Tabular View Option**.

- 1. Select the desired tab in the *Tabular View Option* window (Figure 5-24).
- 2. On the tab select the desired entry (icon, point from, point to, reflector height, etc.), then:
  - Use the Move Right (>>) button to move entries from the left field to the right field. The order of names in the right field must correspond to the order of names in the opened TS raw file.
  - Use the **Move Left** (**<**) 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.
- 3. To save the tabular view options click **OK**.



Figure 5-24. Tabular View Options Examples

## **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 5-25). Repeat steps 2 and 3 as needed.

🐖 Торсо	n Link					
Print	Next Page	Prev Pagene Page	Zoom in Zoom Out	Close		
	Icon	Name	Ground Northing (USft)	Ground Easting (USft)	Elevation (USft)	Code
	¢	49	11319.719	9998.464	450.000	
	÷	50	10000.000	10000.000	450.000	
	•	261	11321.345	7354.646	450.000	FD2.5ALUMPIPE
	\$	84	10000.070	10000.092	450.000	FD2.5BC
	•	259	11351.127	7404.439	452.862	FD1/2RB
	•	260	11371.196	7384.497	454.644	FD1/2RB
	•	370	11335.421	8019.892	488.994	DITCH
	•	292	11323.861	8019.532	489.340	ER
	•	412	11341.083	8019.694	489.676	OHP
	•	411	11350.428	8012.766	490.136	HEAPED
	•	255	11351.296	8014.747	490.137	FD1/2RBBENTBSE
	•	371	11345.521	8017.733	490.396	TOP
	۲	250	11171.245	9122.712	490.574	

Figure 5-25. Print Preview – Points Tab, TopSURV File

5. Click **File ▶ Print** menu, click **OK**.

# Notes:

# Receiver Options and Offset Types

## **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 (http://www.topcongps.com/tech/index.html) or consult your TPS dealer.

- Type of signal (standard L1; optional L2)
- Memory (standard 0Mb; optional up to 128Mb)
- 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)

## **Offset Types in Topcon Link**

Topcon Link allows editing offset values and calculations for offset point coordinates for the following types of offsets.

### **Offsets From an Observation Line**

Offsets from the observation line are used only in TS measurements. Figure A-1 demonstrates offsets from the observation line with the signs for the offset.



Figure A-1. Measuring Offsets From Observation Line

From the *Ts Obs* tab, use the *Properties* dialog box and the *Offset* tab (Figure A-3 on page A-3) to add/edit offset values.

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

• Properties : TS O	bs 1.MARK-2.5T1	? ×
General Observat	ion Offset String	
Offset Along (m)	1	
Offset Across (m)	0.5	
Offset dHt (m)	2.20	
Offset Type	From Observation Line	
OK	Cancel Apply	

Figure A-2. TS Properties – Offset Tab

### **Offset Point to Line**

The offsets from the reference line formed by the reference points (point to line offsets) are used in TS and GPS measurements. Figure A-3 demonstrates offsets from point to line with the signs of the offsets.



Figure A-3. Measuring Offset Point to Line

From the *Point* tab, use the *Properties* dialog box and the *Offset* tab (Figure A-4) to add/edit offset values for a coordinate and TopSURV file.

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

Properties : Point :	200ak	? ×
General Coordinate	S CAD String Offset	
From Point	101	
Offset Dist (m)	-20	
Offset Across (m)	-15	
Offset Ht (m)	10	
Height is		
Relative		
C Absolute		
To Point	1001anonymous	•
ОК	Cancel Apply	

Figure A-4. Point Properties – Offset Tab

### Offsets From a Line with Known Azimuth

The offsets from a line with known azimuth are used in TS and GPS measurements. Figure A-5 demonstrates offsets from the line with known azimuth with the signs of the offsets.



Figure A-5. Measuring Offset from the Line with Known Azimuth

From the *Point* tab for TS measurements or the *GPS Occupation* tab for GPS measurement, use the *Properties* dialog box and the *Offset* tab (Figure A-6 and Figure A-7 on page A-6) to add/edit offset values in a TopSURV file.

- Offset Azimuth offset line azimuth
- Offset Dist the distance along the line with known azimuth from the rover GPS antenna point to the offset point
- Offset Across the distance perpendicular to the line with known azimuth from the rover GPS antenna point to the offset point

- Offset Ht the height difference from the rover GPS antenna to the offset point
- Height is absolute the absolute height of the offset point

Properties : Point 2	201	? ×
General Coordinate	s CAD String Offset	
From Point	101	•
Offset Azimuth	60*00'00.0000	
Offset Dist (m)	30	
Offset Across (m)		
Offset Ht (m)	0	
Height is		
<ul> <li>Relative</li> <li>Absolute</li> </ul>		
OK	Cancel	]

Figure A-6. Point Properties – Offset Tab

Properties : GPS Occupation 1001anonymous2	
General Anten	na Offset
Offset Azimuth	35
Offset Dist (m)	12.8
Offset Ht (m)	0.45
Offset Across (m)	7.4
OK	Cancel Apply

Figure A-7. GPS Occupation Properties – Offset Tab

# **Creating a Regional Geoid Model File**

If geoid heights (differences between ellipsoidal and orthometric heights) for the nodes of a regular grid are known, you can create a Regional Geoid Model File (\*.rgm).

To create this ASCII file with a \*.rgm extension, manually enter geoid heights in the following format:

LAT, LON, n\_row, n\_column, step\_lat, step\_lon, geoid\_direction, ellipsoid;

H1 H2 H3

H4 H5 H6

H7 H8 H9

where

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

Enter latitude and longitudes in the following format (Figure B-1):

#### dd° mm' ss''

#### Figure B-1. Latitude and Longitude Format

- n\_row the number of rows in the file,
- n\_column the number of columns in the file,
- step\_lat grid step along parallels (MM SS)
- step\_lon grid step along meridians (MM SS)

• geoid\_direction – direction for entering geoid heights (Table B-1):



#### Table B-1. Entering Geoid Heights

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

An example of this format can be seen in "Regional Geoid Model File" on page C-15.

Using Topcon Link, convert the Regional Geoid Model file to a Topcon geoid file (\*.gff).

# **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+0000000022
_+11	_x+00000015360_y+00000016995_z+0000000018
_+1113	_x+00000013121_y+00000012355_z-00000001882
_+1114	_x+00000010307_y+00000013914_z+0000000721
_+12	_x+00000013520_y+00000013371_z+00000001000
_+2	_x+0000003135_y+00000015221_z+0000004277
_+3	_ x+00000003993_ y+00000009992_ z-0000000096
_+4	_x+0000006912_y+0000007631_z+0000000407
_+5	_ x+0000002577_ y+0000003569_ z+0000000788
_+6	_x+00000012071_y+00000003714_z-0000000835
_+7	_x+00000015842_y+00000001442_z+0000002275
_+8	_x+00000021133_y+00000002553_z+0000000500
_+9	_ x+00000017531_ y+00000008498_ z-00000001320
_+MARK	_x+00000010000_y+00000010000_z+00000000500
_+MARK1	_ x+00000010033_ y+00000009975_ z-0000000959
_+MARK2	_ x+00000010006_ y+00000010001_ z-00000000904
_+ST1	_x+00000013856_y+00000007047_z-0000000258
_+ST1-1	_ x+00000013856_ y+00000007047_ z-0000000258
_+ST1-3	_ x+00000013830_ y+00000007105_ z-0000000927
_+ST2	_ x+00000014870_ y+00000010679_ z-0000000204

- \_+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**

See 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_,1.60000
_+2_
?+00009448m0655422+1424456d+00008625***+00+00000_*TREE_,1.60000
+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_,1.60000
+11
?+00006342m0871605+0853339d+00006335***+00+00000_*TREE_,1.60000
+12
?+00003273m0665438+1163803d+00003011***+00+00000 *TREE ,1.60000
+13
?+00002902m1232505+1361343d+00002422***+00+00000_*TREE_,1.60000
+14
?+00005683m0794856+1444001d+00005594***+00+00000_*TREE_,1.60000
```

### **GTS-7 Raw Format**

The general format for each record is:

CONTROL WO	ORD 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>6</PointNumber><Code>TREE</Code></Point><Point><PointNumber>6</PointNumber><Code>TREE</Code></Point><Point><PointNumber>6</PointNumber><Code>TREE</Code></Point><Point><PointNumber>6</PointNumber><Code>TREE</Code></Point><Point><PointNumber>6</PointNumber><Code>TREE</Code></Point><Point><PointNumber>8</PointNumber><Code>TREE</Code></Point><Point><PointNumber>8</PointNumber><Code>TREE</Code></Point><Point><PointNumber>10</PointNumber><Code>TREE</Code></Point><Point><Point></PointNumber></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></PointNumber></Point></Point></PointNumber></Point></PointNumber></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></Point></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>
```
# **Regional Geoid Model File**

40 36 10, -4 30 00, 4, 5, 2 00, 2 00, SE, WGS84;

16.16 11.11 6.6 1.1 17.17

12.12 7.7 2.2 18.18 13.13

8.8 3.3 19.19 14.14 9.9

4.4 20.20 15.15 10.10 5.5

# **GPS Vector File Format**

#### GPS Vector files have the following format:

Header(//Topcon Vector Format:v.number of the version,linear units,) VPP(for vector),Name\_Point1,Name\_Point2,dX,dY,dZ,sigma\_dX,sigma\_dY,sigma\_dZ,cor\_XY,cor\_XZ,cor\_YZ, P(for point),Nane\_Point,Lat(DD MMSS.ss),Lon(DD MMSS.ss),Ell.Height,Code,Note,

#### //TopconVectorFormat:v.1,Meters,

VPP,1,2,2.4498,2.7704,-3.2041,0.00131407,0.00106341,0.00257335,0.2479,0.5525,0.2098 VPP,1,3,0.3370,3.5418,-3.8074,0.00154384,0.00201876,0.00239150,0.4817,0.4323,0.4580 VPP,2,3,-2.1339,0.7589,-0.6185,0.00315621,0.00445358,0.00476713,0.4766,0.3580,0.4004 VPP,1,4,2.9617,1.0948,-4.1492,0.00743030,0.00466686,0.00739715,0.2438,0.1733,0.3977 VPP,2,4,0.5134,-1.6737,-0.9458,0.00467626,0.00271100,0.00492552,0.2998,0.1997,0.3185 VPP,3,4,2.6111,-2.4383,-0.3702,0.01177912,0.00991061,0.01118924,0.6141,0.4192,0.4301 P,1,55 33 45.60559,37 58 40.69849,147.849,Hiper XT,Base\_St P,2,55 33 45.44999,37 58 40.73705,147.266,, P,3,55 33 45.47084,37 58 40.64386,146.128,Legant E,Right\_C P,4,55 33 45.44942,37 58 40.64386,146.128,Legant E,Right\_C

# **Cut Sheet Files**

#### **Cut Sheet Standard File:**

Stakeout Cut/Fill Data Sheet
TIME :13:38:24 DATE :12/25/2004
JOB NAME :stake_example.tlsv
UNITS :Meters
PT#CBL_1000 CODE:GCP
NORTH EAST ELEVATION CUT
DESIGN: 123088.194 120003.252 -20.068
STAKEOUT:
Sta#CBL_1000_stk 123088.199 120003.249 -20.079
Difference -0.005 0.003 0.011 0.01
PT#CBL_150 CODE:GCP
NORTH EAST ELEVATION CUT
DESIGN: 123383.566 120800.212 -17.929
STAKEOUT:
STAKEOUT: Sta#CBL_150_stk 123383.571 120800.215 -17.922
STAKEOUT:    Sta#CBL_150_stk    123383.571    120800.215    -17.922    Difference    -0.005    -0.007    -0.01
STAKEOUT:    Sta#CBL_150_stk    123383.571    120800.215    -17.922    Difference    -0.005    -0.007    -0.01
STAKEOUT:    Sta#CBL_150_stk    123383.571    120800.215    -17.922    Difference    -0.005    -0.007    -0.01    PT#W_1001    CODE:RBCS
STAKEOUT:    Sta#CBL_150_stk  123383.571  120800.215  -17.922    Difference  -0.005  -0.003  -0.007  -0.01    PT#W_1001  CODE:RBCS  NORTH  EAST  ELEVATION  CUT
STAKEOUT:    Sta#CBL_150_stk  123383.571  120800.215  -17.922    Difference  -0.005  -0.003  -0.007  -0.01    PT#W_1001  CODE:RBCS  NORTH  EAST  ELEVATION  CUT
STAKEOUT:    Sta#CBL_150_stk  123383.571  120800.215  -17.922    Difference  -0.005  -0.003  -0.007  -0.01    PT#W_1001  CODE:RBCS  NORTH  EAST  ELEVATION  CUT    DESIGN:  123367.665  120542.960  -19.751
STAKEOUT:    Sta#CBL_150_stk  123383.571  120800.215  -17.922    Difference  -0.005  -0.003  -0.007  -0.01    PT#W_1001  CODE:RBCS  NORTH  EAST  ELEVATION  CUT
STAKEOUT:    Sta#CBL_150_stk  123383.571  120800.215  -17.922    Difference  -0.005  -0.003  -0.007  -0.01    PT#W_1001  CODE:RBCS  NORTH  EAST  ELEVATION  CUT    DESIGN:  123367.665  120542.960  -19.751    STAKEOUT:  Sta#W_1001_stk  123367.572  120543.034  -19.555
STAKEOUT:    Sta#CBL_150_stk  123383.571  120800.215  -17.922    Difference  -0.005  -0.003  -0.007  -0.01    PT#W_1001  CODE:RBCS  NORTH  EAST  ELEVATION  CUT
STAKEOUT:    Sta#CBL_150_stk  123383.571  120800.215  -17.922    Difference  -0.005  -0.003  -0.007  -0.01    PT#W_1001  CODE:RBCS  NORTH  EAST  ELEVATION  CUT
STAKEOUT:    Sta#CBL_150_stk  123383.571  120800.215  -17.922    Difference  -0.005  -0.003  -0.007  -0.01    PT#W_1001  CODE:RBCS  NORTH  EAST  ELEVATION  CUT    DESIGN:  123367.665  120542.960  -19.751    STAKEOUT:  Sta#W_1001_stk  123367.572  120543.034  -19.555    Difference  0.092  -0.073  -0.197  -0.20    PT#W_1002  CODE:RBCS  CODE:RBCS  CODE:RBCS
STAKEOUT:    Sta#CBL_150_stk  123383.571  120800.215  -17.922    Difference  -0.005  -0.003  -0.007  -0.01    PT#W_1001  CODE:RBCS  NORTH  EAST  ELEVATION  CUT

DESIGN:	123355.342	120544	4.783 -1	9.375
STAKEOUT:				
Sta#W_1002_stk	123354.78	5 120	544.773	-19.350
Difference	0.557	0.010	-0.025	-0.03
Sta#W_1002_stk	2 123355.39	98 120	)545.016	-20.241
Difference	-0.056	-0.233	0.866	0.87
Sta#W_1002_stk	3 123355.67	79 120	)544.367	-19.665
Difference	-0.337	0.417	0.290	0.29
Sta#W_1002_stk	4 123355.60	00 120	)544.236	-15.593
Difference	-0.257	0.547	-3.782	-3.78
Sta#W_1002_stk	5 123356.35	54 120	)543.771	-16.927
Difference	-1.012	1.012	-2.448	-2.45
DESIGN:	123360.530	120533	3.682 -1	9.518
DESIGN:	123360.530	120533	3.682 -1	9.518
STAKEOUT:				
Sta#W_1003_stk	123356.19	7 120	543.745	-16.867
Difference	4.333	-10.064	-2.651	-2.65
PT#W_1006 C	CODE:RBCS			
NORTH	EAST	El	LEVATION	CUT
DESIGN:	123386.661	120600	).195 -1	9.649
STAKEOUT:				
Sta#W_1006_stk	123387.29	4 120	599.928	-19.371
Difference	-0.633	0.268	-0.278	-0.28
Sta#W_1006_stk	2 123387.21	19 120	)599.931	-19.391
Difference	-0.557	0.264	-0.258	-0.26

Sta#W\_1006\_stk3 123387.016 120600.010 -18.922

-0.027

-0.354 0.185 Sta#W\_1006\_stk4 123386.843 120600.222 -18.670

-0.182

-0.727 -0.73

-0.98

-0.979

Difference

Difference

#### **Cut Sheet User Defined File:**

Cut Sheet User Defined File has the following full format (you can hide/move up/move down any column, unless 'Design Point', from this format):

Header>> Delimiter() FileFormat(Design Point,Code,Staked Point,Design North,Design East,Design Elevation,Station North,Station East,Station Elevation,Delta North,Delta East,Delta Elevation,Cut,Fill,Cut(Fill),Time Stamp,Offset Direction,Offset Distance) <<

CBL\_1000GCPCBL\_1000\_stk123088.194120003.252-20.068123088.199 120003.249-20.0790.005-0.003-0.0110.0000.0110.0112004:06:22 14:01:241 330.9410.005

CBL\_150GCPCBL\_150\_stk123383.566120800.212-17.929123383.571 120800.215-17.9220.0050.0030.0070.0070.000-0.0072004:06:22 16:07:581 32.6870.006

W\_1001RBCSW\_1001\_stk123367.665120542.960-19.751123367.572 120543.034-19.555-0.0920.0730.1970.1970.000-0.1972004:06:22 14:45:061 141.5480.118

W\_1002RBCSW\_1002\_stk123355.342120544.783-19.375123354.785 120544.773-19.350-0.557-0.0100.0250.0250.000-0.0252004:06:22 15:04:211 181.0590.557

W\_1002RBCSW\_1002\_stk2123355.342120544.783-19.375123355.398 120545.016-20.2410.0560.233-0.8660.0000.8660.8662004:06:22 15:05:202 76.5010.239

W\_1002RBCSW\_1002\_stk3123355.342120544.783-19.375123355.679 120544.367-19.6650.337-0.417-0.2900.0000.2900.2902004:06:22 15:07:013 308.9840.536

W\_1002RBCSW\_1002\_stk4123355.342120544.783-19.375123355.600 120544.236-15.5930.257-0.5473.7823.7820.000-3.7822004:06:22 15:12:234 295.1930.605

W\_1002RBCSW\_1002\_stk5123355.342120544.783-19.375123356.354 120543.771-16.9271.012-1.0122.4482.4480.000-2.4482004:06:22 15:13:445 315.0101.431

W\_1003RBCSW\_1003\_stk123360.530120533.682-19.518123356.197 120543.745-16.867-4.33310.0642.6512.6510.000-2.6512004:06:22 15:13:591 113.29610.957

W\_1006RBCSW\_1006\_stk123386.661120600.195-19.649123387.294 120599.928-19.3710.633-0.2680.2780.2780.000-0.2782004:06:22 15:20:231 337.0870.687

W\_1006RBCSW\_1006\_stk2123386.661120600.195-19.649123387.219 120599.931-19.3910.557-0.2640.2580.2580.000-0.2582004:06:22 15:20:592 334.6100.617 W\_1006RBCSW\_1006\_stk3123386.661120600.195-19.649123387.016 120600.010-18.9220.354-0.1850.7270.7270.000-0.7272004:06:22 15:21:373 332.3930.400

W\_1006RBCSW\_1006\_stk4123386.661120600.195-19.649123386.843 120600.222-18.6700.1820.0270.9790.9790.000-0.9792004:06:22 15:22:114 8.5240.184

## **Printed File Formats**

Topcon Link can print data from the *Point* tab, the *GPS Occupation* tab, *the TS obs* tab, the *GPS Obs* tab and *Tape Obs* tab.

• *Point* tab selected (Figure C-1).

Icon	Name	Grid Northing (m)	Grid Easting (m)	Elevation (m)	Code	
•	1001	6176201.041	409994.014	205.494		
٠	1001anonymous	6176201.041	409994.014	205.494		
٠	1001anonymous2	6176201.041	409994.014	205.494		
•	101	6176101.041	409994.014	205.494		
0	101anonymous2	6176101.041	409994.014	205.494		Ρασε1
Δ	101anonymous3	6176101.041	409994.014	205.494		Tager
	102	6176101.043	409994.010	205.493	A5	
Δ	103	6176101.044	409994.012	205.486	A5	
<del>(*)</del>	200	6176081.041	409979.014	215.494	A5	
Control	Note					
None						
None						
None						
None						Daga
None						Page2
Horizontal						8
Vertical	DINS					
Both	DINS					
None						

#### Figure C-1. Sample Printed Point tab

• *TS Obs* tab, left panel selected (Figure C-2).

Icon	#	Point Name	Instrument Height (USft)	
\$,	1	MARK	4.987	
♦.	2	ST1	4.790	
�.	3	ST2	4.626	

Figure C-2. Sample Printed – TS Obs Tab, Left Panel

• *TS Obs* tab, right panel selected (Figure C-3).

Icon	#	Point From		Point To		Reflector Height (LAzimuth	Horizontal Circle	Slope Dista	ncZenith Angle	
Ф,	1	ST2		MARK		5.249	187°56'16.0000	16.240	352°48'34.0000	
Ф,	2	ST2		MARK		5.249	187°56'16.0000	16.240	352°48'35.0000	
Ф,	3	ST2		ST1		5.249	253°46'07.0000	12.392	350°12'18.0000	
Ф,	4	ST2		ST1		5.249	253°46'07.0000	12.392	350°12'19.0000	
Ф,	5	ST2		9		5.249	320°39'01.0000	11.788	343°14'43.000	0.001
Ф,	6	ST2		10		5.249	55°44'14.0000	21.070	2°43'55.0000	ager
Ф,	7	ST2		11		5.249	85°33'39.0000	20.807	2°43'55.0000	0
Ф,	8	ST2		12		5.249	116°38'03.0000	10.738	23°05'22.0000	
Ф,	9	ST2		13		5.249	136°13'43.0000	9.521	326°34'55.0000	
Ф,	10	ST2		14		5.249	144°40'01.0000	18.645	10°11'04.0000	
Date		Note (	ode.		Type					
Date		14000 0			турс					
		5	TAI		55					
		5	TAT		55					
		5	IAI		55					
		5	IAI		55					_
		-	REE		22					ר 2סת פי
		1	REE		55				1	agu⊿
		1	REE		55					_
		1	REE		22					
		1	REE		55					
		T	REE		22					

#### Figure C-3. Sample Printed – TS Obs Tab, Right Panel

• GPS Occupations tab selected (Figure C-4).

Icon	Point Name	Original Name	Antenna Type	Antenna Height (	m) Ant Height Method	Start Time	
٩,		5001-5006	Regant-SD	1.400	Vertical	6/24/2004 08:46:06	
0	1001anonymous	1001anonymous			Vertical		
0	1001anonymous2	1001anonymous2			Vertical		
•	101	101	Regant-SD	0.000	Vertical	6/24/2004 08:32:27	Daga1
0	201anon	101anonymous	Regant-SD	0.000	Vertical	6/24/2004 08:32:27	Pager
0	101anonymous2	101anonymous2			Vertical		0
•	101anonymous3	101anonymous3			Vertical		
0	102	102	Regant-SD	0.000	Vertical	6/24/2004 08:35:57	
0	103	103	Regant-SD	0.000	Vertical	6/24/2004 08:36:23	
۲	Base7000001	Base7000001			Vertical	6/24/2004 08:32:27	

Stop Time	Duration	Method	Note	Receiver	Offset Azimuth	Offset Dist (m)
6/24/2004 08:46:11	0:00:05	AutoTopo				
		Торо				
		Торо				
6/24/2004 08:32:29	0:00:02	Торо				Page2
6/24/2004 08:32:29	0:00:02	Торо			60°00'00.0000	30.000 ***
		Торо				
		Торо				
6/24/2004 08:35:59	0:00:02	Торо	DINS			
6/24/2004 08:36:25	0:00:02	Торо	DINS			
6/24/2004 08:46:11	0:13:44	Base				

Figure C-4. Sample Printed TopSURV File – GPS Occupations Tab

• *Codes* tab, selected left panel (Figure C-5).



Figure C-5. Sample Printed – Codes Tab Left Panel

• *Codes* tab, selected right panel (Figure C-6).

Icon	Name	Default Value	Туре
1.2	D	18.85	Real Number
<u>1</u>	С	15	Integer
ab	В	1A2B3C	Text
E	A	BB	Menu

Figure C-6. Sample Printed – Codes Tab Right Panel

• *Tape* tab selected (Figure C-7)

Icon	Name	WGS84 Latitude	WGS84 Longitude	WGS84 Ell.Height (rrCode	Control	Note	
۰	1	55°41'56.92736N	37°33'59.99073E	212.975	None		
	100	55°42'00.11975N	37°33'56.43786E	212.975	None		
	101	55°41'58.82669N	37°33'56.48513E	212.975	None		
	102	55°41'58.80667N	37°33'54.76788E	212.975	None		
	103	55°41'57.51361N	37°33'54.81516E	212.975	None		
	104	55°41'57.54698N	37°33'57.67722E	212.975	None		
	105	55°41'56.90045N	37°33'57.70085E	212.975	None		
	106	55°41'56.91379N	37°33'58.84567E	212.975	None		
•	2	55°42'00.15978N	37°33'59.87239E	212.975	None		

Figure C-7. Sample Printed – Tape Tab

# **Notes:**

# **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 D-1 describes pin connections for the TS and computer (PC).

(G	rs) (PC)
GND	(1) — (5) GND
N.C.	(2)
TXD	(3) <b>—</b> (3) RXD
RXD	(4) <b>(</b> 2) TXD
(RTS)	(5) (8) CTS
N.C	(6) $(6)$ DSR

Table D-1. F-4 Cable

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

Table D-2. F-3 Cable	Table	D-2.	F-3	Cable
----------------------	-------	------	-----	-------

(G	rs) (PC)	
GND	(1) (1) FG	
N.C.	(2) (7) SG	
TXD	(3)(3) RXD	
RXD	(4) (2) TXD	

(G	TS)	(PC)
(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 D-3 describes pin connections for the total station and printer.

(GT	S) (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

Table D-3. F-4 Cable

# Serial C-RS232C Connector Definition

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



Figure D-1. RS232C Receiver Connector

Table D-4 gives RS232 connector pin details.

Table D-4.	RS232	Connector	Specifications
------------	-------	-----------	----------------

Number	Signal Name	Dir	Details
1	Power_OUT	Р	Power Output (I<0.2 A)
2	GND	-	Signal ground
3	CTS	Ι	Clear to send
4	RTS	0	Request to send
5	RXD	Ι	Receive data
6	TXD	0	Transmit data
7			Not used

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

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

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

Table D-5.	RS232	Connection	Pin	Details

# **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 bar	ud: 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	

# **Notes:**

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Notes



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