

# Spectrum Survey Office

## Post-Processing Software

H21.10.19  
Draft



# **Spectrum Survey Office Program Explanations**

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**October, 2009**

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# Table of Contents

<b>Preface</b> .....	<b>ix</b>
Conventions Used in this Manual .....	ix
Obtaining Technical Support .....	x
Precautions.....	x
Exceptions from Responsibility.....	xi
<b>Chapter 1</b>	
<b>Introduction</b> .....	<b>1-1</b>
Installing Spectrum Survey Office .....	1-2
How to Uninstall or Add a Feature after Installation .....	1-10
Installing Microsoft ActiveSync for Use With	
CE-based Devices .....	1-11
Starting Spectrum Survey Office .....	1-13
Updating Hardware Lock .....	1-20
Getting Acquainted .....	1-21
Spectrum Survey Office Modules .....	1-21
Main Window .....	1-22
Menu Bar .....	1-23
Toolbar .....	1-25
Status Bar .....	1-29
Customizing the Toolbar .....	1-30
Editing the Toolbar .....	1-33
Custom Toolbar Tips .....	1-34
Command Properties .....	1-34
Button Settings .....	1-36
Printing the Selected View .....	1-37
<b>Chapter 2</b>	
<b>Working with a Job</b> .....	<b>2-1</b>
Using the Startup Dialog Box .....	2-1
Creating a New Job .....	2-2
Opening a Job .....	2-4

Saving a Job .....	2-5
Closing a Job .....	2-5
Deleting a Job .....	2-6
Job Configuration .....	2-6
Display Options .....	2-8
Coordinate Systems Setup .....	2-9
Add a Custom Projection .....	2-14
Add a Datum .....	2-15
Set Grid-to-Ground Parameters .....	2-17
Add a Geoid .....	2-19
Units Selection .....	2-21
Save Options for Job .....	2-21
Quality Control Settings .....	2-22
Process Properties .....	2-27
Job Information .....	2-32
Background Images .....	2-32
Georeferencing the Image .....	2-36

### Chapter 3

<b>Importing Data .....</b>	<b>3-1</b>
Importing Coordinate Files .....	3-3
Importing and Creating Custom Format Files .....	3-7
Importing DL Obs Files .....	3-12
Importing GPS+ Raw Data Files .....	3-13
Importing Spectrum Survey Office Jobs .....	3-14
Importing TopSURV PC Jobs .....	3-15
Importing TS Obs Files .....	3-16
Importing From a Device .....	3-18
Importing from a Device using Windows Explorer ..	3-18
Importing From a Receiver .....	3-21
Importing From a Sokkia Receiver.....	3-22
Importing From a TPS Controller .....	3-24
Importing From a Total Station .....	3-25
Importing From a Digital Level .....	3-28
Importing from a Memory Card .....	3-30
Importing RINEX Files from the Internet.....	3-32



**Chapter 4**

**Viewing, Selecting, & Filtering Data ..... 4-1**

- Data Views ..... 4-1
  - Tabular View ..... 4-2
    - Points Tab ..... 4-3
    - GPS Occupations Tab ..... 4-4
    - TS Obs Tab ..... 4-5
    - GPS Obs Tab ..... 4-7
    - DL Obs Tab ..... 4-10
  - Map View ..... 4-12
  - Occupation View ..... 4-13
  - CAD View ..... 4-16
  - Google Earth ..... 4-17
  - Layers View ..... 4-19
    - Setting the Layer for New Codes ..... 4-22
    - Setting the Layer for a New/Existing Point ..... 4-22
    - Setting the Layer for a New/Existing Line ..... 4-24
  - Codes View ..... 4-25
- Setting View Options ..... 4-26
  - Map View Options ..... 4-26
  - Occupation View Options ..... 4-30
  - CAD View Options ..... 4-31
  - Tab Options in the Tabular View ..... 4-34
  - Image Options ..... 4-36
- Selecting Data ..... 4-37
  - Selecting Data in Map, Occupation, and CAD Views ..... 4-37
  - Selecting Data in Tabular and Codes Views ..... 4-38
  - Selecting Points ..... 4-39
  - Selecting TS Occupations ..... 4-40
  - Selecting GPS Occupations ..... 4-40
  - Selecting TS Observations ..... 4-42
  - Selecting GPS Observations ..... 4-43
  - Inverting Selections ..... 4-44
- Filtering Data ..... 4-45
  - Filtering By Type ..... 4-46
  - Filtering By Quality Control ..... 4-47
  - Filtering By Code ..... 4-49
  - Filtering By Time ..... 4-50

Editing Filters ..... 4-51  
 Viewing Properties of Data ..... 4-52

**Chapter 5**

**Editing Data ..... 5-1**  
 Editing in the Tabular View ..... 5-1  
 Editing Antenna Parameters ..... 5-4  
     Option 1: Edit in the Tabular View ..... 5-4  
     Option 2: Edit in the Properties Dialog Box ..... 5-5  
 Editing Antenna Offsets ..... 5-7  
 Adding Antennas Using the Custom Antenna List .... 5-8  
 Editing Points ..... 5-10  
     Option 1: Editing in the Tabular View ..... 5-10  
     Option 2: Editing in the Properties Dialog Box ..... 5-11  
 Renaming Points on the Points Tab ..... 5-12  
     Merging Points ..... 5-14  
 Resolving Duplicate Points ..... 5-14  
 Editing Linework ..... 5-19  
     Adding a New Point ..... 5-20  
     Deleting a Point ..... 5-22  
     Adding a Line ..... 5-22  
         Edit a Created Line ..... 5-25  
     Appending Points to a Line ..... 5-27  
         Option 1: Selecting the Line, then  
             Selecting the Point(s) ..... 5-27  
         Option 2: Selecting the Point, then  
             Selecting the Line ..... 5-28  
     Inserting Points to a Line ..... 5-29  
         Option 1: Selecting the Line, then  
             Inserting (Creating) the Point ..... 5-30  
         Option 2: Selecting the Point, then  
             Selecting the Line ..... 5-31  
     Splitting a Line ..... 5-32  
     Merging Lines ..... 5-33  
     Reverse a Line ..... 5-33  
     Deleting a Line ..... 5-34  
     Deleting a Vertex from a Line ..... 5-34  
     Selecting Segment Type ..... 5-34

Creating a Curve .....	5-35
Creating a Curve by Two Points.....	5-37
Creating a Curve by Three Points.....	5-38
Editing GPS Occupation Types .....	5-39
Editing Codes in the Codes View .....	5-41
Adding a Code .....	5-41
Editing a Code .....	5-41
Adding and Editing an Attribute .....	5-43
Editing Codes Used for Points .....	5-45
Editing Layers .....	5-47
Adding a Layer .....	5-47
Editing a Layer in the Layers View .....	5-48
Setting the Layer for Codes .....	5-49
Setting the Layer for a New/Existing Point .....	5-50
Setting the Layer for New/Existing Linework .....	5-51
Editing TS Instrument Parameters .....	5-52
Option 1: Edit in the Tabular View .....	5-52
Option 2: Edit in the Properties Dialog Box .....	5-54
Adding TS Instruments Using the Custom	
TS Instruments List .....	5-55
Manually Adding Total Station Occupation .....	5-57
Manually Adding Digital Run .....	5-60
Editing Data Properties .....	5-62
Editing Point Properties .....	5-62
Editing GPS Occupations Properties .....	5-65
Editing TS Obs Properties .....	5-68
Edit TS Occupations Properties .....	5-68
Edit TS Observations Properties .....	5-69
Editing GPS Obs Properties .....	5-72

## Chapter 6

### **Processing, Adjusting, & Localizing Points ..... 6-1**

Setting Process and Adjustment Properties .....	6-1
Enabling GPS Observations for Kinematic Occupation .	6-4
Enabling Kinematic Data for Go Occupations .....	6-5
Enabling or Disabling Point Data .....	6-6
Enabling or Disabling Epochs .....	6-6
Processing .....	6-8

Processing All GPS Observations .....	6-8
Processing Selected GPS Observations .....	6-9
Understanding the Results .....	6-9
About Vector Processing Modes .....	6-11
Adjustment .....	6-11
Adjustment Test: Checking Vector Coordinates .....	6-16
Adjustment Test: Analysis of Repeated Observations .....	6-17
Adjustment Test: Detecting Identical Points .....	6-18
Adjustment Test: Analysis of the Network .....	6-19
Adjustment Test: Analysis of Vertical and Horizontal Control Point(s) .....	6-20
Adjustment Test: Analysis of Consistency of Control .....	6-21
Evaluating the Quality of the Adjusted Network .....	6-22
Viewing the Adjustment Report .....	6-27
Processing Loop Closures and Viewing the Report ..	6-27
Editing Loop Closure Report Options .....	6-29
Localization .....	6-30
Horizontal and Vertical Localization Determinations .....	6-31
Accuracy Estimation for Localization Parameters ....	6-33
Creating Localization in the job .....	6-34

## Chapter 7

<b>Reporting .....</b>	<b>7-1</b>
Standard Reports .....	7-1
TS Observations Report.....	7-2
Quality Control Report .....	7-3
Points Report .....	7-4
Localization Report .....	7-5
GPS Observations Report .....	7-6
Adjustment Report .....	7-7
Customized Reports .....	7-9
Editing a Report Configuration .....	7-11
Copy a Report .....	7-11
Edit Items in the Selected Report .....	7-12
Edit Item Options .....	7-13
Creating a New Report Configuration .....	7-18

**Chapter 8**

**Exporting ..... 8-1**

- Exporting to a File ..... 8-3
- Exporting Files to a Device ..... 8-5
  - Export to a TPS Controller ..... 8-6
    - Using Windows Explorer ..... 8-6
    - Using Spectrum Survey Office ..... 8-7
  - Export to a TPS Total Station ..... 8-9
    - Using Windows Explorer ..... 8-9
    - Using Spectrum Survey Office ..... 8-11

**Chapter 9**

**Advanced Module ..... 9-1**

- Advanced Module for Processing ..... 9-1
  - General Tab ..... 9-1
  - Engine Tab ..... 9-3
  - Troposphere Tab ..... 9-6
  - Splitting a GPS Occupation ..... 9-8
  - Viewing/Saving GPS Residuals ..... 9-11
- Epoch View ..... 9-14
- Raw Data Plot ..... 9-18
  - Editing Plots in Raw Data Plot Window ..... 9-24
  - Editing and Creating Macros ..... 9-27
- Datum Transformations ..... 9-29
- Antennas List ..... 9-35
  - Create a Custom Antenna ..... 9-35
  - Import Antenna Calibration Set ..... 9-36
- Computing the Position of the Camera's
  - Perspective Center ..... 9-38
- Advanced Module for Adjustment ..... 9-42
- Advanced Module for Localization ..... 9-45

**Appendix A**

**Installing the Global Geoid ..... A-1**

**Appendix B**

**About Quality Control Messages ..... B-1**

- Points Tab Quality Control Messages ..... B-2

Point Failed Identical Points Test .....	B-2
Point Failed Standard Deviation Test .....	B-4
Control Point Failed Misnamed GPS Occupations Test .....	B-6
Control Point Not Linked with the Network .....	B-7
GPS Occupations Tab Quality Control Messages .....	B-8
Occupation Failed Misnamed GPS Occupations Test	B-8
TS Obs Tab Quality Control Messages .....	B-10
TS Observation Rejected by Distance, Vertical Angle, or Horizontal Angle .....	B-11
TS Observation with Outliers Rejected by Distance, Vertical Angle, or Horizontal Angle .....	B-12
GPS Obs Tab Quality Control Messages .....	B-13
GPS Observation Failed to Match Desired Precision	B-14
GPS Observation Has a “Float Solution” .....	B-15
GPS Observation Failed to Process .....	B-15
GPS Observation Rejected by Plane or by Height ....	B-16
DL Obs Tab Quality Control Messages .....	B-17
DL Observation Failed to Match Desired Precision ..	B-17

**Appendix C**

<b>Symbols Used in Tabs and on Views .....</b>	<b>C-1</b>
Points Tab Symbols .....	C-1
GPS Occupation Tab Symbols .....	C-4
TS Obs Tab Symbols .....	C-5
GPS Obs Tab Symbols .....	C-7
DL Obs Tab Symbols .....	C-8
Map View Symbols .....	C-9

**Appendix D**

<b>Hot Keys .....</b>	<b>D-1</b>
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**Appendix E**

<b>Connectors .....</b>	<b>E-1</b>
Serial C-RS232C Connector .....	E-1
Receiver COM Port Status .....	E-2

# Preface

Thank you for purchasing Spectrum Survey Office.

- Please read the Software Usage License Agreement contained at the back of the manual before using this software.
- Please read this manual carefully, before using Spectrum Survey Office.
- The specifications are subject to change without prior notice and without obligation by Sokkia Topcon Co., Ltd. and may differ from those appearing in this manual.
- The content of this manual is subject to change without notice.
- Some of the diagrams and screen displays shown in this manual are simplified for easier understanding.
- Sokkia Topcon Co., Ltd. will not be liable to you for any profit or loss resulting from the use of this software.
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- Except as permitted by Copyright law, this manual may not be copied, and no part of this manual may be reproduced in any form or by any means.
- This manual may not be modified, adapted or otherwise used for the production of derivative works.

## Conventions Used in this Manual

The following conventions, typefaces and icons are used in this manual:

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

**Topo** Indicates the name of a dialog box or screen.



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



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



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

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## Obtaining Technical Support

When contacting our service representative, please make sure you have the following information: your **software version number** and **an accurate description of the problem**. For contact details, see the final page of this manual.

## Precautions

- Data should be backed up (transferred to an external device etc.) on a regular basis to prevent data loss.



# Exceptions from Responsibility

- The user of this product is expected to follow all operating instructions and make periodic checks (hardware only) of the product's performance.
- The manufacturer, or its representatives, assumes no responsibility for results of faulty or intentional usage or misuse including any direct, indirect, consequential damage, or loss of profits.
- The manufacturer, or its representatives, assumes no responsibility for consequential damage, or loss of profits due to any natural disaster, (earthquake, storms, floods etc.), fire, accident, or an act of a third party and/or usage under unusual conditions.
- The manufacturer, or its representatives, assumes no responsibility for any damage (change of data, loss of data, loss of profits, an interruption of business etc.) caused by use of the product or an unusable product.
- The manufacturer, or its representatives, assumes no responsibility for any damage, and loss of profits caused by usage different to that explained in the operator's manual.
- The manufacturer, or its representatives, assumes no responsibility for damage caused by incorrect operation, or action resulting from connecting to other products.

# Introduction

Spectrum Survey Office is an easy and powerful post-processing program. Spectrum Survey Office provides a full-featured environment for processing and adjusting field observations created with the family of SOKKIA instruments. Depending on the purchased module, Spectrum Survey Office processes TS observations, RTK observations, and post-processes GPS observations, or some combination of the three module options.

Spectrum Survey Office is used for:

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

Spectrum Survey Office has tabular and graphical representations of data:

- Use the Tabular view for viewing points information, viewing vector or occupation information, viewing data with the same names, and sorting lines in alphabetical order by time or by increasing or decreasing values.
- Use the Map view for displaying a common network configuration, multiple background images, estimating the mutual position of points and vectors, and finding the necessary vector or point.
- Use the Occupation View for displaying occupations.
- Use the CAD view for displaying view of linework with the associated points and lines.
- Use the Advanced module to choose additional options and settings for post-processing and adjustment.

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

## Installing Spectrum Survey Office

Spectrum Survey Office software comes on a CD contains all projections, datums and geoids.

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

**Table 1-1. Spectrum Survey Office System Requirements for Installation**

<ul style="list-style-type: none"><li>• Microsoft® Windows XP/Vista operating system</li><li>• Processor compatible with Intel® Pentium® 1000 MHz or faster</li></ul>	<ul style="list-style-type: none"><li>• 512 MB of RAM (1000MB recommended)</li><li>• 300 MB of available hard-disk space</li></ul>
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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://dev.topconsupport.com/secure\\_site/software/GPS\\_software.php#pc\\_cdu](http://dev.topconsupport.com/secure_site/software/GPS_software.php#pc_cdu).)

1. Insert the Spectrum Survey Office software CD into the computer's CD-ROM drive.

If downloading the software from the TPS website, save the downloaded compressed file to an accessible location and extract the Spectrum Survey Office executable file.

2. The InstallAware Wizard starts up:



3. Click **Next** to start the installation process.

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

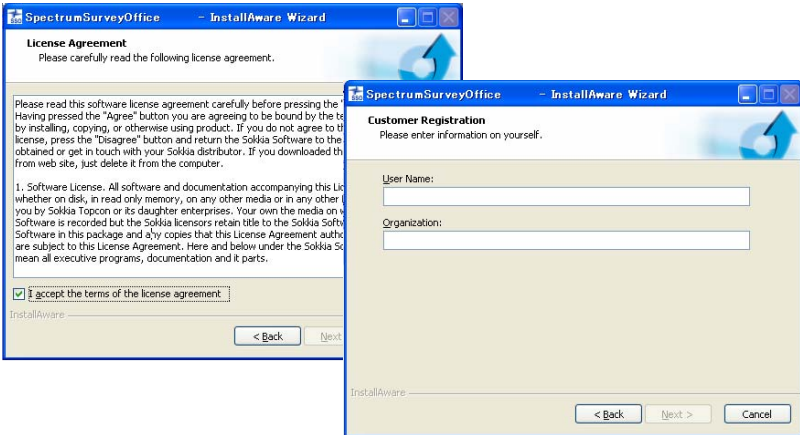


Figure 1-1. Begin the Installation

5. Select a needed setup type. Depending on the user's selection, either all program features or only highlighted features will be installed. If the user selects *Typical* type and presses **Next**, the installation software will do the following:
  - automatically select all available datums and projections (except the following *Table Projections*):
    - *rdtrans 2004* and *rdtrans* for Netherlands
    - *LB72* for Belgium
    - *KKJ* for Finland
    - *USTNO2* for United Kingdom

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

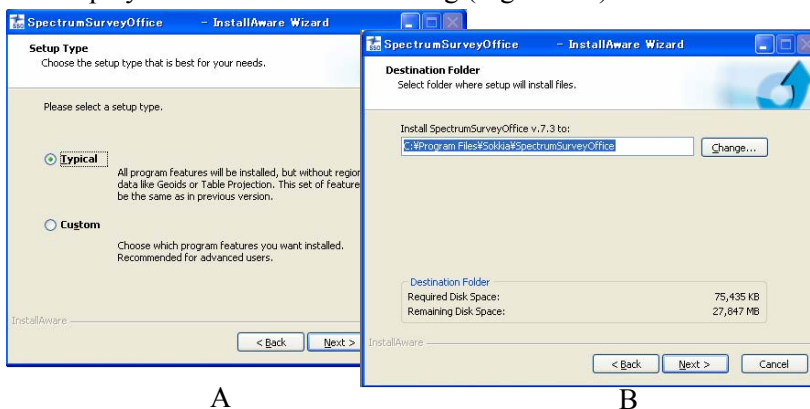


Figure 1-2. Typical Setup Type

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

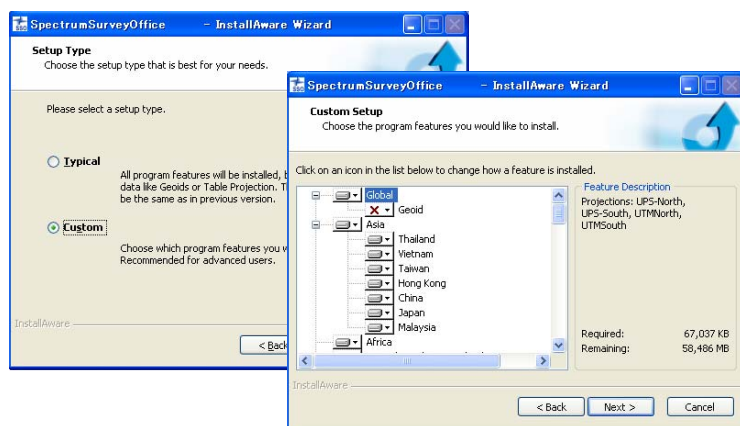


Figure 1-3. Custom Setup Type

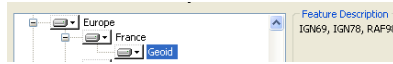
### NOTICE

*The typical installation does not allow one to install a geoid on the computer. As against of the typical installation, the custom installation allows one to install the highlighted geoid for the corresponding projection(s)/datum(s) of the given region.*

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

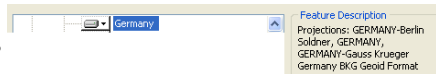
This dialog box contains the list of projections:

- with regional geoids



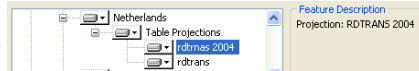
or

- without regional geoids

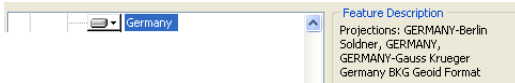


or

- with table projection

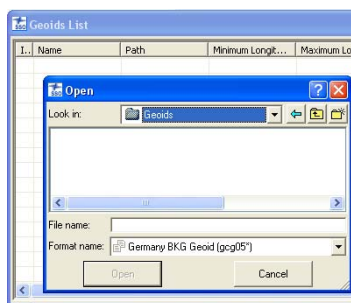


The *Feature Description* displays the list projection(s)/ formats/ geoid(s) which consist the highlighted item. To see what the feature contains, select the desired feature:

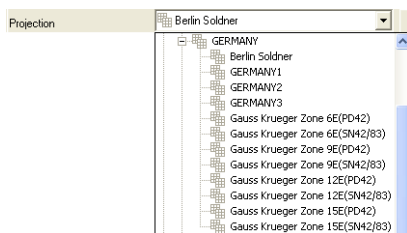


If the selected projection contains a list of projection(s) and a geoid file format, Spectrum Survey Office will be installed with the selected projection(s) and format for adding the corresponding geoid to the Spectrum Survey Office job (but not a geoid file). In the given case:

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

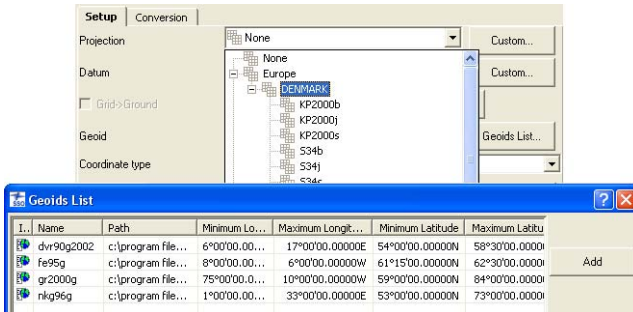


- the installed projection(s) will be displayed in the list of projections for conversion:

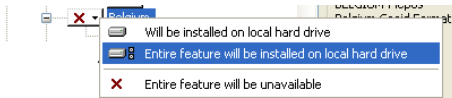


If the selected projection contains a list of projection(s) and the geoid, Spectrum Survey Office will be installed with the selected projection(s), format for adding the corresponding geoid and the corresponding geoid to the Spectrum Survey Office job. In the given case the *Coordinate System* item of the *Job Configuration*

dialog box will display the installed projection, installed geoid(s) and the corresponding geoid file format(s) in the list of geoid

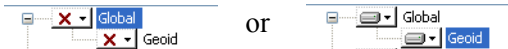


To add/remove the desired regional projection or geoid to/from the installing, click the desired feature and select the corresponding command from the pop-up menu :



The following rules is used for adding projection and geoid:

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



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



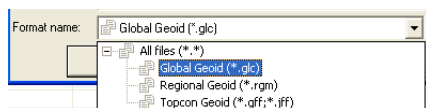
**NOTICE** NOTICE

*Without reference to the selected projection type, Spectrum Survey Office installation will install all datums*

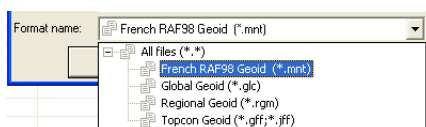
If the user did not select any geoid file in the process of installation, after finishing Spectrum Survey Office installation process it is possible to add (using Job Configuration window) only the following geoids



(global (\*.glc), custom regional (\*.rgm) and topcon geoid (\*.jff and/or \*.gff) files) in the current Spectrum Survey Office job :



If the user selected some regional geoid file in the process of installation, after finishing Spectrum Survey Office installation process it is possible to add (using Job Configuration window) only the following geoids (selected official geoid, global (\*.glc), custom regional (\*.rgm) and topcon geoid (\*.jff and/or \*.gff) files) in the Spectrum Survey Office' job:



### NOTICE

*Without reference to the selected projection/geoid type, Spectrum Survey Office installation saves geoid(s), which were added in the previous version to the geoid list*

To add the desired geoid(s) or the desired projection(s) to the Spectrum Survey Office's job after finishing Spectrum Survey Office installation process, the user needs to do the steps is described in "How to uninstall or add a feature after installation" on page 1-10

To continue Spectrum Survey Office installation, click **Next**.

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

6. Spectrum Survey Office is installed on the computer (Figure 1-4)

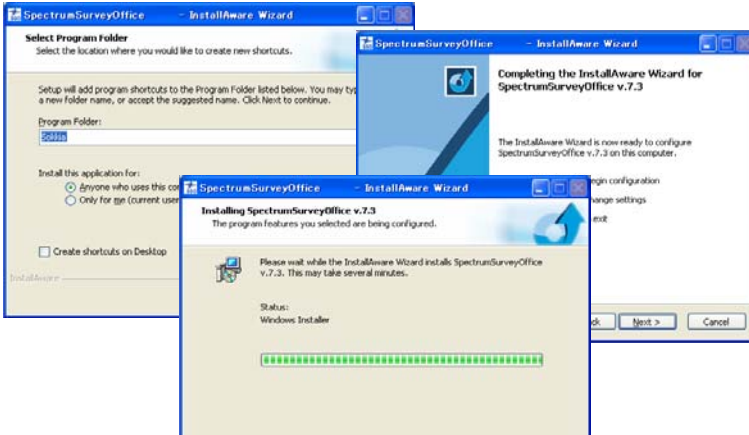


Figure 1-4. Select Program Folder and Installation Progress

7. Click **Finish** to exit the installation.
8. The Spectrum Survey Office shortcut will be created (Figure 1-5) on the computer desktop from which to quickly start the program.



Figure 1-5. Spectrum Survey Office Desktop Shortcut

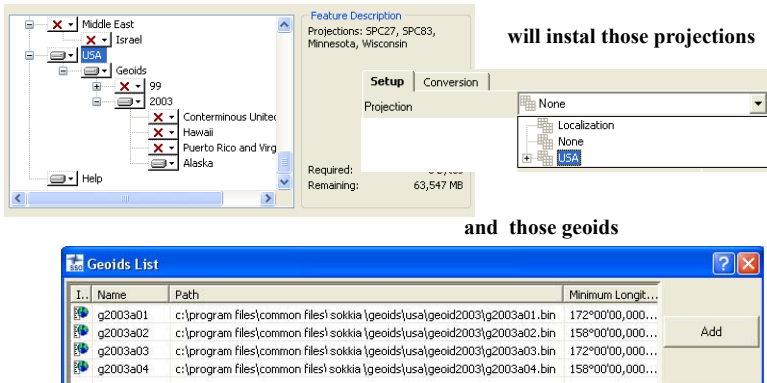
## How to see the installed features

The user can check all installed features in *Custom* setup option after finishing Spectrum Survey Office installation process and restarting Windows. To do it, make the following steps:

1. Run Spectrum Survey Office
2. Create a new job or open an existing job
3. Click **Job ▶ Job Configuration ▶ Coordinate System ▶ Setup** tab.

4. The projection list contains the custom projections and those projections, which were highlighted in the process of installation (Figure 1-6).
5. The geoid list contains the geoids, which were used in the previous version and those geoids, which were highlighted in the process of installation (Figure 1-6).

**The variant of custom installation**

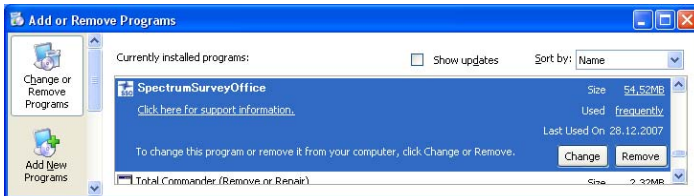


**Figure 1-6. Example of Custom Setup Installing**

## How to uninstall or add a feature after installation

The user can add any features from *Custom Setup* window after finishing Spectrum Survey Office installation process and restarting Windows. To do it, make the following steps:

1. Click **Settings ▶ Control Panel ▶ Add or Remove Programs**
2. Select *Spectrum Survey Office* in the *Add or Remove Programs* and click *Change* (Figure 1-7):



**Figure 1-7. Add and Remove Programs**

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

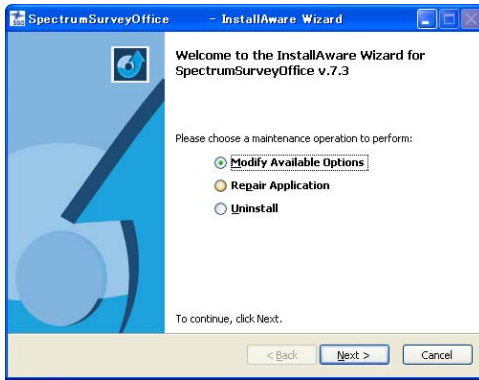


Figure 1-8. InstallAware Wizard

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

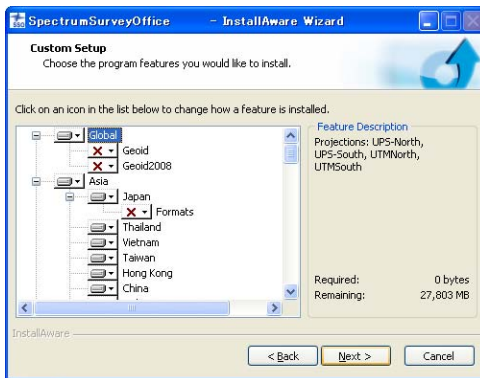


Figure 1-9. Custom Setup Window

## Installing Microsoft ActiveSync for Use With CE-based Devices

ActiveSync® is free software from Microsoft® that establishes a connection between a computer (with operation system Windows XP) and an external device. ActiveSync is used for file transfers and software downloads between a computer and mobile device running

the Windows® CE operating system, such as a hand-held controller or CE-based Total Station.

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

ActiveSync will start automatically when connecting a CE-based device.

Log on to the Microsoft website ([www.microsoft.com](http://www.microsoft.com)) to download ActiveSync. Install the program onto the computer.



After installing ActiveSync, start the application and click **File ▶ Connection Settings**. Apply the following settings based on the number of ports on the computer (Table 1-2 on page 1-13)



**NOTICE**

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

Table 1-2. About ActiveSync Connection Settings

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

**NOTICE**

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


## Starting Spectrum Survey Office

Spectrum Survey Office is a modular product, where each module has its own specific purpose allowing the user to solve different tasks. To use a full- function module (or all modules at a time) the user must have authorization for using appropriate modules. To get authorized, the user can purchase one of the following:

1. USB dongle,
2. Access code for a single computer,

3. Licence for a set of computers to work in a local net.

The above ways of getting authorization can be used together.

If the user does not have an authorization, Spectrum Survey Office provides an opportunity to work in Demo Mode, where one can use PP (Post - Processing), RTK (Real Time Kinematic), TS (Total Station). But the user is allowed to only view, edit and process no more than **five** points in a job. To run Spectrum Survey Office in Demo Mode, click  on the **Licenses** dialog box (see Figure 1-12 on page 1-16).

If you have purchased a hardware lock ( USB dongle):

- download the drivers from the site <http://www.safenet-inc.com/support/tech/sentinel.asp> and install them on the computer. This allows the computer to access the hardware lock.
- insert the hardware lock into the computer's USB port (Figure 1-10) and start Spectrum Survey Office.

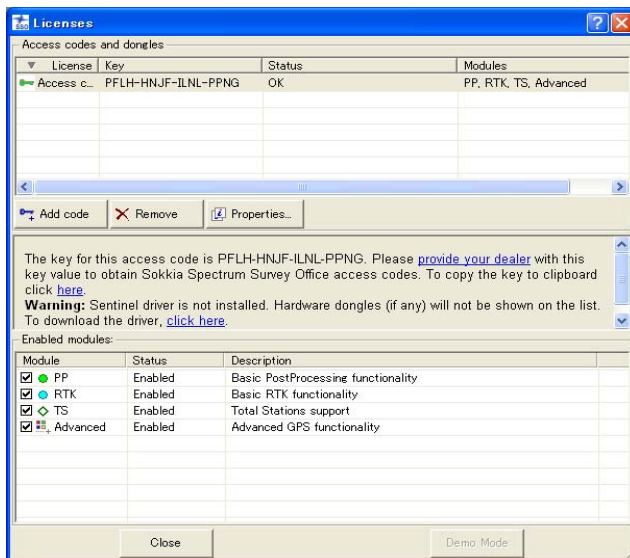


Figure 1-10. Insert USB Hardware Dongle

To start Spectrum Survey Office, do one of the following:

- click **Start ▶ Programs ▶ Sokkia ▶ Spectrum Survey Office**
- double-click the **Spectrum Survey Office shortcut**

This USB dongle will activate the corresponding modules. To see what modules are authorized by this dongle, click **Help ▶ Licenses**:



**Figure 1-11. The Licenses Window. Using USB Dongle only**

The *Modules* column of the *Access codes, dongles and license servers* tab displays all available modules for this key. These modules are activated while the USB key is in the USB port. This USB dongle is applicable to any computer with Spectrum Survey Office installed.

If the user does not have a USB dongle, and does not enter an access code to the corresponding field of the **Licenses** window, the software prompts to send an e-mail to a local dealer to request an access codes for the given computer:



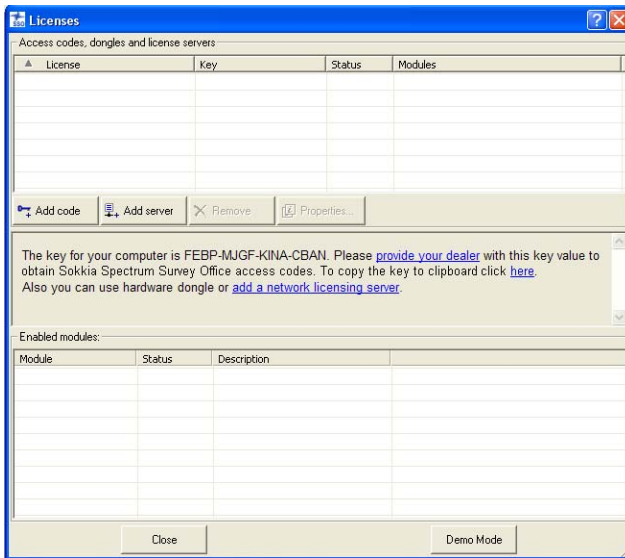


Figure 1-12. Licenses Window with out Licenses

To create this e-mail, click [provide your dealer](#) . The following e-mail will be automatically created:

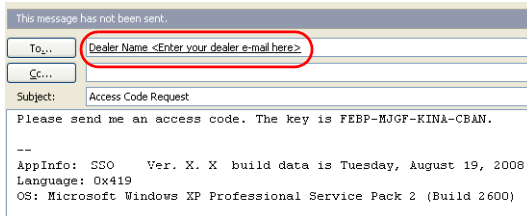
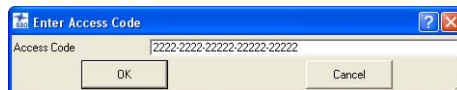


Figure 1-13. E-mail for Access Code Request

After receiving the access code, click  on the *Licenses* dialog box and type in (or paste) the code into the following box:



After clicking *OK* on this box, Spectrum Survey Office will check the entered value. If this value is correct, the *Access codes, dongles and license servers* tab displays this code and all modules which are activated by this access code:




Figure 1-14. The Licenses Window. Using Access Code only



### NOTICE

*One access code corresponds to one key value. The key value is tied to the computer and operation system (OS) of this computer. If reinstalling the OS on the same computer this key value will change and old access code(s) will not be used.*

If the user has a license server access, he can add the address to the corresponding box (click ):



Click *OK* on this box and wait a little to get permission to work with those modules of Spectrum Survey Office which are available for the given user of local network:

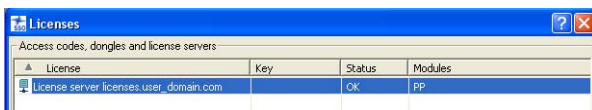
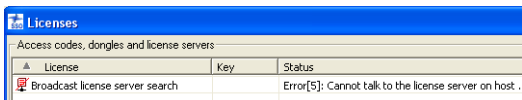


Figure 1-15. The Licenses Window. Using Server's license only

If connection with the license server is not successfully, the *Access codes, dongles and license servers* tab displays the error message:

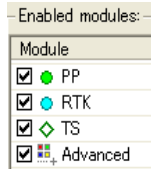


## NOTICE

## NOTICE

*To understand how to get and install licenses, please read the manual: 'Sentinel RMS system administrator guide'.*

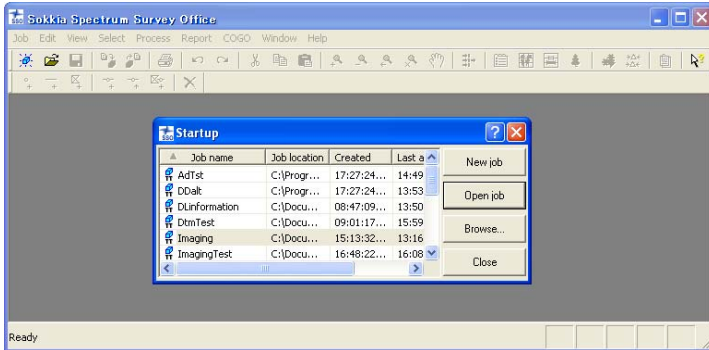
Irrespective of the applied licenses, the user can disable/enable the modules in the *Enabled modules* field:



**Figure 1-16. Selection of Enabled Modules**

Close and open Spectrum Survey Office again to activate the new/selected module(s).

When closing the software with access codes entered or the hardware lock inserted or with the license from a license server, Spectrum Survey Office will return to the main window (Figure 1-17).



**Figure 1-17. Spectrum Survey Office Startup Example Window**

The **Startup** window (Figure 1-17 on page 1-18) automatically displays from which to create new jobs or open earlier jobs.

- See “Getting Acquainted” on page 1-21 for details on the various tools and menus available in Spectrum Survey Office.

- See “Working with a Job” on page 2-1 for details on the Startup window and its selections.
- See “Data Views” on page 4-1 for details on the data views available in Spectrum Survey Office.

Spectrum Survey Office also supports the drag-and-drop technique for opening files. A Spectrum Survey Office job can be open or closed.

1. Run Windows Explorer on the computer and navigate to the location of the desired files.
  2. Click and hold the file(s) to open.
  3. Drag-and-drop the file(s) to the open Spectrum Survey Office software (Figure 1-18).
- If dropping a job onto the Spectrum Survey Office main window, the job will open.
  - If dropping a job or data onto a currently open job, the job or data will be imported.

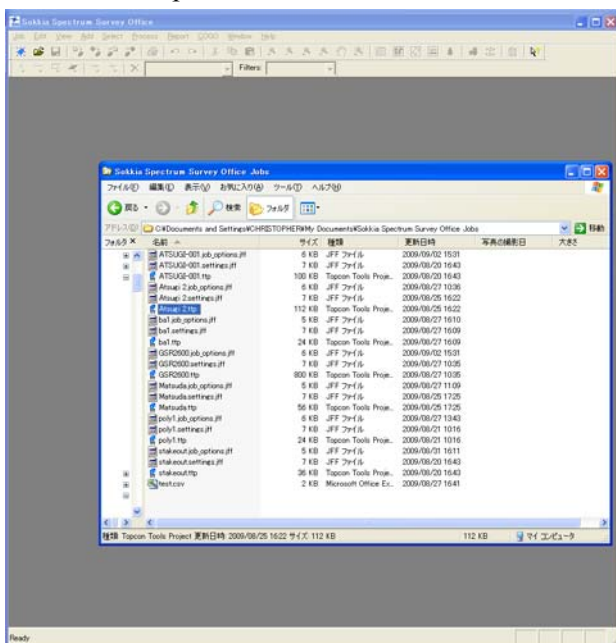


Figure 1-18. Open File Using Drag-and-drop

# Updating Hardware Lock

The hardware lock can activate not all modules in Spectrum Survey Office. To update the hardware lock for activating new Spectrum Survey Office module(s), take the following steps:

1. Highlight the hardware line in the *License* window and click [provide your dealer](#) for the dongle's key. The key value of this hardware lock will be automatically copied and the following e-mail will be automatically created:

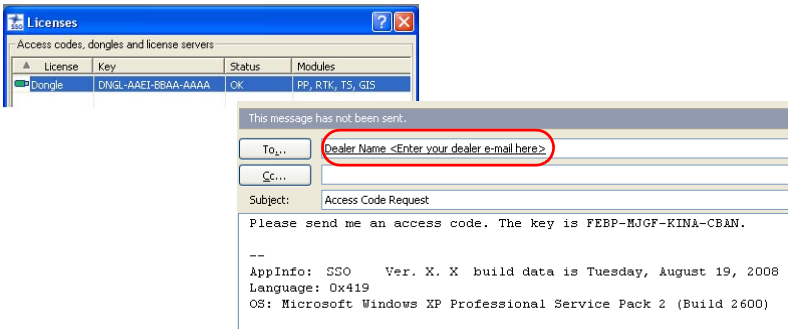
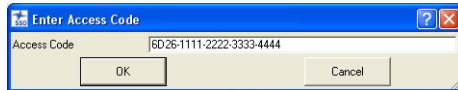


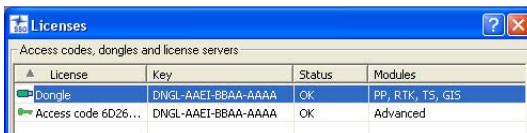
Figure 1-19. E-mail for Dongle's Access Code Request

2. After receiving the corresponding access code, click [Add code](#) on the *Licenses* dialog box and type in (or paste) the code into

the following box:



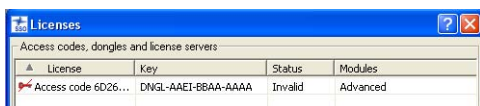
3. After clicking *OK* on this box, Spectrum Survey Office will check the entered value. If this value is correct, the *Access codes, dongles and license servers* tab displays this code and all modules which are activated by this access code:



NOTICE

**NOTICE**

*These Spectrum Survey Office modules can be enabled only by the hardware lock inserted in the computer port. If the hardware lock is not used in the computer, the following line will display in the Licenses window:*



## Getting Acquainted

This section introduces the various functions available in Spectrum Survey Office for viewing, configuring, or editing data files.

NOTICE

**NOTICE**

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

## Spectrum Survey Office Modules

Spectrum Survey Office can be packaged as a module based on the needs and requirements of different jobs.

### PostProcessing Module

Includes the engine for postprocessing GPS+ data.

### RTK Module

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

### TS Module

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

## Advanced Module

Includes additional options for processing, adjustment and localization.

## Main Window

The Spectrum Survey Office main window (Figure 1-20) has the following components:

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

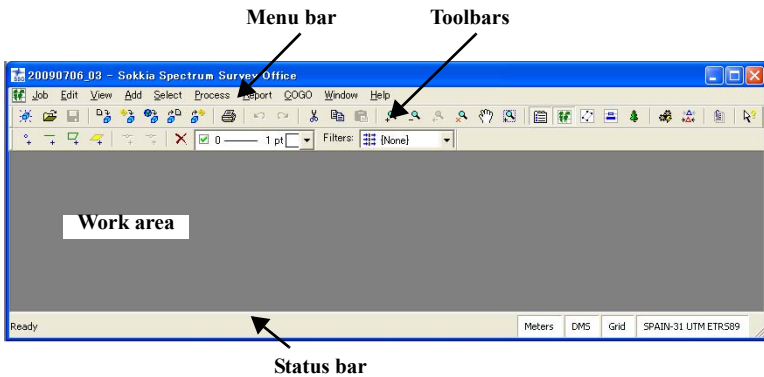


Figure 1-20. Spectrum Survey Office Main Window

Upon startup, the **Startup** window displays (Figure 1-17 on page 1-18) the following:

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

## Menu Bar

The menu bar (Figure 1-21) provides access to most options available using Spectrum Survey Office.

Job Edit View Add Select Process Report COGO Window Help

Figure 1-21. Menu Bar

Table 1-2 describes the functions available in each menu.

Table 1-3. Spectrum Survey Office Menu Options

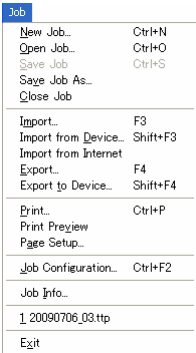
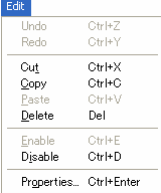

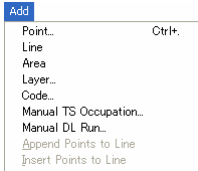
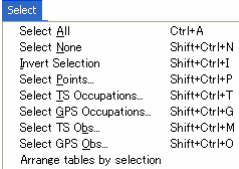
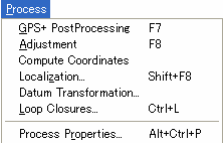
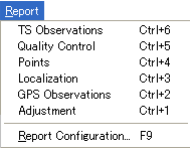

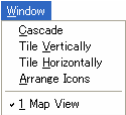
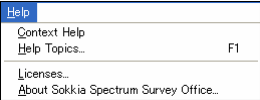
Menu	Functions
<p><b>Job menu</b></p> 	<ul style="list-style-type: none"> <li>• creates, opens, saves, saves a copy of, and closes a job</li> <li>• prints information from an active job</li> <li>• imports from a file or exports to a file</li> <li>• imports from a device or exports to a device</li> <li>• imports raw data and ephemeris from a Internet</li> <li>• defines printing variables</li> <li>• defines a configuration for an active job</li> <li>• views job information</li> <li>• displays recently accessed files</li> </ul>
<p><b>Edit menu</b></p> 	<ul style="list-style-type: none"> <li>• allows a redo or undo of the last operation</li> <li>• cuts, copies, pastes, or deletes information</li> <li>• prohibits or permits the use of points and observations in adjustment and post-processing</li> <li>• displays properties for selected data</li> </ul>



Table 1-3. Spectrum Survey Office Menu Options (Continued)

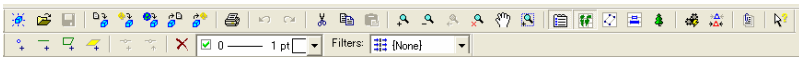
Menu	Functions
<p><b>View menu</b></p> 	<ul style="list-style-type: none"> <li>• provides access to viewing and hiding the Status bar and various views</li> <li>• displays or hides data in either the Tabular view, Map view, Filters, Occupation view, CAD view, Layers view, Codes view, Antennas List view, Google Earth view and Background Image view</li> <li>• customizes toolbars to user specifications</li> <li>• sets Pan and Zoom mode for Map View, CAD view.</li> <li>• sets options for Map view, Occupation view, Tabular view, Cad view, Images view, and Stereopair view</li> </ul>
<p><b>Add menu</b></p> 	<p>adds a point, a line, area, code, manual TS - occupation, manual DL run, selected objects and insert points to the created line</p>
<p><b>Select menu</b></p> 	<p>selects points, occupations, and observations based on a user-defined criteria</p>
<p><b>Process menu</b></p> 	<ul style="list-style-type: none"> <li>• processes GPS observations</li> <li>• adjusts observations</li> <li>• computes coordinates of the points</li> <li>• computes localization parameters</li> <li>• determines datum parameters</li> <li>• displays loop closures</li> <li>• sets processing properties</li> </ul>

**Table 1-3. Spectrum Survey Office Menu Options (Continued)**

Menu	Functions
<p>Report menu</p> 	<ul style="list-style-type: none"> <li>• displays data reports in a separate window, including adjustment results, points and observations details, and the results of localization and quality control tests</li> <li>• customizes existing reports and creates user-defined reports</li> </ul>
<p>COGO menu</p> 	<ul style="list-style-type: none"> <li>• calculates the inverse for selected points with respect to a known point</li> </ul>
<p>Window menu</p> 	<ul style="list-style-type: none"> <li>• arranges open windows in cascade (stacked) or tile (adjacent) views</li> <li>• arranges icons</li> <li>• displays the current view (Map, Occupation, Codes)</li> </ul>
<p>Help menu</p> 	<ul style="list-style-type: none"> <li>• adds a question mark to the cursor with which to get help about certain items</li> <li>• displays the help topics for Spectrum Survey Office</li> <li>• displays license information and customizes enabled modules</li> <li>• gives Spectrum Survey Office version, build date, and purchased modules information</li> </ul>

## Toolbar

The toolbar for Spectrum Survey Office (Figure 1-22) contains buttons for frequently used functions. To create a custom toolbar, see “Customizing the Toolbar” on page 1-30.



**Figure 1-22. Toolbar**

Upon startup, the toolbars display beneath the menu bar.

- To display or hide the toolbar, click **View ► Customize** and enable/disable the desired toolbar.

- To move the toolbar, click the background behind the buttons, then drag the toolbar to a new location.

To display CAD toolbar buttons using a customized toolbar, see “Customizing the Toolbar” on page 1-30.

Table 1-4 describes the various buttons available on the standard Toolbar.

**Table 1-4. Toolbar Button Functions**








Button	Description
	<p>New Job – Creates a new job.</p> <ol style="list-style-type: none"> <li>1. Click the button to display the <i>Create a new job</i> dialog box.</li> <li>2. Type the name of the job and select its location.</li> <li>3. Type the user name in the <i>Created by</i> field and enter comments in the <i>Comments</i> box, if needed.</li> </ol>
	<p>Open Job – Opens an existing job.</p> <ol style="list-style-type: none"> <li>1. Click the button to display the <i>Open Job</i> dialog box.</li> <li>2. Select the desired job.</li> <li>3. Click <b>Open Job</b>.</li> </ol>
	<p>Save – Saves a job to the directory defined during job creation.</p>
	<p>Import from Files – Imports observation files into a job from a hard disk drive, local area network, or storage media.</p> <ol style="list-style-type: none"> <li>1. Click the button to display the <i>Import from files</i> dialog box.</li> <li>2. Select the path or folder, the type of format, and then select the names of observed files. Click <b>Open</b>.</li> </ol>
	<p>Import File from Internet – Imports observation files from the Internet. See “Importing From a Device” on page 3-18 for more details.</p>
	<p>Import File from Device – Imports observation files from TPS GPS+ receivers, controllers, total stations, and Topcon memory cards.</p> <ol style="list-style-type: none"> <li>1. Click the button to display the <i>Import file from device</i> dialog box.</li> <li>2. Select the device(s) and click <b>Next</b>.</li> </ol> <p>See “Importing From a Device” on page 3-18 for more details.</p>
	<p>Export to File – Exports data from job files onto a hard disk drive, local area network, or storage media.</p> <ol style="list-style-type: none"> <li>1. Click the button to display the <i>Export to file</i> dialog box.</li> <li>2. Select the path or folder, type the name of file, and click <b>Save</b>.</li> </ol>

Table 1-4. Toolbar Button Functions (Continued)































Button	Description
	Print – Prints the current window or table.
	Undo – Reverses the last action.
	Redo – Returns the last action.
	Cut – Removes the selected object(s).
	Copy – Copies the selected object(s).
	Paste – Places object(s) from the Windows clipboard to the current cursor position.
	Zoom In – Switches the active Map, Occupation, and CAD view into zoom mode.
	Zoom Out – Switches the active Map, Occupation, and CAD view into zoom mode.
	Zoom back – Zooms back on the Map, Occupation, and CAD view.
	Restore All – Fits all data in the active Map, Occupation, and CAD view into the viewable extents of the active view.
	Pan – Changes the pointer to a “hand” with which to “grab” and move the Map, Occupation, and CAD view.
	Zoom to Selection – Zooms in on the selected coordinate data, points etc.
	Tabular View – Opens and closes a spreadsheet/table presentation of data in a job.
	Map View – Displays observations and observed points.
	CAD View – Displays design data (points, lineworks).
	Occupation View – Opens and closes the graphical occupation view for the job.

Table 1-4. Toolbar Button Functions (Continued)

Button	Description
	Codes – Opens a table with the job’s codes.
	GPS+ PostProcessing – Uses the PostProcessing engine to process all GPS observations in a job.
	Adjustment – Adjusts the network.
	Configure Reports – Opens the Report Configuration window.
	Context Help – Displays a pop-up tip with information about the selected view, button, information, etc. <ol style="list-style-type: none"> <li>1. Click the button. The pointer changes to a question mark.</li> <li>2. Click the object you want additional information on. A pop-up tip gives further information.</li> <li>3. Click outside the pop-up tip to close it.</li> </ol>

## CAD Toolbar Buttons

Button	Description
	Add point – Adds a point to the job. <ol style="list-style-type: none"> <li>1. Click the button. The pointer changes to an “add point” pointer.</li> <li>2. Click anywhere on the CAD view.</li> <li>3. Enter information for the point on the <i>Add Point</i> dialog box.</li> <li>4. Click <b>OK</b>. Click the button again to return the pointer to normal.</li> </ol>
	Add line – Adds a line to the job. <ol style="list-style-type: none"> <li>1. Click the button. The pointer changes to an “add point” pointer.</li> <li>2. Click anywhere, or at the desired point, on the CAD view. A line is created between two points.</li> </ol>
	Add Area - closes the lines that have been created.
	Add Layer <ol style="list-style-type: none"> <li>1. Click the button.</li> <li>2. Enter information for the layer on the <i>Add Layer</i> dialog box.</li> <li>3. Click <b>Ok</b>.</li> </ol>
	Append points to line – Adds points onto the end of a line.

Button	Description
	Add points to line – Breaks the line at the selected point and adds a point, essentially creating two lines out of one line.
	Erase – Deletes the selected object(s).
	Layers Control 1. Click the combo box. 2. Clicking on layer name selects the layer as active.
	Filters Control creates and selects a user-defined filter for observations and points 1. Click the combo box. 2. Clicking on the filter name makes this filter active.

## Status Bar

The status bar (Figure 1-23) displays various informative messages about current Spectrum Survey Office activities and data.

Double-click the boxes to display pop-up lists that provide quick access to some of the most commonly changed job configuration options (Figure 1-23).

- metric and angular units
- coordinate and projection systems

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

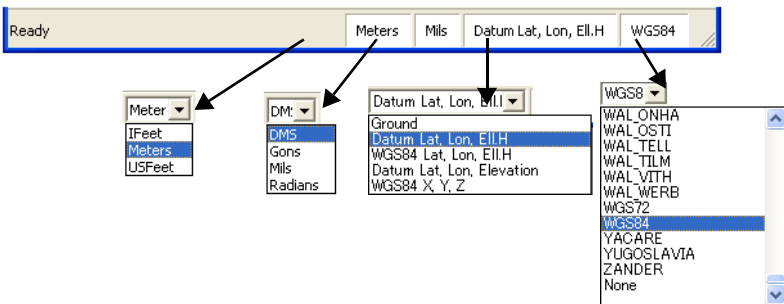


Figure 1-23. Status Bar and Pop-up Lists

# Customizing the Toolbar

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

1. To customize toolbar options, click **View ► Customize**. The *Toolbars* tab in the *Customize toolbars* dialog box displays all available toolbars for activating or inactivating, and adds or deletes toolbars. (Figure 1-24).

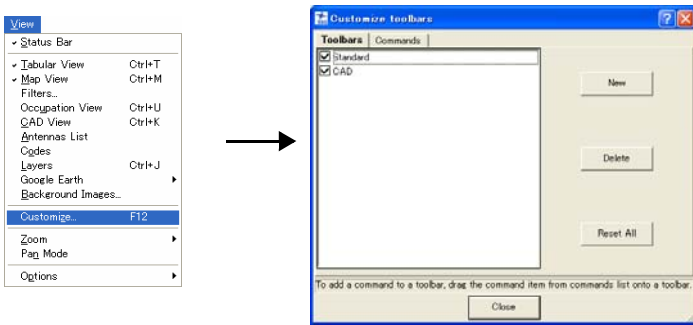


Figure 1-24. Customize Toolbars

2. Click **New** to add a new toolbar to the main window. Name the toolbar and click **OK** (Figure 1-25 on page 1-30).

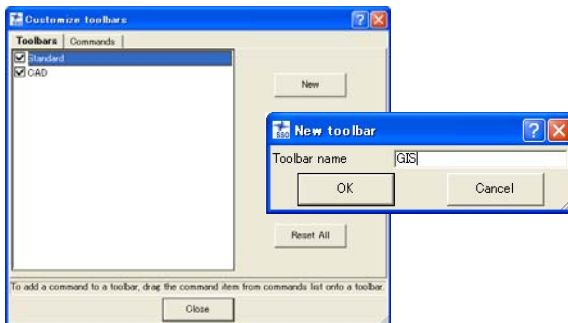


Figure 1-25. Add New Toolbar

The customized toolbar is added to the *Toolbars* tab and displays as an empty toolbar on the main screen (Figure 1-26).

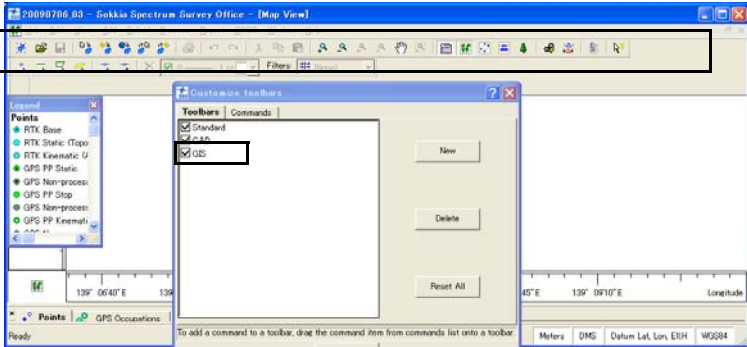


Figure 1-26. New Toolbar

3. Click the *Commands* tab. The left panel displays a list of menus and the right panel displays commands available for the selected menu (Figure 1-27).

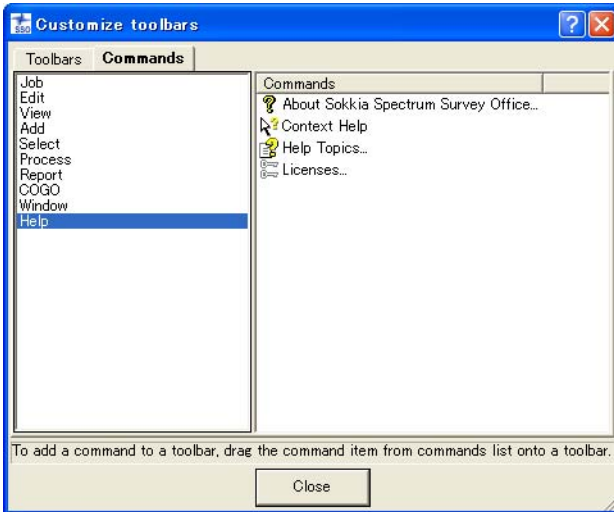


Figure 1-27. Toolbar Commands

4. To add a command, select the applicable menu, then click and drag the desired toolbar command to the empty toolbar (or to a location on any toolbar) on the main screen and release the mouse button (Figure 1-28).



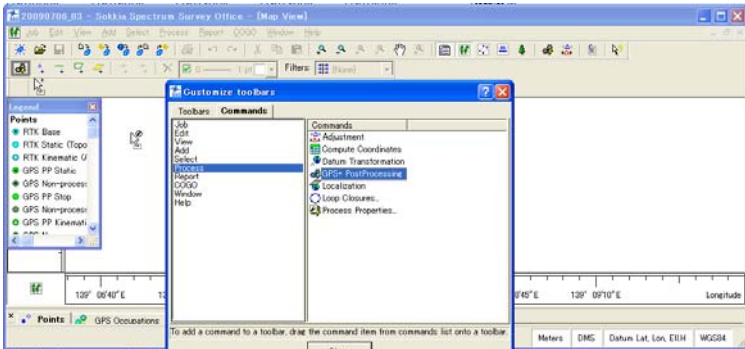


Figure 1-28. Adding Commands to Toolbar

- When all desired commands have been added to the toolbar, rearrange the toolbar buttons as needed: click and drag the button to a location on the toolbar (Figure 1-29). When editing the toolbar, the *Customize toolbars* dialog box must be open.

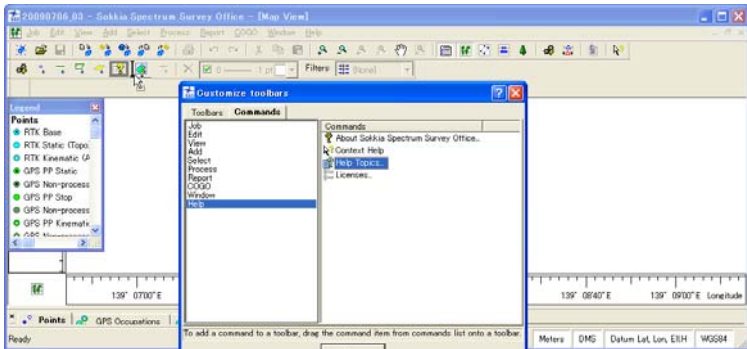


Figure 1-29. Editing Toolbar Button Location

See “Editing the Toolbar” on page 1-33 and “Custom Toolbar Tips” on page 1-34 for further customizing details.

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

## Editing the Toolbar

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

Right-click the toolbar to display the toolbar pop-up menu for further editing (Figure 1-30 on page 1-34).

- Delete Button – deletes the selected button from the toolbar.
- Copy Button Image – copies the button’s image for applying to another button.
- Paste Button Image – pastes a copied button image to another button.
- Set Default Image – sets the original (default) image for the selected button.
- Begin a Group – inserts a spacer bar before the selected button to set toolbar buttons in groups. A check mark indicates the beginning of the group. Click the menu option again to remove the check mark and button grouping.
- Command Properties – displays the *Command Properties* dialog box in which to select folder and filter properties for import/export toolbar buttons. See “Custom Toolbar Tips” on page 1-34 for details.
- Button Settings – displays the *Button Settings* dialog box for entering the *Button Name* (for when the cursor pauses over the button and when displaying the button as text) and the button’s display properties (described below). See “Custom Toolbar Tips” on page 1-34 for details.
- Show Bitmap – displays an image for the button.
- Show Text – displays the button as text.
- Show Bitmap and Text – displays both an image and text for the button.

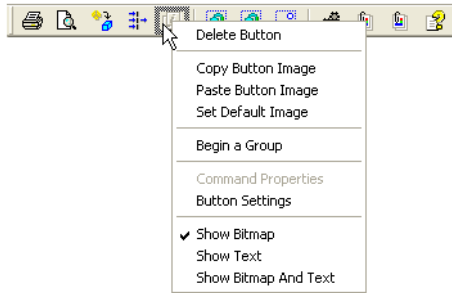


Figure 1-30. Toolbar Pop-up Menu

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

## Custom Toolbar Tips

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

### Command Properties

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

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

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

1. Right-click an **import/export toolbar button** and click **Command Properties** on the pop-up menu (Figure 1-31).

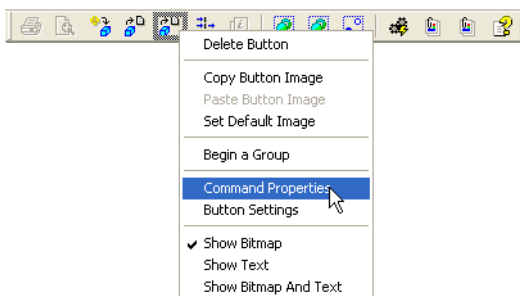


Figure 1-31. Display Command Properties

2. On the **Command Properties** dialog box, click the **browse** button to select the default folder to import files to or export files from (Figure 1-32).
3. Click the **Filter** drop-down list to select the default import/export format (Figure 1-32).
4. Click **OK** to save the settings and close the dialog box.



Figure 1-32. Apply Command Properties

5. Right-click the **same toolbar button** and click **Button Settings** on the pop-up menu. Assign a unique name to the button and set text display properties as described in “Button Settings” on page 1-36.

## Button Settings

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

1. Right-click a **toolbar button** and click **Button Settings** on the pop-up menu (Figure 1-33).

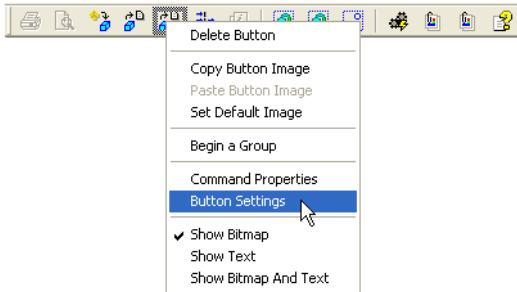


Figure 1-33. Display Command Properties

2. On the *Button Settings* dialog box, type a name for the button (or use the default name) (Figure 1-34).
3. Select a *Button appearance* (Figure 1-34):
  - Show Bitmap – displays the button as an image.
  - Show Text – displays the button as text.
  - Show Bitmap and Text – displays both an image and text for the button.
4. Click **OK** to save the settings and close the dialog box.



Figure 1-34. Apply Button Settings

Figure 1-35 displays the different button appearance options.

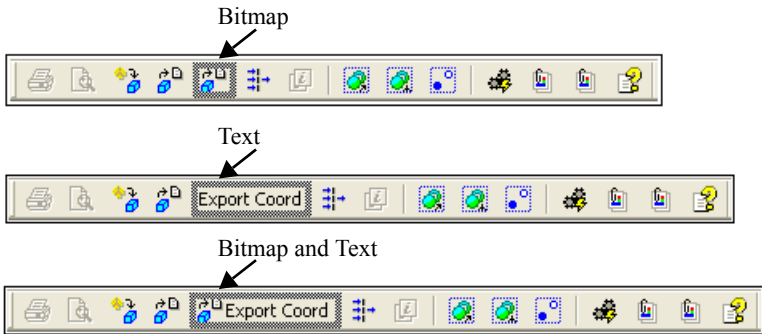


Figure 1-35. Button Appearance Options

## Printing the Selected View

All views in Spectrum Survey Office can be printed for viewing offline.



TIP

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

### To Print Map, Occupation, or CAD Views:

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

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

### To Print the Codes View:

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

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

**To Print Tabular Views:**

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

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

# Working with a Job

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

## Using the Startup Dialog Box

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

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

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

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



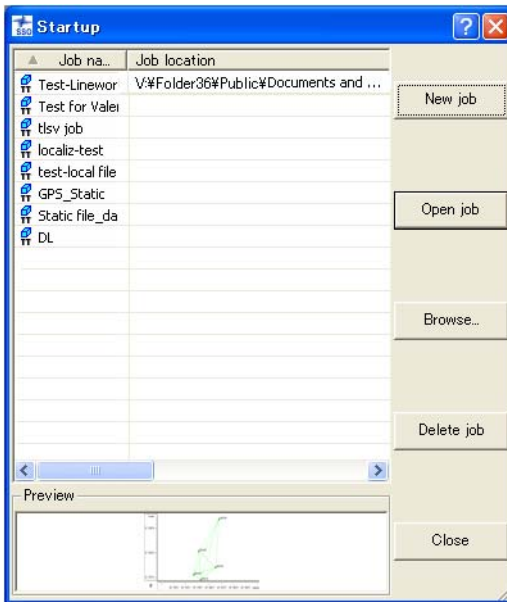


Figure 2-1. Startup Dialog Box

## Creating a New Job

Creating a new job will open an empty job file in Spectrum Survey Office, as well as automatically save the new file in the selected folder.

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

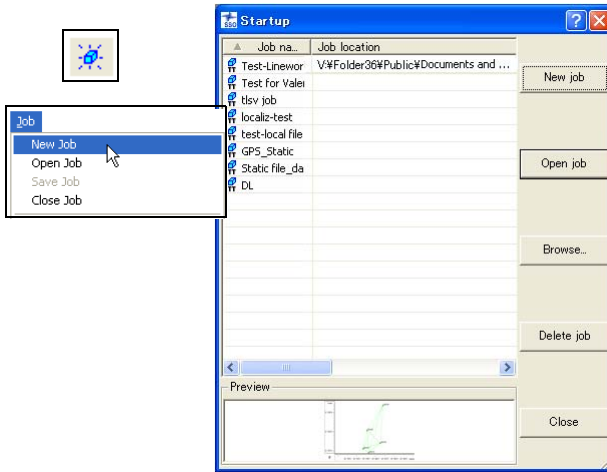


Figure 2-2. Ways to Create a New Job

2. Enter the following information (Figure 2-3):
  - *Job name*, *Created by*, and *Comment* information.
  - Click the **browse** button (“...”) to select the folder in which to save the job.
  - Choose a configuration from the *Configurations* list or click **Edit configuration** (see “Job Configuration” on page 2-6 for information on editing the configuration).

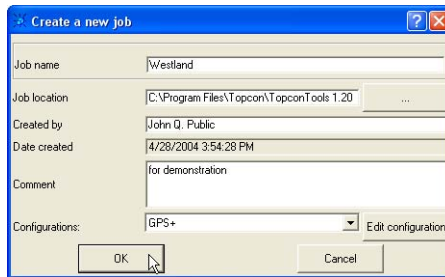


Figure 2-3. Create A New Job

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

# Opening a Job

You can open a Spectrum Survey Office job from within the program, double-click a \*.tpp file, or drag-and-drop a \*.tpp file into Spectrum Survey Office.

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

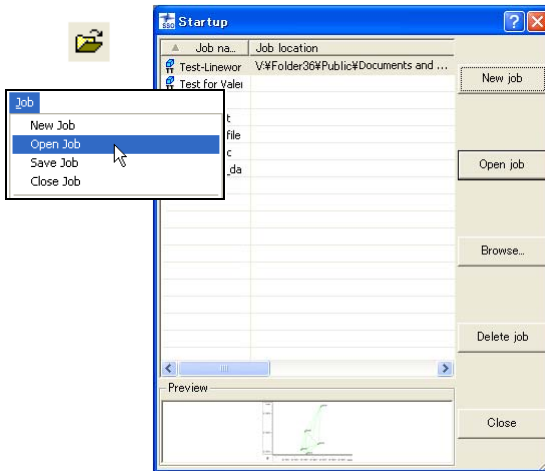


Figure 2-4. Ways to Open a Job

- Navigate to the desired folder, click the desired job, and click **Open**. The selected job opens in Spectrum Survey Office.

# Saving a Job

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

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



Figure 2-5. Ways to Save a Job

When opening another job or exiting the program, Spectrum Survey Office will ask to save the currently open job.

# Closing a Job

To close a job while leaving Spectrum Survey Office open, click **Job ▶ Close Job** (Figure 2-6).

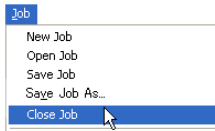


Figure 2-6. Close Job

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

Click **Job ▶ Exit** to exit Spectrum Survey Office after saving and closing a job.

## Deleting a Job

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

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

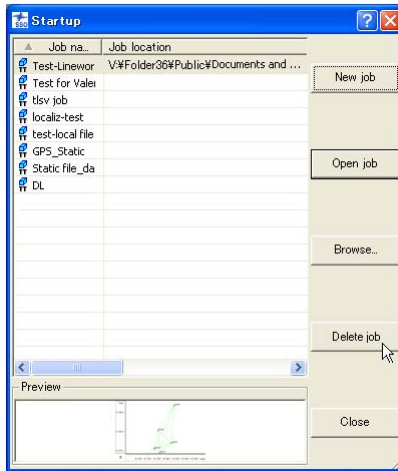


Figure 2-7. Select Job to Delete

## Job Configuration

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

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

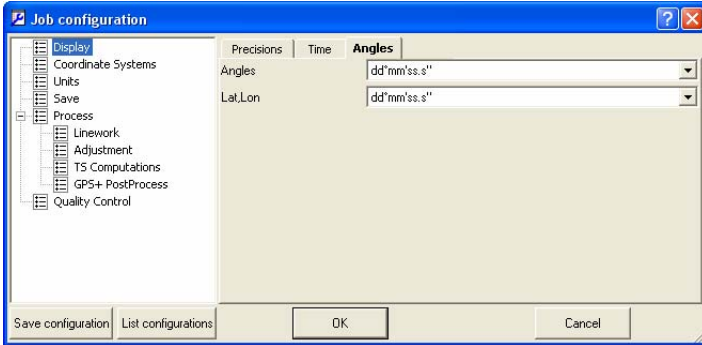


Figure 2-8. Job Configuration

- The left panel of the dialog box displays the items used to configure a job. The following sections describe these items.
- The right panel of the dialog box displays parameters for the selected item.
- Clicking the List configuration button displays the *Configuration list* dialog box (Figure 2-9). The default configurations differ in coordinate systems and precisions for Points, GPS Obs, TS Obs, DL Obs, and Loop Closure.

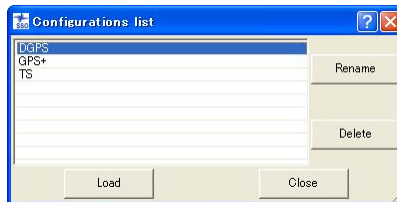


Figure 2-9. Configurations List

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

- Ground is set for TS configuration.
- Datum System is set for DGPS and GPS+ configurations.

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

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



Figure 2-10. Enter Configuration Name

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

## Display Options

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

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

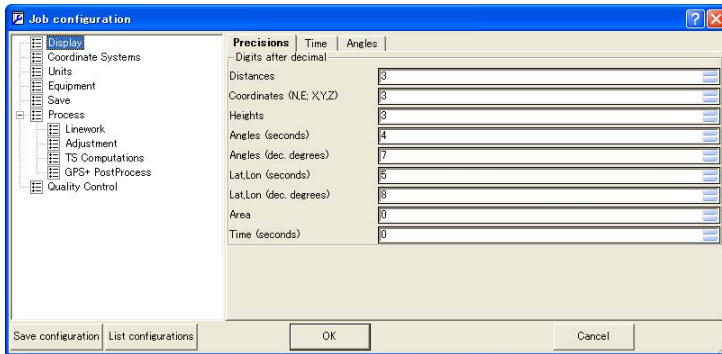


Figure 2-11. Job Configuration – Precisions Tab

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

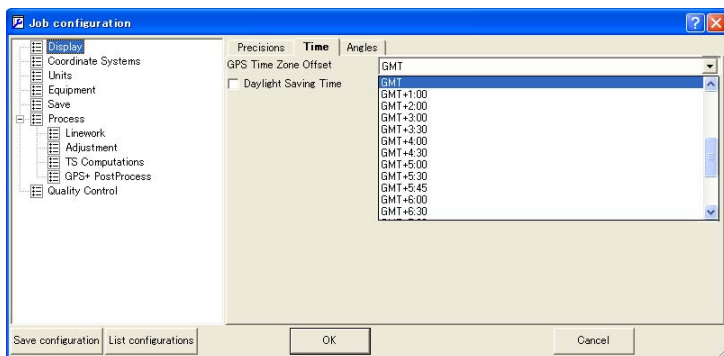


Figure 2-12. Job Configuration – Time Tab

- The *Angles* tab (Figure 2-13) sets the format angular values.

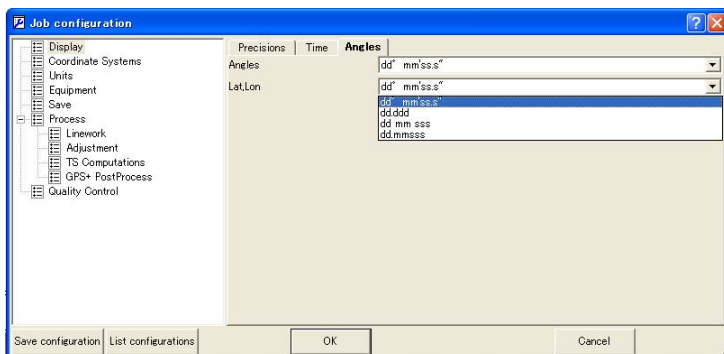


Figure 2-13. Job Configuration – Angles Tab

## Coordinate Systems Setup

The Coordinate System item displays the *Setup* and *Conversion* tabs in the right panel.

- The *Setup* tab sets the current coordinate system and the desired geoid for the opened job.

Any Spectrum Survey Office job contains points, with coordinates either in a Grid system on corresponding Datum or a Ground coordinate system. To display point coordinates in the desired coordinate system, select the appropriate projection/



datum in the Coordinate Systems window (Figure 2-14 on page 2-10) or in the Status Bar.

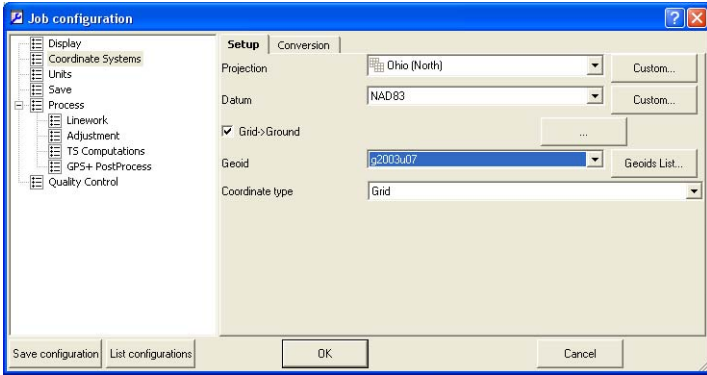
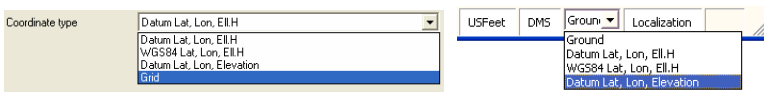


Figure 2-14. Job Configuration – Coordinate Systems/Setup Tab

- The *Projection* drop-down list sets the pre-defined grid projection for the job. See “Add a Custom Projection” on page 2-14 for details on adding projections.
- When a projection (except Localization and None) is chosen, the *Grid->Ground* parameters check box is available.

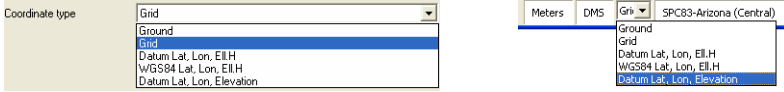


- If the *Grid->Ground* parameters box is unchecked (disabled) in the *Coordinate Systems* window, then ‘Ground’ is absent in the *Coordinate type* list in the *Coordinate Systems* window and in the list of coordinate systems in the *Status Bar*.

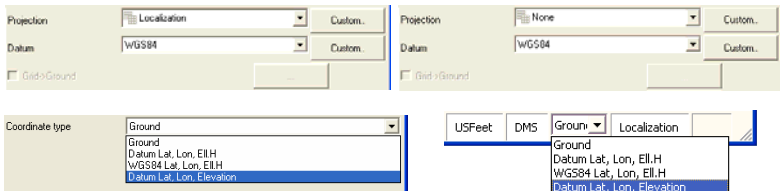


- If the *Grid->Ground* parameters box is checked (enabled) in the *Coordinate Systems* window, then ‘Ground’, ‘Grid’ and

‘Datum’ are displayed in the *Coordinate type* list and in the list of coordinate systems in the **Status Bar**.



- The *Grid->Ground* parameters check box and button opens a dialog box to set grid-to-ground transformation parameters. If unchecked, the coordinates will not be converted to grid and vice-versa. See “Set Grid-to-Ground Parameters” on page 2-17 for applying these parameters.
- To display point coordinates in a local coordinate system (that is, in a system not related to any state grid system), select **Localization** or **None** from the *Projection* drop-down list.
  - Localization will display coordinates as ground, converted from grid using localization.
  - None will display only ground coordinates.
- When Localization or None are chosen from the projection list, the *Grid->Ground* parameters check box is not available in the **Coordinate Systems** dialog box, ‘Grid’ is absent in the *Coordinate type* list in the **Coordinate Systems** dialog box and in the list of coordinate systems in the Status Bar.



**Figure 2-15. Grid Unavailable When Localization or None is Selected**

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

grid projection allows different datums to be used (such as *UTMNorth*, *UTMSouth*, and *UPS* grids).

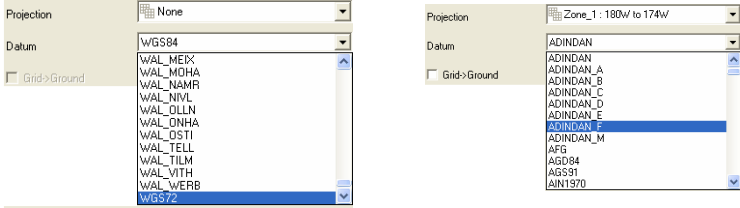


Figure 2-16. Example of Selecting Datum for UTM (Zone 7)

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



Figure 2-17. Example Setting of Datum for JAPAN\_01 Projection

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

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

This is the latest update of ITRF2000 parameters.

- NAD83(ITRF96) has the following transformation parameters (shifts, rotations and scale) to WGS-84 datum:

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

**NOTICE** NOTICE

*Use to support the previous version of NAD83<->ITRF96. This datum was used in Spectrum Survey Office until version 5.04.*

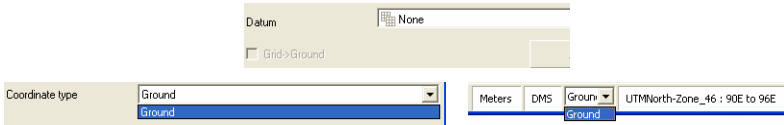
- NAD83\_NO\_TRANS has zero values of transformation parameters (shifts, rotations and scale) to WGS-84 datum.

**NOTICE** NOTICE

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

See “Add a Datum” on page 2-15 for details on adding a datum.

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



- The *Geoid* drop-down list sets the geoid model for the job. Select the necessary geoid model from the drop-down list. See “Add a Geoid” on page 2-19 to add a geoid.
- The *Coordinate type* drop-down list sets the type of coordinates used for the job. This setting can also be changed using the corresponding drop-down list in the status bar.
- If the geoid file is downloaded to the job and the geoid covers the area where the job’s points are located.
  - orthometric heights will be displayed if you select **Grid**, **Ground**, or **Datum Elevation** in the *Coordinate type* list or in the Status Bar.

In this case, the orthometric heights are displayed in the ‘*Elevation*’ column of the *Points* tab.

- ellipsoidal heights will be displayed if you select WGS84 *Lat,Lon,Ell.H* or *Datum Lat,Lon,Ell.H* in the Status Bar.

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

## Add a Custom Projection

To define a custom projection:

1. Click the *Projection Custom* button.
2. On the *Custom Projections List* (Figure 2-18 on page 2-14):
  - Click **Add** to define a custom projection and continue below.
  - Click **Remove** to delete the selected custom projection.

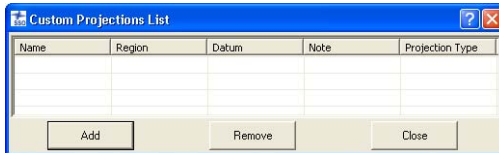


Figure 2-18. Custom Projections List

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

The custom projection is added to the projections list.

4. When finished defining or removing custom projections, click **Close** on the *Custom Projection List*. The new projections can

then be selected from the *Projection* drop-down list on the Coordinate Systems panel.

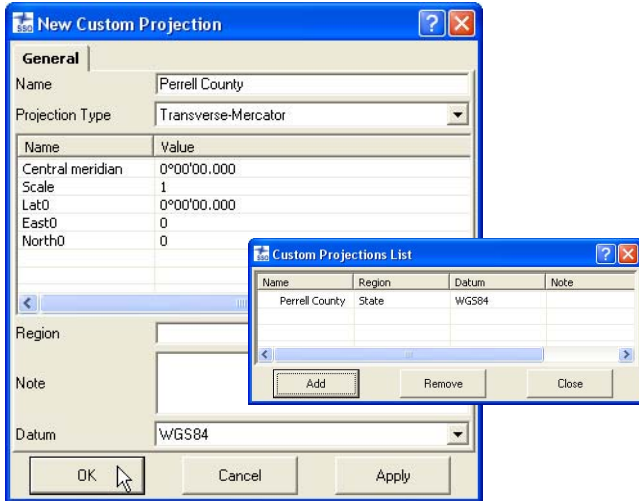


Figure 2-19. New Custom Projection

## Add a Datum

To define a custom datum:

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

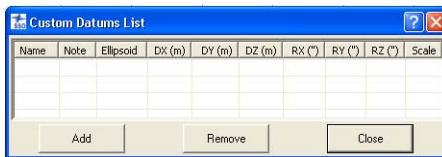


Figure 2-20. Custom Datums List

3. On the *New Custom Datum* dialog box, enter the following information and click **OK** (Figure 2-21 on page 2-16):
  - Name – type a name for the datum

- Ellipsoid – select the ellipsoid used to create the datum
- DX, DY, DZ – enter the ellipsoid’s shift parameters
- RX, RY, RZ – enter the ellipsoid’s angle rotation parameters
- Scale – enter the scale to adjust the ellipsoid by
- Notes – type any desired notes

The custom datum is added to the datums list.

**NOTICE** NOTICE

*Enter the DX/DY/DZ, RX/RY/RZ, and Scale parameters with respect to the WGS84 datum.*

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

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

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

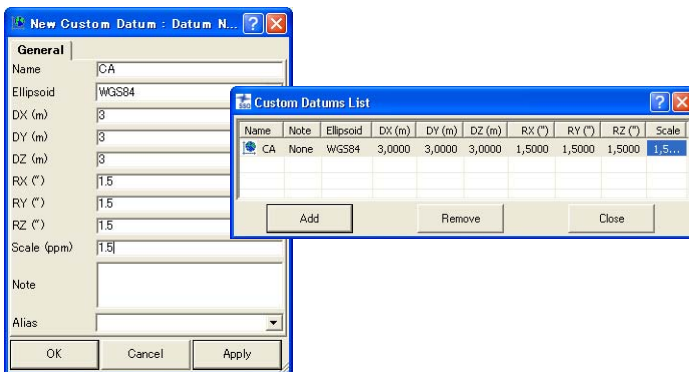


Figure 2-21. New Custom Datum

## Set Grid-to-Ground Parameters

A ground projection is a grid mapping projection re-scaled, rotated and shifted to convert point coordinates to another reference surface (up to average project elevation) to produce near ground values. The ground coordinates can be converted back to the grid projection.

Spectrum Survey Office has two methods for setting Grid to Ground parameters:

**Method One:** Rotation of the ground system is performed relative to the origin of the Grid coordinate system. Click and enable the **Parameters** radio button (Figure 2-22) and take the following steps:

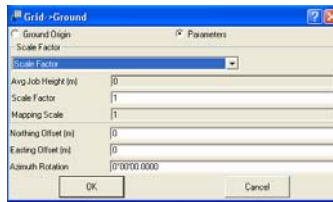


Figure 2-22. Creating Ground Projection Using Parameters Option

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

of the Map Scale Factor

Scale Factor	
Avg Job Height	
Avg Job Height (in)	198.12
Scale Factor	
Mapping Scale	1.0000005829

OR

- select **Scale Factor** from the drop-down list in the **Grid->Ground** dialog box (see Figure 2-22 on page 2-17) and enter the value of the Scale Factor. This value can be taken from the *Combined Grid to Ground Scale Factor* field of the

*Points* tab

Scale Factor	
Scale Factor	
Avg Job Height (in)	0
Scale Factor	1.00002930221
Mapping Scale	1

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



**Method Two:** Rotation of the Ground from Grid is performed relative to some point in the job. Click the **Ground Origin** radio button (Figure 2-23) and take the following steps:

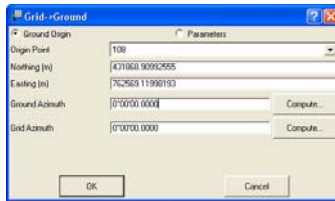


Figure 2-23. Creating Ground Projection Using the Ground Origin Option

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

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

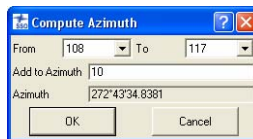


Figure 2-24. Compute Azimuth Window

## Add a Geoid

If the Geoid list is empty:

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

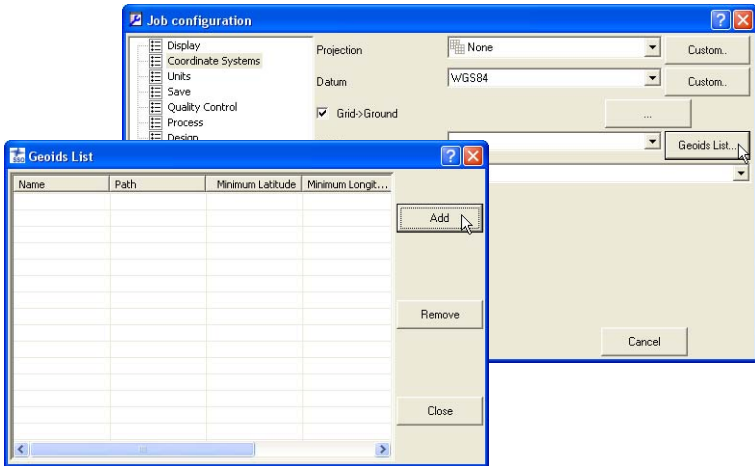


Figure 2-25. Add Geoids List

2. On the **Open** dialog box, navigate to the location of the geoids list and click **Open** to add the new geoid model to the Spectrum Survey Office geoids list (Figure 2-26 on page 2-19).

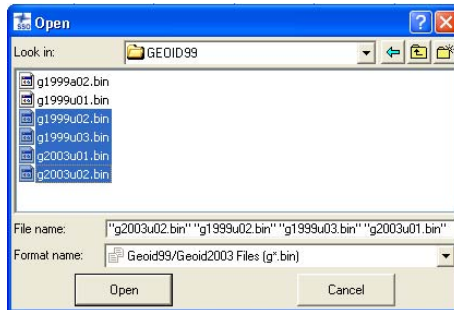


Figure 2-26. Open and Add Geoid List

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

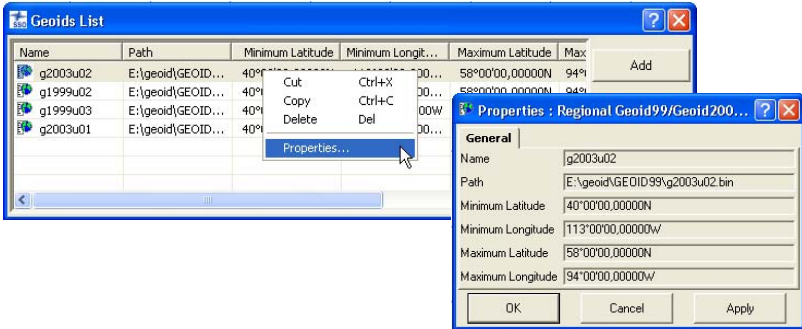


Figure 2-27. Geoids List and Properties Dialog Box

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

- To remove a geoid model from the Spectrum Survey Office geoids list, select the file in the **Geoids list** dialog box and click **Remove**.

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

- parameters of the NAD27 from Spectrum Survey Office database
- or
- the Federal standard for NAD 27 to NAD 83 datum transformations – NADCON program

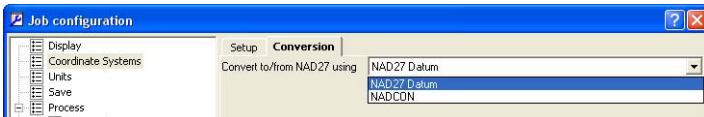


Figure 2-28. Job Configuration, Coordinate systems – Conversion Tab

## Units Selection

The Units item sets linear and angular units of measurement for the job (Figure 2-29).

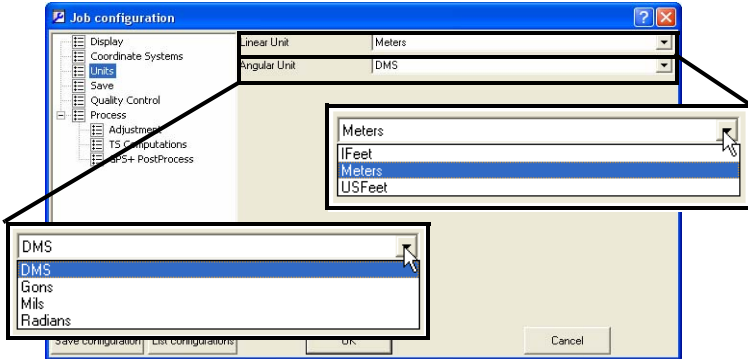


Figure 2-29. Job Configuration – Units

## Save Options for Job

The Save item sets the folder in which to backup files, how to back up files imported from devices, and the backup interval for automatic saving (AutoSave) (Figure 2-30 on page 2-21). The AutoSave feature is useful for securing data against loss and will save files in the “C:\Documents and Settings\\SpectrumSurveyOffice\SpectrumSurveyOfficeAutoSave” folder.

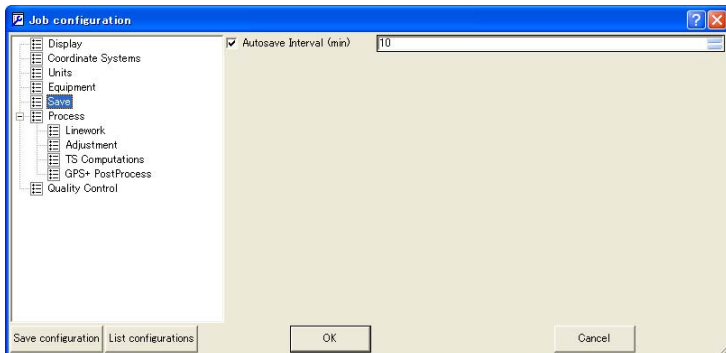


Figure 2-30. Job Configuration – Save

## Quality Control Settings

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

- The *Point Precisions* tab sets horizontal and vertical precisions for the coordinates of static, kinematic and localization points (Figure 2-31). If horizontal (*Std Dev Hz*) and vertical (*Std Dev u*) residuals for a point are worse than the value in the settings in this tab, the point is highlighted in red in the *Points* tab, in Map view, and in Reports.

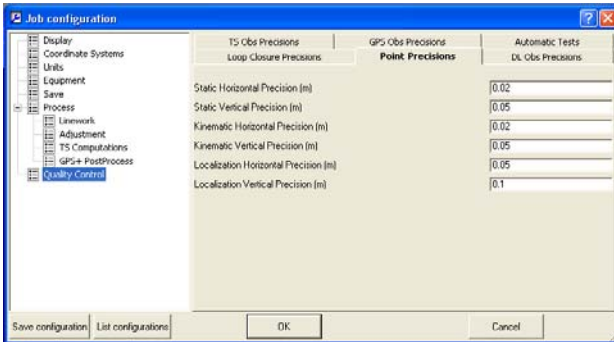


Figure 2-31. Job Configuration – Point Precisions

- The *TS Obs Precisions* tab sets precision for a distance and horizontal/vertical angle of TS observations (Figure 2-32 on page 2-23). If the values of the distance/horizontal/vertical residuals from a net adjustment—with Rejection Criterion-By Control—are worse than the values set in this tab, the observations are highlighted in red on the *TS Obs* tab, Map view,

and Reports. These observations will not be used in the final adjustment of the net.

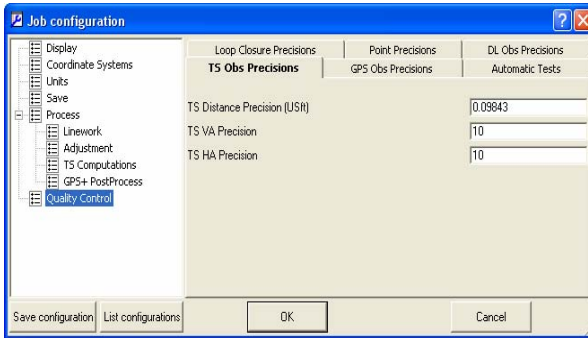


Figure 2-32. Job Configuration – TS Obs Precisions

- The *GPS Obs Precisions* tab sets horizontal/vertical precisions for RTK vectors and static/kinematic GPS post processing vectors (Figure 2-33 on page 2-24). If the values for horizontal  $\sqrt{(Res(e))^2 + (Res(n))^2}$  and vertical residuals for RTK and GPS post-processed vectors resulting from a net adjustment—with Rejection Criterion-By Control—are worse than the values set in this tab, the observations are highlighted in red on the *GPS Obs* tab, in Map view, and in Reports. If the values of horizontal precision/vertical precision for RTK and GPS post-processed vectors calculated in the process of net adjustment are worse than the values set in this tab, the observations are highlighted in red on the *GPS Obs* tab, in Map view and in Reports, and will not be used in the final adjustment of the net.

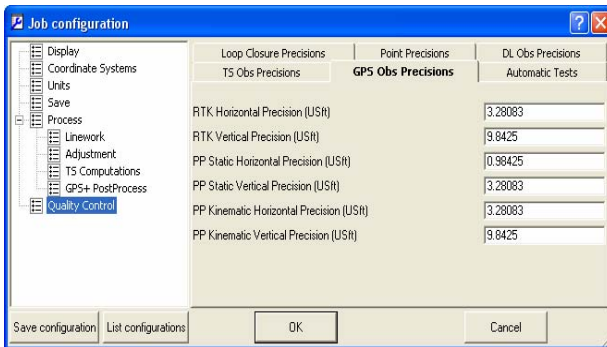


Figure 2-33. Job Configuration – GPS Obs Precisions

- The *DL Obs Precisions* tab sets precisions for digital level measurements (Figure 2-34). If the values of Ht Residual resulted from a net adjustment—with Rejection Criterion-By Control—are worse than the values set in this tab, the observations are highlighted in red on the *DL Obs* tab and Reports. These observations will no be used in the final adjustment of the net.

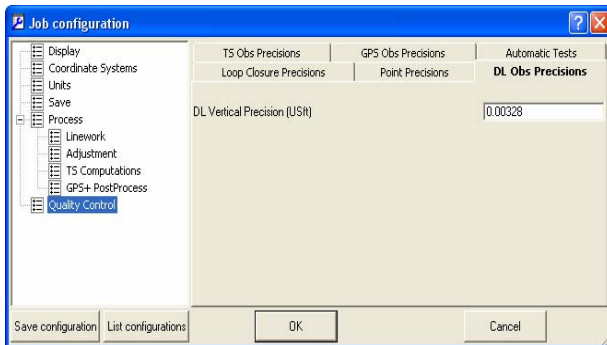
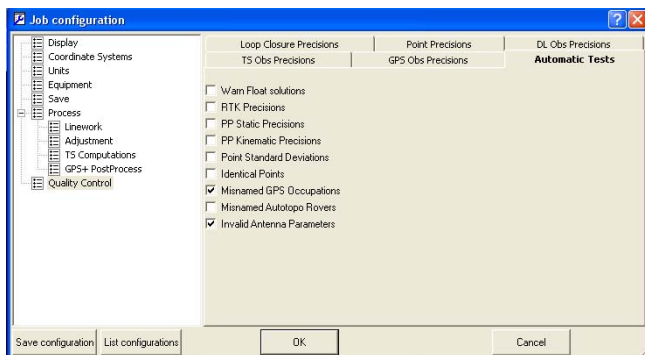


Figure 2-34. Job Configuration – DL Obs Tab

- The *Automatic Tests* tab sets which of the quality control tests to run instantly in the background and mark points and observations that fail the QC test in red (Figure 2-34 on page 2-24). Clearing any of these check boxes will also clear red marks and textual descriptions on the QC tabs of the *Property* dialog boxes. When selecting a test, the test will first check existing data, then

continue to run in the background. The following tests are available:



**Figure 2-35. Job Configuration – Automatic Tests Tab**

- Warn Float Solutions test, in case of Float solutions observations are highlighted in red on the Table, in Map views, and in Reports.
- RTK Precisions test, in case of dissatisfaction the requirements of RTK Precision (see tab Precisions) during RTK. Observations are highlighted in red on the Table and Map views, and in Reports.
- PP Static Precisions test (when both receivers are stationery), in case of dissatisfaction the requirements of PP Static Precision (see tab Precisions). Observations are highlighted in red on the Table and Map views, and in Reports.
- PP Kinematic Precisions test (when one of the receivers is stationery), if the requirements of PP Kinematic Precision (see tab Precisions) are not satisfactory. Observations are highlighted in red on the Table and Map views, and in Reports.
- Point Standard Deviations tests, during adjustment in case of dissatisfaction the precision criterion, which is determined depending on the point type, points are highlighted in red on the Table and Map views, and in Reports. Quality Control tab in Properties for these points contains message: Failed to match the desired precision



- Identical Points test. Test determines the points with a small distance between them. The minimum acceptable distance is determined depending on the point type, in case of dissatisfaction the precision criterion Points are highlighted in red on the Table and Map views, and in Reports. Quality Control tab in Properties for these points contains message: “This point is very close to point <point name>. They are probably identical”.
- Misnamed GPS Occupations test. For static measurements only. Test determines the occupations, which are more than 30 m away from the point and probably are misnamed. Such Points and Occupations are highlighted in red on the Table and Map views, and in Reports.
- Misnamed Autotopo Rovers test. For kinematic measurements only. Test determines the occupations, which are more than 30 m away from the point and probably are misnamed. Such Points and Occupations are highlighted in red on the Table and Map views, and in Reports.
- Invalid Antenna Parameters. The test determines the antenna parameters for GPS occupations of the current job. If the Antenna Type field is empty, or/and the antenna height is absent, or/and antenna height method is slant, when the antenna height is less than the antenna radius, or the radius of this antenna is not defined, such Occupations will be highlighted in red on the Table and Map views, and in Reports.

- The *Loop Closure Precisions* tab sets the horizontal and vertical tolerances for loop closures (Figure 2-36).

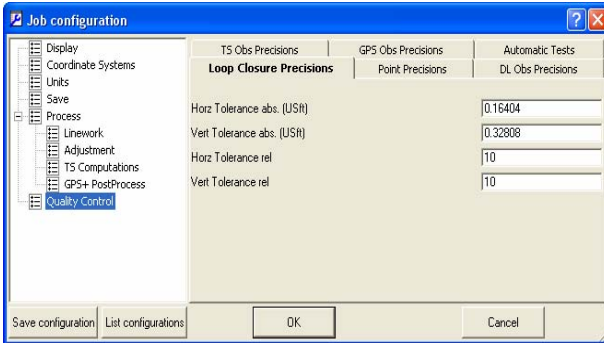


Figure 2-36. Job Configuration – Loop Closures Tab

## Process Properties

The Process option displays options for Linework, Adjustments, TS Computations, and GPS+ PostProcesses in the right panel (see also “Processing, Adjusting, & Localizing Points” on page 6-1):

- The Linework Process sub-menu option allows you to disable/enable the automatic generation of linework from feature codes process.

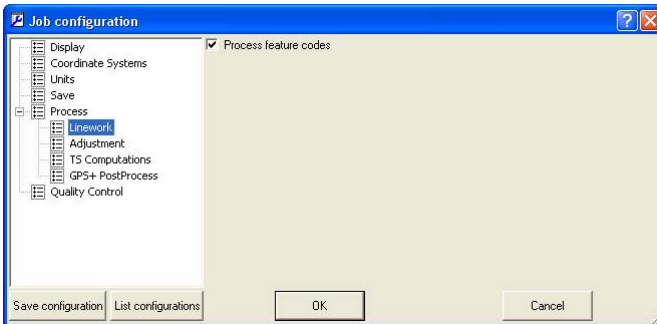
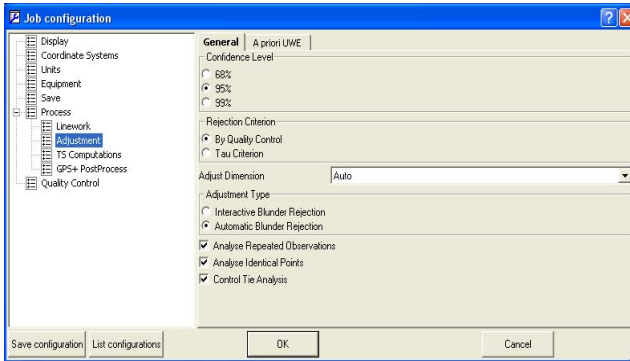


Figure 2-37. Job Configuration – Linework

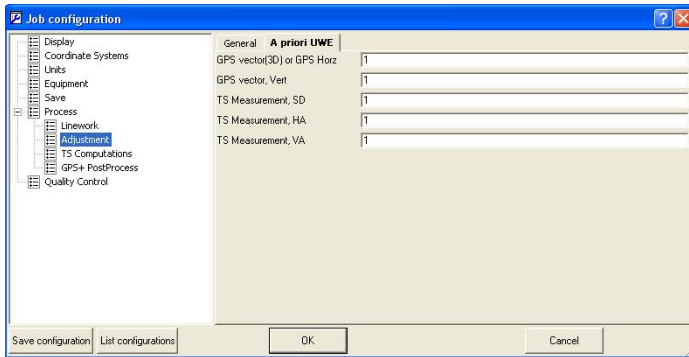
- The General tab of Adjustment Process sub-menu option sets the confidence level for adjustment, the rejection criteria for quality control, and the tests to be performed before network adjustment

(Figure 2-38). The default confidence level is 95% and the default rejection criterion is By Quality Control.



**Figure 2-38. Job Configuration – Adjustment - General tab**

- The A priori UWE tab of Adjustment Process sub-menu option allows a user to set a priory unit of weight error for the GPS vector in vertical, horizontal or 3D adjustment, and for slope distance, horizontal angle, vertical angle of TS measurements in adjustment of network (Figure 2-39). The default confidence level is 1.



**Figure 2-39. Job Configuration – Adjustment - A priori UWE tab**

- The TS-Computations Process sub-menu option sets the refraction coefficient to be applied to total station observations

when adjusting (Figure 2-40). The default refraction coefficient is 0.14.

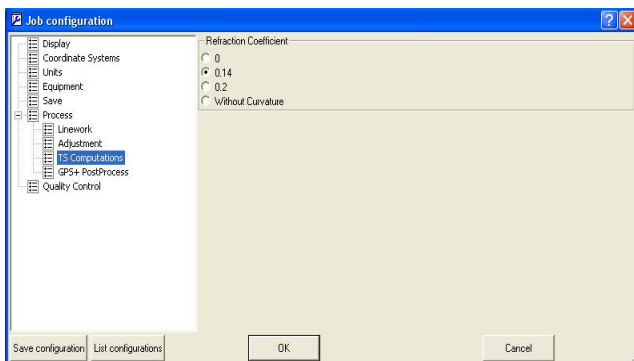


Figure 2-40. Job Configuration – TS-Computation

- The *GPS+ PostProcess Process* sub-menu option (Figure 2-41 on page 2-30) sets the following parameters:

- the elevation mask
- the navigation system
- the limit of the vector distance

If the distance of a job vector exceeds the specified limit. Spectrum Survey Office will not create GPS observation for it.

- the minimum duration for station mode (Auto or Fixed Time)
- enables/disables creating GPS observation for the 'Kinematic' occupations
- enables/disables creating GPS observation for the 'Go' occupations
- enables/disables calculating the DPOP value for all types of post-processed observations.

- enables/disables auto import of the corresponding occupation of base (reference) station from the Internet into the current job.

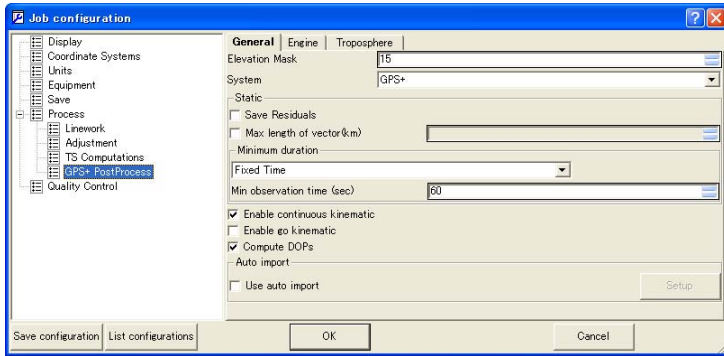


Figure 2-41. Job Configuration – GPS+ PostProcess

**NOTICE** NOTICE

*This option requires the Internet access on the computer*

If the user checks ‘Use auto import’ field, the Setup button will be enabled. After clicking this button, the user can select the network and type in the name of the desired reference station in manual mode (Figure 2-42 B). Auto mode provides searching by the criterion of a minimal distance from the existed occupation in the job (Figure 2-42 A):

A



B

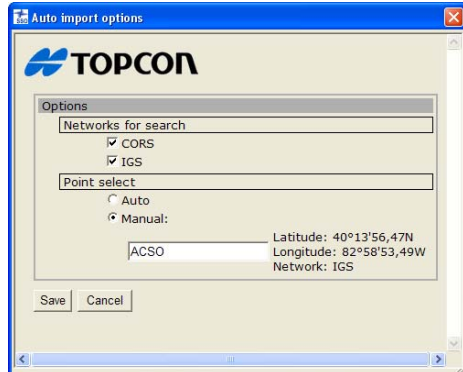


Figure 2-42. Auto Import Options Dialog Box

Clicking the Save button saves all the settings made in the dialog box and closes the dialog.

## Equipment Properties

If the Advanced module is activated, Spectrum Survey Office allows the following:

- selection of the type of GPS antenna calibrations from the default absolute and default relative
- import any other antenna calibration from a file (click the **Antenna Calibration** button)

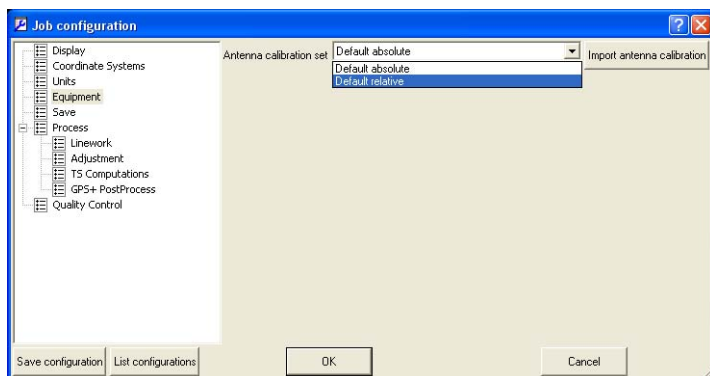


Figure 2-43. Job Configuration->Equipment

The selected calibration will be applied to all type of antennas used in the current job.



### NOTICE

*If the Advanced module is not activated, Spectrum Survey Office automatically uses a solute calibration for GPS antennas.*

## Job Information

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

To access this information, click **Job ► Job info**. The *Properties* dialog box displays the active job (Figure 2-44). Enter *Created by* and *Comments* information as needed. Click **OK** to save the information.



Figure 2-44. Job Properties

## Background Images

The Map and CAD View displays a background image for a work area. Spectrum Survey Office can open only georeferenced image as background. (Georeferencing of the image establishes the relationship between pixel coordinates and real datum/grid/ground / local coordinates).

If the image is not georeferenced, Spectrum Survey Office can calculate the relationship with the desired coordinate system. To do this, the user has to have the coordinates of the ground control points in the given coordinate system. See “Georeferencing the Image” on page 2-36 for more details.

To add a vector or raster image as background to the current job, do the following:

1. Click **View ▶ Background images** (Figure 2-45).

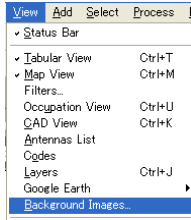


Figure 2-45. Add a Vector/Raster Image as Background

2. Click the **Add Image** button in the **Background images** dialog box (Figure 2-46).



Figure 2-46. Select the Add Image Button

3. Select the desired image file in the **Open** dialog box, then click **Open**. This image will be displayed in the left panel (**Available Images**) of the **Background images** dialog box (Figure 2-47). An unlimited number of images can be activated in this panel.

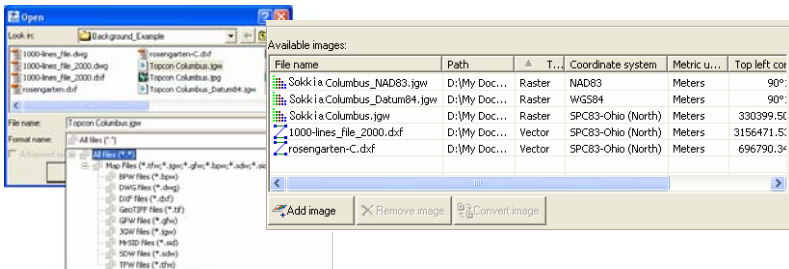


Figure 2-47. Selecting the Image File



## NOTICE

## NOTICE

The current version of Spectrum Survey Office supports the following files as background: BPW (\*.bpw), DWG (\*.dwg), DXF (\*.dxf), GEOTIFF (\*.tif), GFW (\*.gfw), JGW (\*.jgw), MrSID (\*.sid), SDW (\*.sdw), TPW (\*.tpw).

4. Select the needed background image in the left panel and click the double arrows button. This image will display in the right panel (*Images used in the job*) of the **Background images** dialog box. If the coordinate system of the selected image is the same as the job's coordinate system, this image will be marked with a green icon in the right panel and displayed in the Map and CAD views.

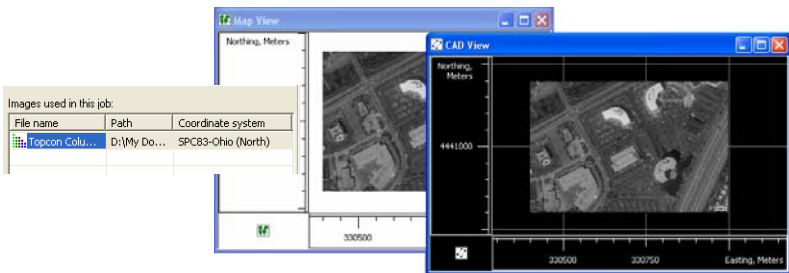


Figure 2-48. Map View and CAD View Images

5. Be sure that the *Show Background Map* entry box is checked (enabled) for the Map/CAD View (To see this check box, right-click on the Map/CAD view, then select **Options** from the pop-up menu).

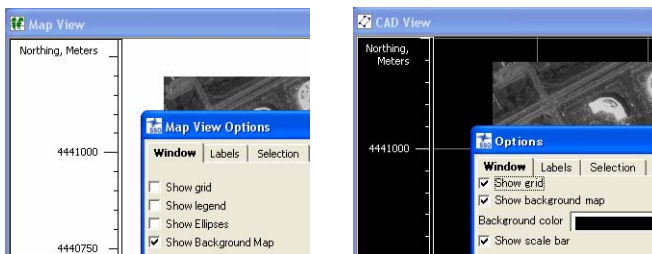



Figure 2-49. Enable the Show Background Map Entry Box


The left panel of the **Background images** dialog box displays all available images. These images are available and can be opened in any job. The left panel of the **Background images** dialog box have the following columns:

- File name – the name of the available image file
- Path – displays the path of the image file
- Type – the type of the image file (*Vector* or *Raster*)
- Coordinate System – the coordinate system name of the image file
- Metric Units - the linear units of the image file.
- Top Left Corner -X / Top Left Corner -Y – the plane coordinates of the top left corner of the image in the given coordinate system.

The right panel of the **Background images** window displays the images which can be used in the job. The Map and CAD view displays an image from the right panel only if the coordinate system of this image is the same as the job's coordinate system. In this case the green icon will be displayed in the *File Name* column. If the user changes the coordinate system for the current job, the image will not shown and red icon will be displayed in the *File Name* column.

Images used in this job:		
File name	Path	Coordinate system
 Sokk1a Columbus.jgw	D:\My Doc\Top...	SPC83-Ohio (North)

Meters	DMS	Grid	SPC83-Ohio (North)
--------	-----	------	--------------------

Images used in this job:		
File name	Path	Coordinate system
 Sokk1a Columbus.jgw	D:\My Doc\Top...	SPC83-Ohio (North)

Meters	DMS	Datum Lat, Lon, Ell.H	NAD83
--------	-----	-----------------------	-------

To convert any image to any coordinate system, highlight the desired image in the left panel and click the **Convert Image** button. Type in the name of the created file in the **Save** dialog box, select the needed *Metric Unit*, *Coordinate type* and *Datum*, then click the **Save** button.

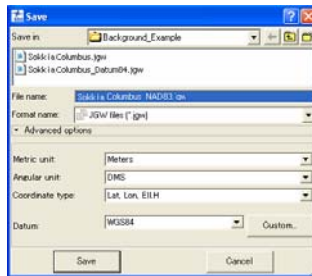


Figure 2-50. Save Dialog Box

The created image will be displayed in the left panel.

Available images:			
File name	Path	Type	Coordinate system
Sokki i a Columbus_NAD83.jgw	D:\My Doc...	Raster	NAD83
Sokki i a Columbus.jgw	D:\My Doc...	Raster	SPC83-Ohio (North)

To work with the job in different coordinate systems, the user can create images for these systems and set these images to the right panel. Selection of a coordinate system will activate a corresponding image, and the CAD and MAP View will display the background for selected coordinate systems.

Images used in this job:		
File name	Path	Coordinate system
Sokki i a Columbus.jgw	D:\My D...	SPC83-Ohio (North)
Sokki i a Columbus_Datum84.jgw	D:\My D...	WGS84
Sokki i a Columbus_NAD83.jgw	D:\My D...	NAD83
Sokki i a Columbus_GROUND.jgw	D:\My D...	Ground

## Georeferencing the Image

To georeference an image using Spectrum Survey Office in a coordinate system, the user should have:

- a digital image in one of the following formats: JPEG (\*.jpg), Bitmap (\*.bmp) and TIFF (\*.tif)
- the picture points in the desired coordinate system

The minimal number of picture points needed to calculate relationship between the image and real coordinate system depends on the user selection.

1. If the user selects the “Translation” georeference method in *Georeference Options* dialog box (click *Georeference Options*

in the toolbar); no less than two points are needed. In this case, Spectrum Survey Office will calculate:

- the offsets of the origin of coordinates for two axes (E and N or Latitude and Longitude)
- the average value of the scale

If the user adds the three or more picture points, Spectrum Survey Office will calculate the plane residuals for each picture point and display these values graphically on the image.

2. If the user selects the “Translation with Rotation” georeference method in **Georeference Options** dialog box (click *Georeference Options* in the toolbar); no less than three points are needed. In this case, Spectrum Survey Office will calculate:

- the offsets of the origin of coordinates for two axes (E and N or Latitude and Longitude)
- the average value of the scale
- an angle of image rotation

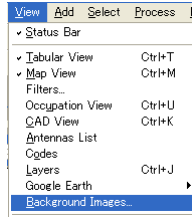
If the user adds the four or more picture points, Spectrum Survey Office will calculate the plane residuals for each picture point and display these value graphically on the image.

The accuracy of calculation of the parameters between the image and real coordinate system depends on:

- the accuracy of the picture point coordinates
- the number of the picture points
- the location of the picture points on the image
- the accuracy of identification the picture (ground) points on the image
- the image scale

To georeference an image using Spectrum Survey Office, do the following:

1. Click **View ▶ Background images** (Figure 2-51 on page 2-38).



**Figure 2-51. To Georeference an Image – Click View ▶ Background Images**

2. Click the **Add Image** button in the *Background images* dialog box (Figure 2-52).



**Figure 2-52. Click the Add Image Button**

3. Select the desired image file (a digital image in either JPEG (\*.jpg), Bitmap (\*.bmp), or TIFF (\*.tif) format in the *Open* dialog box and click **Open**.

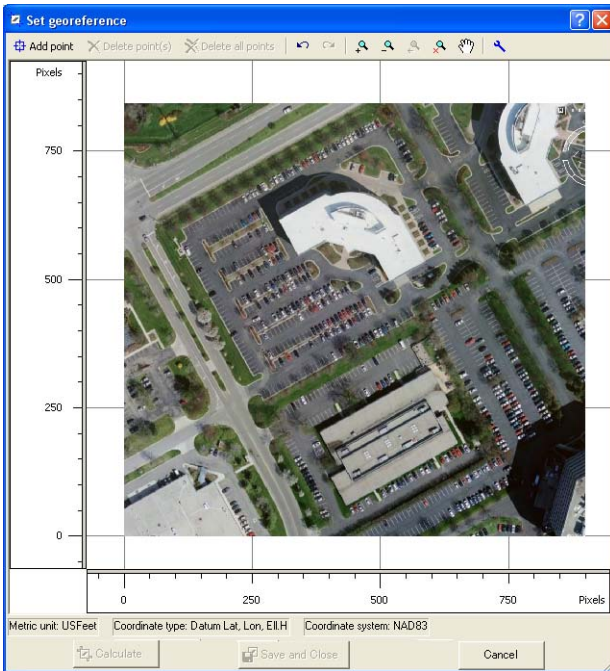



Figure 2-53. Set Georeference Dialog Box

If the image is not georeferenced, Spectrum Survey Office automatically opens the *Set georeference* dialog box, where the desired image will be displayed in the image coordinate system. This dialog box allows zooming the image using either the tool bar buttons (*Zoom In*, *Zoom Out*, *Zoom Back*, *Restore All*, and *Pan*) or the mouse wheel.

The image georeferencing parameters (the coordinate system, the coordinate type, and metric unit) are defined by the same parameters selected (for example, in the *Status bar*) for the current job before opening the image. These current settings are shown in the lower line of this dialog box.

To mark a photo point on the image, do the following on the *Set georeference* dialog box:

1. Click **Add point** in the Toolbar. The cursor changes into  (add point cursor).

Zoom on the part of the image where the photo point is located.

- Using the ‘add point’ cursor, identify and left-click the desired point on the image. Type in a name in the *Label* field and the coordinates on the current coordinate system or select the corresponding photo point from the list (this list displays all job’s points) on the *Add georeference point* dialog box (Figure 2-54). It is possible to edit the label name in the corresponding field of this dialog box. The project point name is not editable. By default, for a point selected from the list, the label name and project point name are the same.

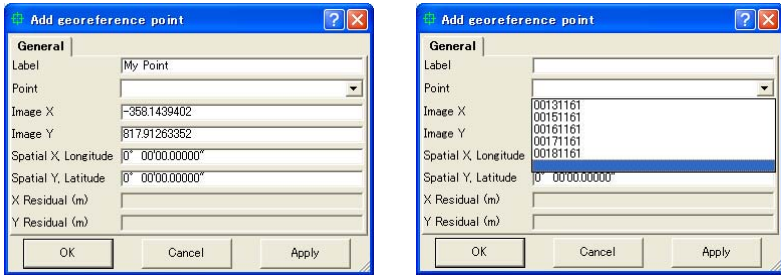


Figure 2-54. Add georeference Point Dialog Box

After clicking **OK** in the *Add georeference point* dialog box, this photo point is displayed on the image. The *Set georeference* dialog box displays the mark and label of the point.

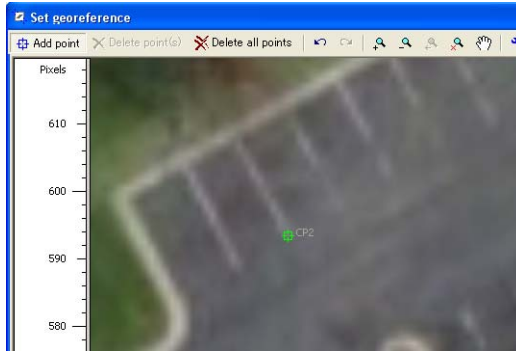


Figure 2-55. The Photo Point on the Image

To delete a point from the image, select the desired point(s) and click the **Delete point(s)** button on the *Set georeference* dialog box (Figure 2-56).

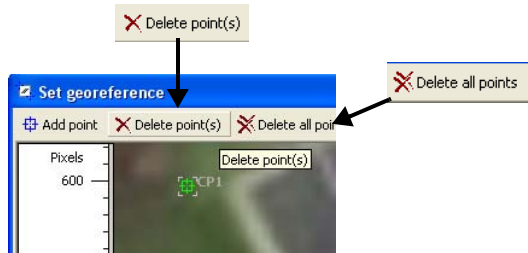
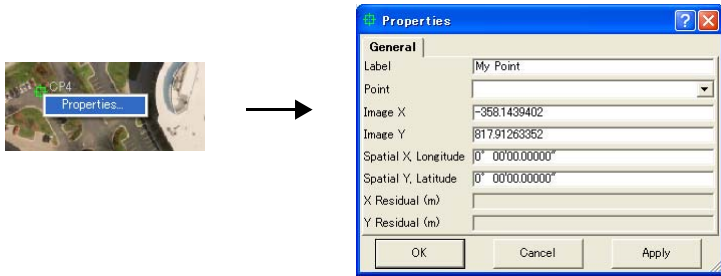



Figure 2-56. Deleting Selected Point(s)

To delete all photo points from the image, click the **Delete all points** button on the *Set georeference* dialog box (Figure 2-56). To view the properties of the photo point, right-click the point and click *Properties* on the pop-up menu.






**Figure 2-57. Properties for the Photo Point**

If the user marks two or more photo points, Spectrum Survey Office can start to calculate the plane parameters between two (image and real) coordinate systems. In this case, the **Calculate** button  is available.

If the user marks three or more photo points, Spectrum Survey Office can calculate the plane parameters and angle rotation between two coordinate system.

To georeference the image, click the **Calculate** button . Spectrum Survey Office will do the following:

- Calculate the offsets of the origin of coordinates for two axes, the average value of the scale, and the angle of image rotation (for three or more points)
- Transform the image using these calculated parameters

- Display the image in the current coordinate system

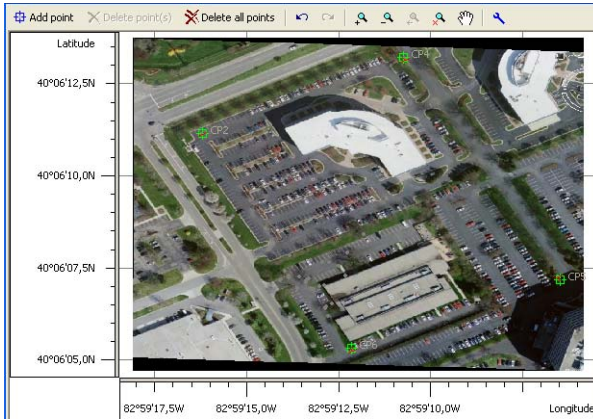


Figure 2-58. The Georeferenced Image

To save the calculated parameters and the transformed image, click the **Save and Close** button in the *Set georeference* dialog box. Navigate to the location in which to save the file and type in the file name in the corresponding field of the *Save* dialog box. Click **Save**: to complete (Figure 2-59).

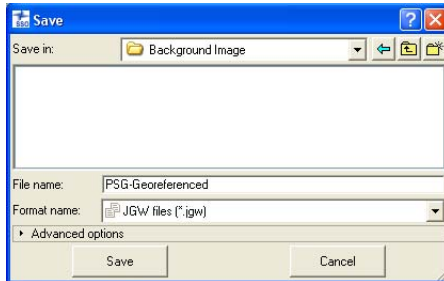
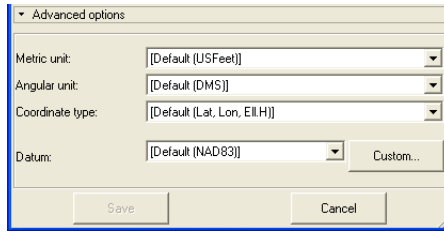


Figure 2-59. Save dialog Box

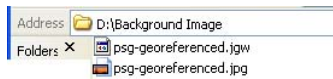
Using the advanced option of the Save dialog, the user can save this image in the same file formats with a different datum, coordinate type, metric and angular unit (Figure 2-60 on page 2-44).



**Figure 2-60. Advanced Option Parameters**

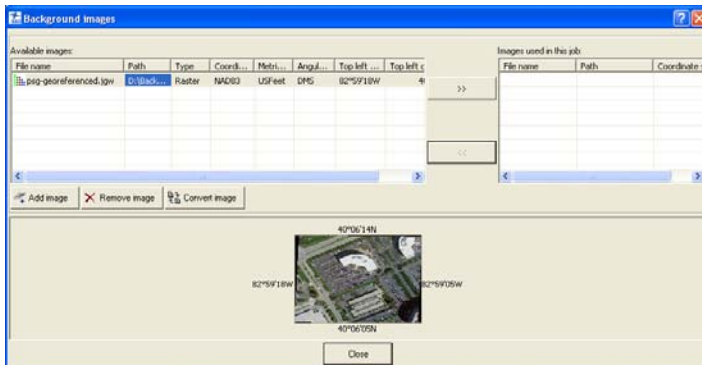
Spectrum Survey Office creates and saves two file types in the selected folder:

- The transformed image in the same format which was selected for the image that was not georeferenced
- ESRI World File Format (Figure 2-61)



**Figure 2-61. ESRI World File Format**

After saving these files, the left panel of the **Background images** dialog box displays the georeferenced image (Figure 2-62).



**Figure 2-62. Georeferenced Image Displays in the Background Images Dialog Box**

Select the background image you prefer in the left panel and click the double arrows button. This image will be marked with a green icon in the right panel and displayed in the Map and CAD view.

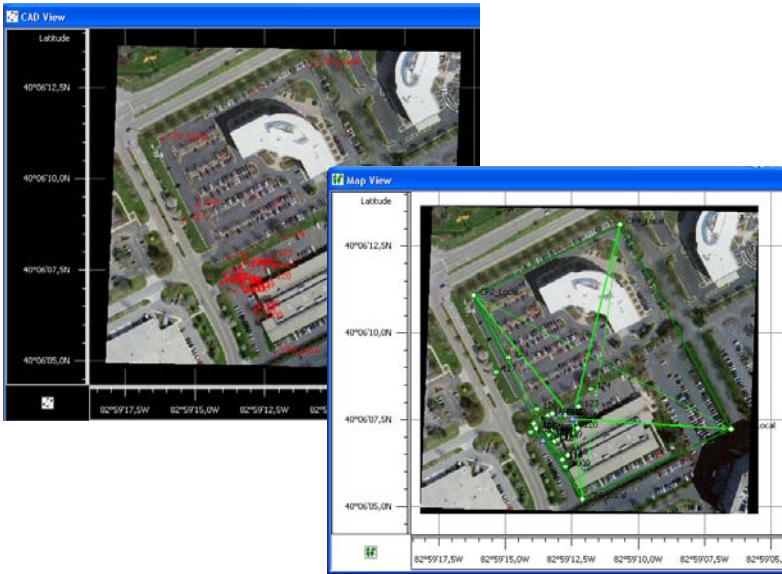


Figure 2-63. Map View and Cad View

# Importing Data

Before importing a file from the computer or a device, open a job in Spectrum Survey Office. Newly imported data is selected in all views. Importing From a File, Spectrum Survey Office imports the following file formats:

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Code Library           <ul style="list-style-type: none"> <li>Autodesk Layer States (*.las)</li> <li>DBF Code Library file (*.dbf)</li> <li>Topcon Text Library file (*.tdd)</li> <li>XML Code Library file (*.xml)</li> </ul> </li> <li>• Coordinate files           <ul style="list-style-type: none"> <li>Sokkia SDR Points (*.sdr)</li> <li>Spectrum Survey Field Coordinates (*.txt)</li> <li>CORS Coordinate files (*.txt)</li> <li>TDS Files (*.CR5)</li> <li>MX GENIO Points (*.mgn)</li> <li>LandXML Points (*.xml)</li> <li>Topcon XML Points (*.xml)</li> <li>Topcon 3D (*.pt3)</li> <li>Custom Text Format files (*.*)</li> <li>FC-4 Points (*.xyz; *.fc4; *.pnt)</li> <li>FC-5 Points (*.xyz; *.fc5; *.pnt)</li> <li>GTS-210/310-10 Points (*.xyz; *.pnt)</li> <li>GTS-210/310-12 Points (*.xyz; *.pnt)</li> <li>GTS-7 Points (*.xyz; *.pnt)</li> <li>Name,E,N,Z,Code (*.csv)</li> <li>Name,Lat,Lon,Ht,Code (*.csv)</li> <li>Name,N,E,Z,Code (*.csv)</li> <li>NGS Datasheet file (*.htm; *.html)</li> <li>SBG Geo (*.geo)</li> <li>SBG Pxy (*.pxy)</li> </ul> </li> <li>• DL Obs File (*.dl; *.txt; *.lev)           <ul style="list-style-type: none"> <li>Topcon DL Obs (*.dl; *.lev; *.txt; *.xml)</li> <li>Topcon XML DL Obs (*.xml)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• GPS+ Raw Data Files           <ul style="list-style-type: none"> <li>Compact RINEX files RINEX files</li> <li>SP3 &amp; SPC3 files (*.sp3)</li> <li>TPD files (*.tpd)</li> <li>TPS / JPS files (*.tps; *.jps)</li> <li>Sokkia GSR2600/GSR2700/GSR1700 files (*.pdc)</li> </ul> </li> <li>• Localization Files (*.gc3)           <ul style="list-style-type: none"> <li>Topcon 3D (*.gc3)</li> </ul> </li> <li>• Spectrum Survey Office Jobs (*.ttp)</li> <li>• Spectrum Survey Field PC Job Files (*.tsj; *.tlsv)</li> <li>• TS Obs Files           <ul style="list-style-type: none"> <li>Custom TS Raw Format (*.*)</li> <li>FC-5 Raw (*.raw; *.dat; *.fc5)</li> <li>GTS-210/310 Raw (*.raw; *.dat; *.gts; *.gt6)</li> <li>GTS-6 Raw (*.raw; *.dat; *.gts; *.gts6; *.gt6)</li> <li>GTS-7 Raw (*.raw; *.gts; *.gts7; *.gt7)</li> <li>GTS-7+ Raw (*.raw; *.dat; *.gts; *.gts7; *.gt7)</li> <li>TDS RW5 TS Obs (*.rw5; *.raw)</li> <li>Topcon XML TS Obs (*.xml)</li> </ul> </li> </ul> |
|---|---|

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

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

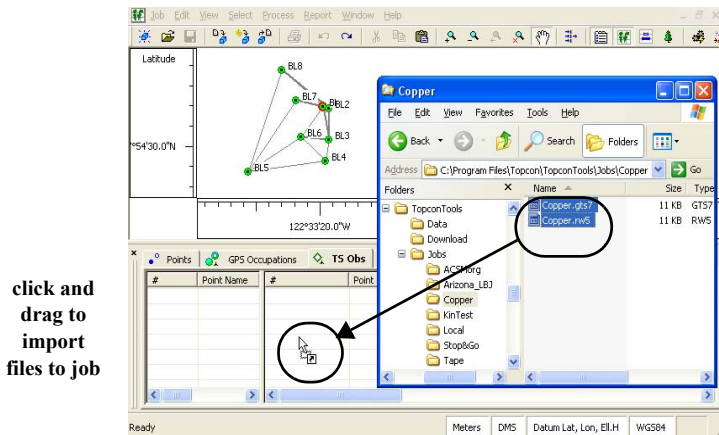


Figure 3-1. Import Data Into Existing Job Using Drag-and-drop

- When using this procedure with the right mouse button, the **Drop options** dialog box displays for increased import control (Figure 3-2). Click **OK** to continue.
  - Select the format type.

- Enable *Recurse folders* to import data from all sub-folders within a selected folder.

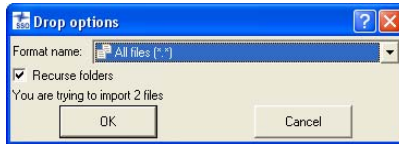


Figure 3-2. Drop Options for Drag-and-drop Importing

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

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

## Importing Coordinate Files

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

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

- If using delimited text files for storing coordinates, but different formats are required, select ‘Custom Text Format’ to describe a custom text format (see “Importing and Creating Custom Format Files” on page 3-7 for details).
  - “Spectrum Survey Field Coordinates” are comma-delimited coordinate files that can be exported from Spectrum Survey Field; they can contain attribute information, along with coordinates and codes.
  - “CR-5” files are coordinate files produced by TDS controller software.
  - “FC-4 Points”, “FC-5 Points”, “GTS 210/310-10 Points”, “GTS 210/310-12 Points”, and “GTS-7 Points” are the formats in which Topcon total stations store coordinates; these formats can be used to input coordinates from Topcon total stations.
  - “Sokkia SDR Points” is the format in which Sokkia total stations output files.
  - “CORS Coordinate files” and “NGS Datasheet files” are coordinate files that can be taken from NGS and CORS websites.
1. To import a coordinate file on a computer into Spectrum Survey Office, with a job open, either click **Job ▶ Import**, press **F3**, or click the **Import** button on the Toolbar.
  2. Select the format name as *Coordinate File*, or click the coordinate file plus button and select an individual file type.
  3. Navigate to the location of the file and select the desired file.
- Not every coordinate file contains information about coordinate units and the coordinate system. By default, the coordinate file will be treated as if it uses the job’s linear unit and coordinate system after importing.



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

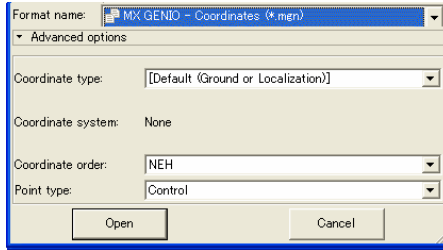
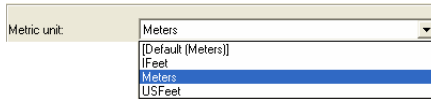


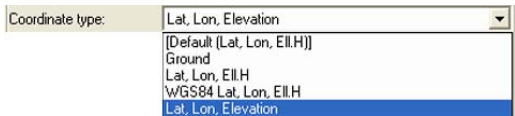
Figure 3-3. Advanced Option for Spectrum Survey Field Coordinates File

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

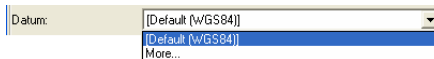
- Metric unit



- Coordinate type



- Depending on the selection in the *Coordinate type*, the *Datum* field displays the following:
  - If *Ground* is selected, the *Datum* field displays that no coordinate system is set
  - If *Lat, Lon, Ell.H* or *Lat, Lon, Elevation* is selected, the *Datum* field displays the name of the datum set in the job, and the available datum from the drop-down list.



- If *WGS-84 Lat, Lon, Ell.H* is selected, the *Datum* field displays the datum *WGS-84*.
- Selection of the coordinate order is only available if *Ground* is selected as the coordinate type.



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

Point type:	Design
<input type="button" value="Open"/>	Design Control Manual

**NOTICE** *NOTICE*

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

[Default (Meters)] .

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

Other formats of the coordinate file, which Spectrum Survey Office can import to the current job, have different fields in the *Advanced* option. For example, the *Advanced* option for the *GTS-210/310-10 Points*, *GTS-210/310-12 Points*, *Name,E,N,Z,Code*, *Name,N,E,Z,Code*, *GTS-7 Points*, *FC-4 Points* have *Coordinate type*, *Projection*, *Datum*, and *Point type* fields.

Coordinate type:	[Default (Ground)]
Coordinate system:	None
Point type:	Design

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

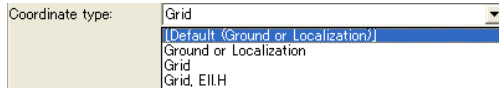
**NOTICE** *NOTICE*

*The Coordinate type is not available in the Advanced option*

*[Default (Ground)] when only the given coordinate system is available in the job*

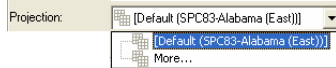
When all coordinate systems (*Ground*, *Grid*, *Datum*) are available in the job, the coordinate type list for the coordinate files (*GTS-210/310-10 Points*, *GTS-210/310-12 Points*, *Name,E,N,Z,Code*, *Name,N,E,Z,Code*, *GTS-7 Points*, *FC-4*

*Points, FC-5 Points, Sokkia SDR Points*) displays the following list of coordinate system:



If *Grid* system is selected, the *Projection* field displays the name of the projection set in the job, and allows selecting any

projection from the drop-down list



- Clicking the **Open** button on the **Import** window imports the file to the job. The data is displayed in the *Points* tab (Figure 3-4 on page 3-7).

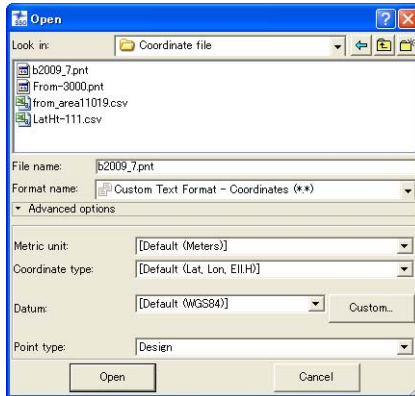


Figure 3-4. Import Coordinate Files

## Importing and Creating Custom Format Files

Besides the commonly used file formats, Spectrum Survey Office also supports user-defined ASCII file formats.

- To import a coordinate file on a computer into Spectrum Survey Office, with a job open, either click **Job ► Import**, press **F3** or click the **Import** button on the Toolbar.

2. In the *Format name* drop-down list, click the **Coordinate File** plus button and select **Custom Text Format**.
3. Navigate to the location of the file and select the desired file.
4. Select the desired *Advanced* options (Figure 3-5 on page 3-8):
  - Define the *Projection*, *Datum*, and *Metric unit*.
  - Enable *Control* to mark coordinates of all points from the imported file as fixed; otherwise, the coordinates are marked as none.
5. Click **Open** (or **Save** if exporting) to set custom format properties (Figure 3-5).

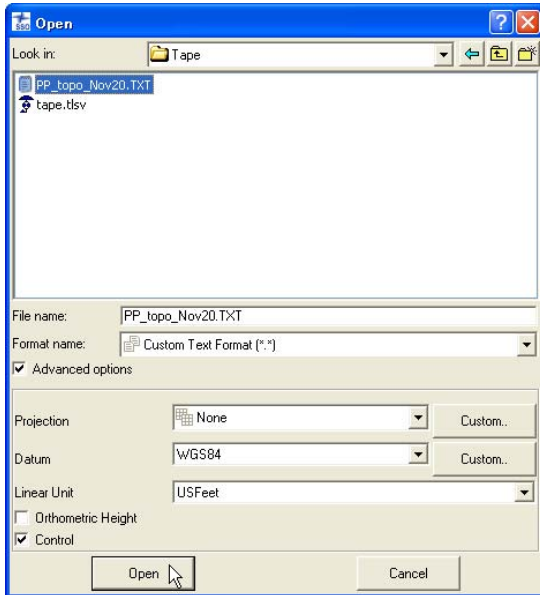


Figure 3-5. Import Custom Format File

6. On the *Custom format properties* dialog box, select the *Delimiters* and *Coordinate system* from the drop-down lists (Figure 3-6 on page 3-9).

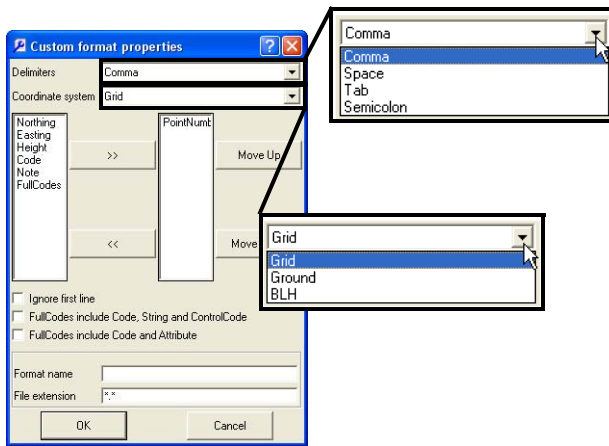


Figure 3-6. Select Delimiters and Coordinate System

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

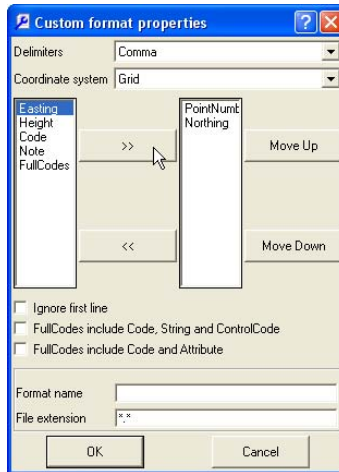


Figure 3-7. Add Elements to Custom File Type

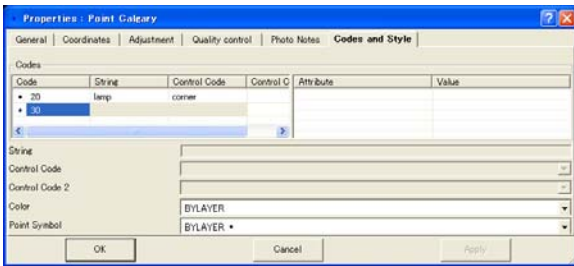
8. To arrange included elements, select an element in the right column and use the **Move Up/Move Down** buttons.

9. Select *Ignore first line* to have Spectrum Survey Office disregard the first line of the file.
10. Depending on the type of codes included in the custom format, select the desired option:
  - For fullcodes that contain codes, strings and control codes, use the string code shown in Figure 3-8.

-----  
 Code String Control Code  
 CT,663.873,241.411,180.604,20&lamp@corner,30&@,  
20&lamp@corner,30&@,  
**FullCodes**

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

After importing this coordinate file to a job, the following information on the **Properties** dialog box will display (Figure 3-9) at this point in the **CAD** tab.



**Figure 3-9. Point Properties – CAD tab**

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

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

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

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

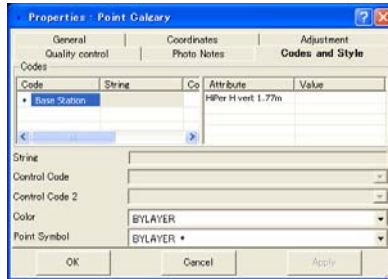


Figure 3-11. Point Properties - Codes and Style tab

If the file format contains FullCodes, it should be the last in the list of the right panel in the *Custom format properties* dialog box (Figure 3-12 on page 3-12).

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

11. Name the format and give it an extension to include it in the *Format name* list (Figure 3-12 on page 3-12).

- If no name or extension is given, Spectrum Survey Office will assign a random name and extension to the custom format to use until you exit.
- Giving the custom format a name will save and list the new format in the *Format name* list for later use.



TIP

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

12. Click **OK** to import the selected file according to the indicated format properties (Figure 3-12 on page 3-12).

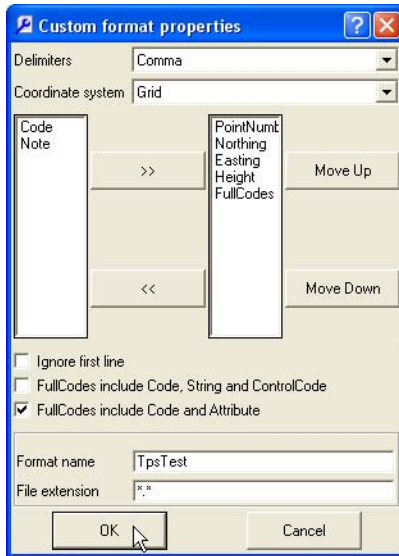


Figure 3-12. Enter Format Name and File Extension

## Importing DL Obs Files

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

1. To import a DL observations file on a computer into Spectrum Survey Office, with a job open, click **Job ► Import**, press **F3**, or click the **Import** button on the Toolbar.
2. Select the format name as *DL Obs File*.
3. Navigate to the location of the file and select the desired file. This file type has no advanced options.
4. Click **Open** to import the file (Figure 3-13 on page 3-13).



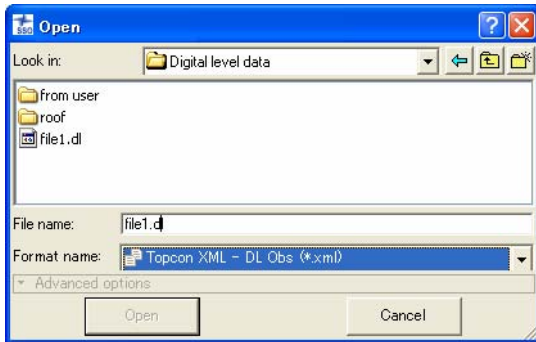


Figure 3-13. Import DL Obs File

## Importing GPS+ Raw Data Files

Spectrum Survey Office imports the following GPS+ raw data files:

- RINEX is the standard format for exchanging GPS Raw Data. For static observation session (occupation) 2 or 3 files are created; the first usually having an extension beginning with the letter 'O' and stores the observations; the second usually having extensions beginning with the letter 'N' or 'G', depending on GPS/GLONASS capability, and stores GPS and GLONASS navigational data (orbits) for those observations.

If standard RINEX conventions for naming files are followed, and navigational files are present in the same folder from where you are importing observation files, Spectrum Survey Office will automatically pick up the appropriate navigational files.

However, if you use different naming conventions for these RINEX files, or navigational files are placed in a different folder, remember to import them as well. A lack of navigational data will inhibit the ability to process observations.

- Compact RINEX file (or a Hatanaka compressed file) is the compression of RINEX observation files. This file type contains a "D" extension.
- SP3 files are the common format for storing precise orbits and can be used to import precise orbits into a Spectrum Survey Office job.

- TPS/JPS files are the raw data files logged by Topcon receivers.
  - TPD files are a Topcon proprietary format for storing GPS raw data, and can be used to backup raw data or exchange raw data between different jobs (Figure 3-14).
  - PDC files are the raw data files logged by Sokkia receivers; GSR2600, GSR2700 and GSR1700.
1. To import a GPS raw data file on a computer into Spectrum Survey Office, with a job open, click **Job ▶ Import**, press **F3**, or click the **Import** button on the Toolbar.
  2. Select the format name as either a *GPS Raw Data File* or click the GPS raw data file plus button and select an individual file type.
  3. Navigate to the location of the file and select the desired file.
  4. Click **Open** to import the file.

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

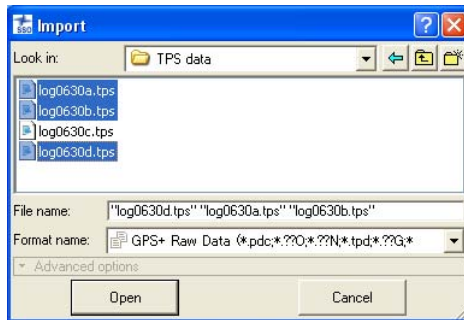


Figure 3-14. Import GPS Raw Data File

## Importing Spectrum Survey Office Jobs

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

1. To import a Spectrum Survey Office job on a computer into Spectrum Survey Office, with a job open, either click **Job ▶ Import**, press **F3**, or click the **Import** button on the Toolbar (Figure 3-15).

2. Select *Spectrum Survey Office Job* as the format name.
3. Navigate to the location of the file and select the desired file.
4. Click **Open** to import the file (Figure 3-15).

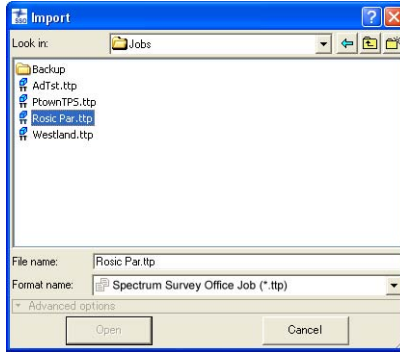


Figure 3-15. Import Spectrum Survey Office Job

If the imported Spectrum Survey Office job configuration is different from the current Spectrum Survey Office job configuration, the **Override Job Configuration** dialog box displays. Select the configuration to override and click **OK** (Figure 3-16).

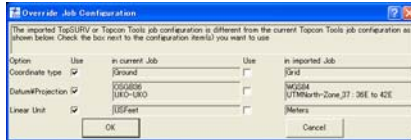


Figure 3-16. Configuration Override Notice – Example

## Importing Spectrum Survey Field PC Jobs

1. To import a Spectrum Survey Field PC job on a computer into Spectrum Survey Office, with a job open, either click **Job ► Import**, press **F3**, or click the **Import** button on the Toolbar (Figure 3-17 on page 3-16).
2. Select *Spectrum Survey Field PC File* as the format name.
3. Navigate to the location of the file and select the desired file.
4. Click **Open** to import the file (Figure 3-17 on page 3-16).

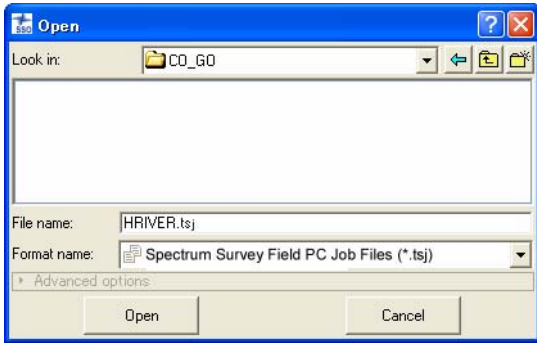


Figure 3-17. Import Spectrum Survey Field PC Job

If the imported Spectrum Survey Field job configuration is different from the current Spectrum Survey Office job configuration, the **Override Job Configuration** dialog box displays. Select the configuration to override and click **OK**.



#### NOTICE

*The Spectrum Survey Office job and Spectrum Survey Field file must use the same geoid for calculating the orthometric heights for points; otherwise, the point heights will be incorrectly calculated when opening the file (a warning will display).*

## Importing TS Obs Files

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

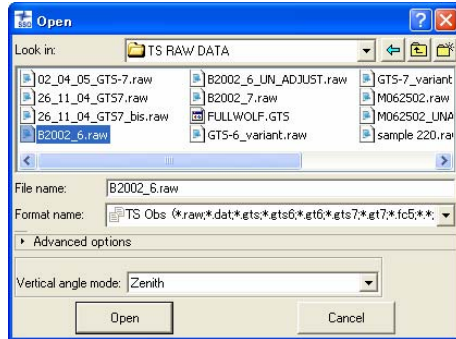
1. To import a TS Obs file on a computer into Spectrum Survey Office, with a job open, either click **Job ▶ Import**, press **F3**, or click the **Import** button on the Toolbar.
2. On the **Import** dialog box, select the format name as a *TS Obs File*, or click the TS raw data file plus button and select an individual file type.
3. Navigate to the location of the file and select the desired file.

- Set the desired *Advanced options* (Figure 3-18). Define the projection type, grid->ground transformation parameters, coordinate order, and type of vertical angle, if known.

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

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

- Click **Open** to import the file (Figure 3-18).



**Figure 3-18. Import TS Obs File**

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

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

For the point, the sum of the Zenith Vertical Angles equals  $n \times 90$ .

TS Obs files do not allow saving information about vertical angle mode. However, this mode can be set when opening a TS Obs file: on

the *Horizontal Level* field (Figure 3-19), set the mode enabled for the survey in the Total Station.

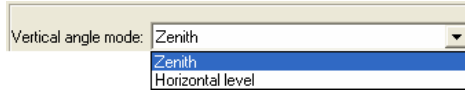


Figure 3-19. Vertical Angle Field When Importing a TS Obs File

## Importing From a Device

Spectrum Survey Office imports data from a device to a computer for post-processing using either Windows® Explorer or Spectrum Survey Office.

Since files from devices are imported directly into active jobs, make a backup copy of the imported file to ensure you don't lose original data. See "Save Options for Job" on page 2-21 for details.

## Importing from a Device using Windows Explorer

Installing Spectrum Survey Office creates additional device directories on the computer (Figure 3-20). On computers with Windows XP, the "Mobile Device" folder displays after installing

Microsoft ActiveSync. On computer with Windows Vista, the “Windows CE” folder automatically displays after connecting.

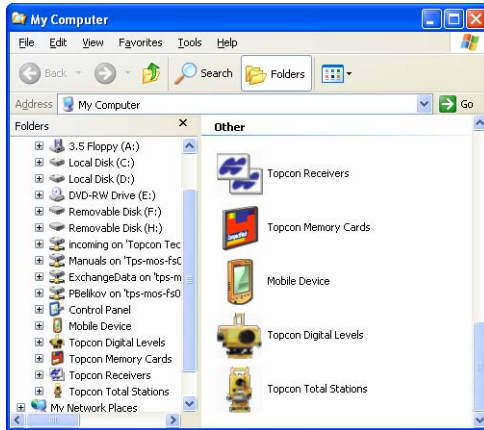


Figure 3-20. Sokkia's Device Folders

1. To import data from a device using Windows Explorer, connect the computer and device, then click the appropriate directory. Refer to the device's documentation for connection details.
2. For controllers, Microsoft ActiveSync needs to be installed on the computer with Windows XP. If the user's computer operates under Windows Vista, ActiveSync is not needed. A connection between the computer and an external device with Windows CE will be automatically established after connecting your device to your PC.
3. Navigate to the directory that contains the Sokkia device folders and click the appropriate device folder.
  - Once the desired device has been found, stop the search to continue below; otherwise, the search will continue until all connected devices of the selected type have been found.
  - To update the list of connected devices of the selected type, click **Search for connected <device type>**.
  - For total stations and digital levels, add a new device as needed.

1. Right-click **Add New <Station or Digital Level>**, then click **Create <Station or Digital Level>** on the pop-up menu.
2. On the *General* tab, enter *Name*, *Notes*, the *Port* the device connects to, and the *Model*. On the *Advanced* tab enter *Name*, the *Port* the device connects to, the *Baud Rate*, *Parity*, *Data Bits*, *Stop Bits*, and/or *Protocol* used for communication.
3. Click **Ok** to add the device.
  - To view information about a detected device, right-click the device and click **Properties**.
4. Once the connected device is detected, click the device's directory to view collected files stored in the device.

For total station and digital level files, follow the on-screen steps to prepare the TS for file downloads.
5. To download the file(s) from the device to the computer, create a folder on the computer then select the file(s) to download.
  - For receiver files, copy or drag-and-drop the selected file(s) to the folder.
6. After copying device files to the computer, import them into a Spectrum Survey Office job using the **Job ▶ Import from Device** function. See the following sections for details:
  - “Importing From a Receiver” on page 3-21
  - “Importing From a Sokkia Receiver” on page 3-22
  - “Importing From a TPS Controller” on page 3-24
  - “Importing From a Total Station” on page 3-25
  - “Importing From a Digital Level” on page 3-28
  - “Importing from a Memory Card” on page 3-30



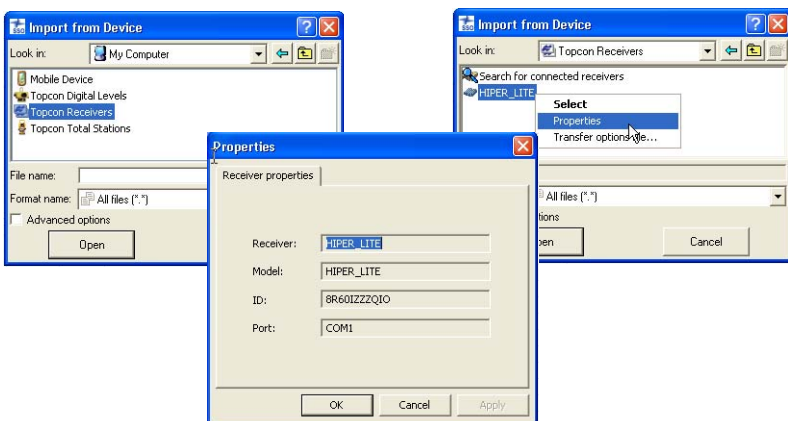
## Importing From a Receiver

### NOTICE

*Before connecting the receiver's USB port to the computer's USB port, the TPS USB driver must be installed on the computer.*

1. Refer to the Topcon receiver manual for the procedure to connect a receiver and a computer.
  - Connect the receiver and computer using the RS232 or USB cable, and turn on the receiver.
  - If the receiver and computer are Bluetooth® enabled, connect using Bluetooth.
2. Start Spectrum Survey Office and open a job, then click **Job ▶ Import from Device**.
3. Click **Topcon Receivers** in the *Import from Device* dialog box (Figure 3-21 on page 3-21). Spectrum Survey Office will search for Topcon receivers connected to the computer (COM or USB port). When finished, all receivers connected to the computer will display.

To view information about a receiver, right-click the receiver and click **Properties** (Figure 3-21 on page 3-21).



**Figure 3-21. Connected Device(s) and Device Properties**

4. To view the collected raw files stored in a receiver, click the desired receiver.
5. To import the file(s) from the receiver to the current job, highlight the file(s), set the corresponding file format in the *Format name* field and click **Open** (Figure 3-22).

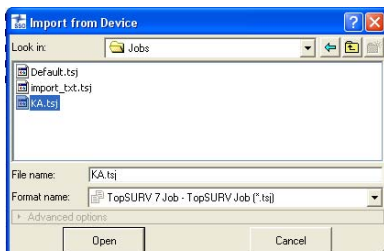
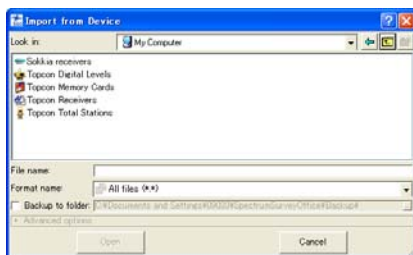


Figure 3-22. Select the Raw Data File to Import

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

## Importing From a Sokkia Receiver

1. Start Spectrum Survey Office and open a job, then click **Job ▶ Import from Device**.



2. Double-click **Sokkia receivers** in the *Import from Device* dialog box.

- To add a device, click **Add New Sokkia receiver** or click **Menu ▶ Create Sokkia receiver**.



Figure 3-23. Creating a New Sokkia receiver

- On the *General* tab of **Create Sokkia receiver** dialog box, enter *Name*, *Notes*, the *Port* the device connects to, *Baud Rate* and the *Device*. On the *Advanced* tab, enter the *Parity*, *Byte size*, *Stop Bits*, and/or *Handshake* used for communication (Figure 3-30).



Figure 3-24. Sokkia Receiver Properties

- Click **OK**.
- Double-click the Sokkia receiver icon to import file(s) from this Sokkia receiver to the current job.

- On the **Import from Device** dialog box, enter the file name as “file.pdc” and select the file type (Figure 3-25).

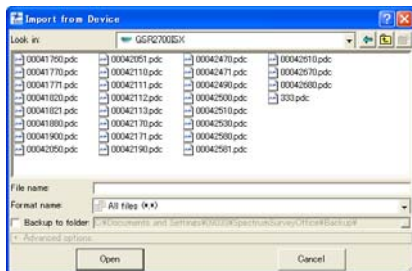


Figure 3-25. Import From Sokkia receiver

- Select the desired file in the Sokkia receiver for downloading to the computer and click **Open**.

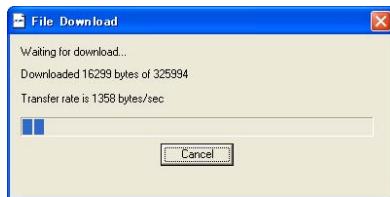


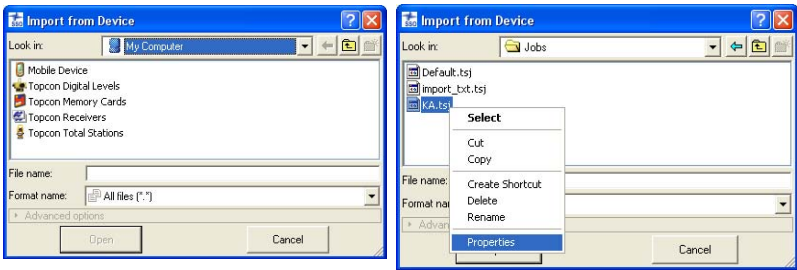
Figure 3-26. Importing from Sokkia receiver

The new point(s) contained in the Sokkia receiver will be processed as “GPS Obs” data.

## Importing From a TPS Controller

- Follow the manufacturer’s directions for connecting the computer and a controller.
- With a job open, click **Job ▶ Import from Device**.
- Once Microsoft ActiveSync (for Window XP computer) establishes a connection with the controller, double-click **Mobile Device** or **Window CE** in the **Import from Device** dialog box (Figure 3-27 on page 3-25).

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



**Figure 3-27. Connected Device(s) and Device Properties**

4. To view the collected files stored in a controller, click the desired folder where \*.tsj files are stored.
5. To import the file(s) from the controller to the current job, set the corresponding file format in the *Format name* field and click **Open** (Figure 3-28).



**Figure 3-28. Select the File to Import**

The new point(s) and observations contained in the Spectrum Survey Field file will display in the appropriate tabs, Map View and CAD view after a successful import of the file into the current Spectrum Survey Office job. The file will be saved in the folder defined in the *Folder For Backup* field during job configuration.

## Importing From a Total Station

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

1. Start Spectrum Survey Office and open a job, then click **Job ▶ Import from Device**.
2. Double-click **Topcon Total Stations** in the *Import from Device* dialog box.
3. To add a device, right-click **Add New Station** and click **Create Station** (Figure 3-23).

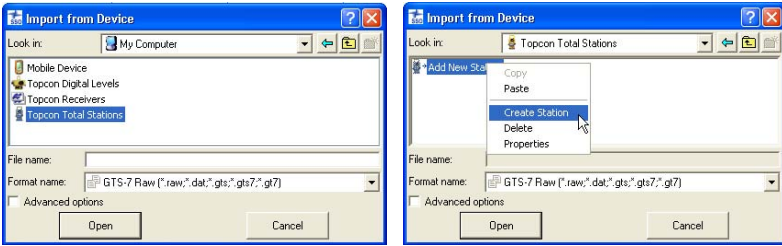


Figure 3-29. Creating a New Station

4. On the *General* tab, enter *Name*, *Notes*, the *Port* the device connects to, and the *Model*. On the *Advanced* tab, enter the *Baud Rate*, *Parity*, *Data Bits*, *Stop Bits*, and/or *Protocol* used for communication (Figure 3-30).

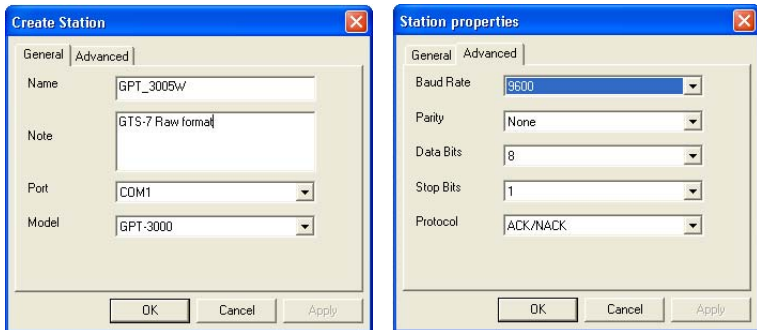


Figure 3-30. Total Station Properties

5. Click **OK**.
6. Double-click the total station icon to import a coordinates or measurement file from this total station to the current job.

- On the **Import from Device** dialog box, enter the file name as “file.txt” and select the file type (Figure 3-25).



Figure 3-31. Import From Total Station

- Follow all the steps listed in the **Download File From Total Station** dialog box to prepare the Total Station (Figure 3-32).
- Select the desired file in the Total Station for downloading to the computer.
- Click **Start** in the **Download file from Total Station** dialog box. When ready to send data from the Total Station to the computer, press the **F3** key.

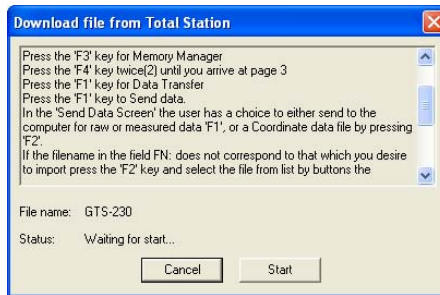


Figure 3-32. Total Station Instructions – Preparing for Import

The new point(s) contained in the total stations will display in the *Points* and *TS Obs* tabs, and in *Map* view and *CAD* view after a successful import of the file into the current Spectrum Survey Office job. A “file.txt” file will be saved in the folder defined in the *Folder For Backup* field during job configuration.

## Importing From a Digital Level

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

1. Start Spectrum Survey Office and open a job, then click **Job ▶ Import from Device**.
2. Double-click **Topcon Digital Levels** in the *Import from Device* dialog box (Figure 3-33).
3. To add a device, right-click **Add New Station** and click **Create Station**.

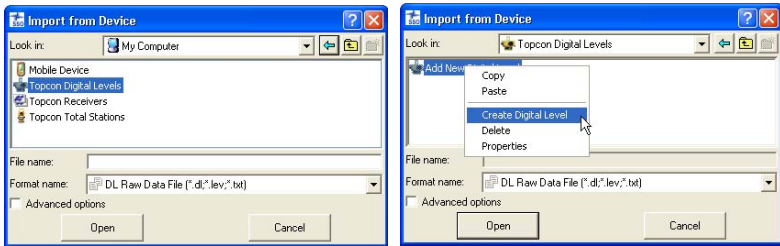


Figure 3-33. Create New DL

4. On the *General* tab, enter *Name*, the *Port* the device connects to, the *Baud Rate*, and *Parity* used for communication (Figure 3-34). Click **OK**.

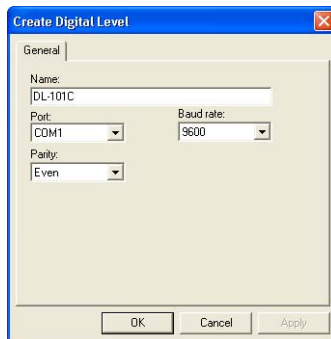
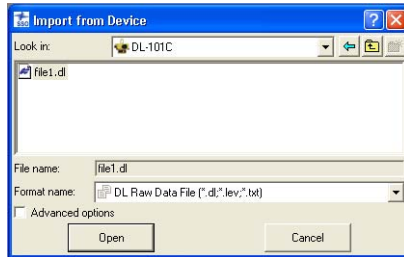


Figure 3-34. Digital Level Properties

5. Double-click the digital level icon (Figure 3-35 on page 3-29).

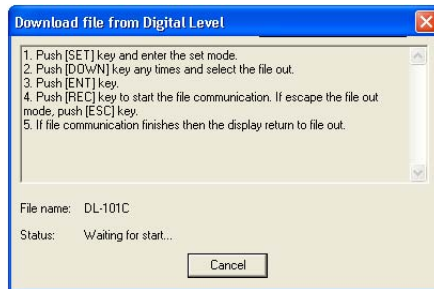


6. In the *Format name* field entry box, select the file name, “DL Raw Data File”. The File name, “file.dl”, is already selected (Figure 3-35).



**Figure 3-35. Import From Digital Level**

7. Follow the on-screen steps to prepare the digital level.
8. Select the desired file in the Total Station to download to the computer (Figure 3-36).



**Figure 3-36. Digital Level Instructions – Preparing for Import**

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

## Importing from a Memory Card

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

- Memory cards formatted in Topcon receiver's file system. These cards are used in a TPS receiver, such as the GR-3 or NET-G3
- Memory cards formatted using the FAT32 file system. These cards used in controllers, such as FC-100 or FC-200 or GMS-2.

To download data from the first type of memory card, use Spectrum Link/Spectrum Survey Office. These cards are only supported with this software.

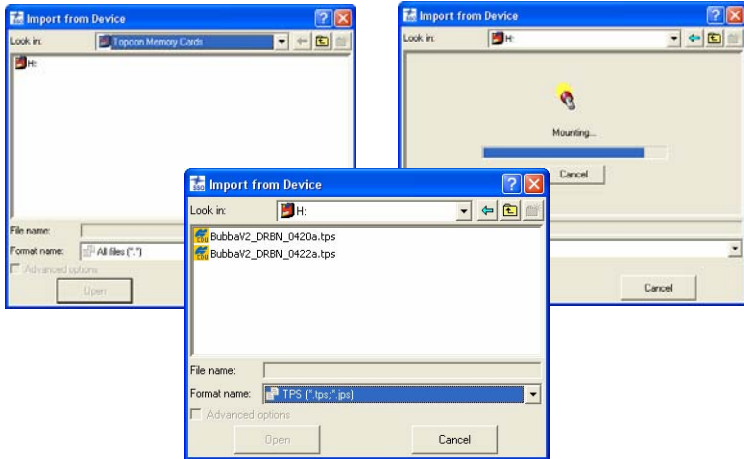
If a memory (SD) card was used in a TPS receiver, such as the GR-3 or NET-G3, and contains \*.tps files, it has already been formatted. Spectrum Link/Spectrum Survey Office can read files on a memory card formatted in the TPS receiver file system. The device icon color for a formatted card is red.

Spectrum Link/Spectrum Survey Office can format a memory card for use in a TPS receiver, such as the GR-3 or NET-G3. The device icon color for an Unformatted card is gray.

To import data from a Memory Card using Spectrum Survey Office, take the following steps:

1. Insert the receiver's memory card (SD card), label side down, into the computer's SD card slot.
2. Start Spectrum Survey Office and open a job, then click **Job ▶ Import from Device**.
3. Click **Memory Card** in the **Import from Device** dialog box. If the SD card was formatted in the receiver's file system, the disk, which designates the Topcon Memory Card, will display as red (Figure 3-37 on page 3-31).

- To view the collected raw files stored in the Memory Card, click the disk. The list of \*.tps files are displayed after checking of the file system of this CD card.



**Figure 3-37. Import From Memory Card**

- To import the file(s) from the Memory Card to the current job, highlight the file(s), set the TPS file format in the *Format name* field drop-down entry box and click **Open**.
- If the SD card was formatted in any other system, the icon of the memory card will be displayed as gray. In this case, Spectrum Survey Office does not read the file stored in the card. To format the Memory Card, double-click on the icon and click **Yes**.

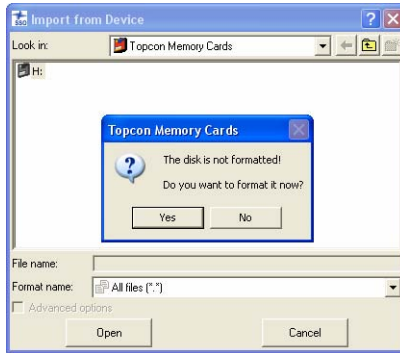


Figure 3-38. Unformatted Memory Card

## Importing RINEX Files from the Internet

Importing RINEX files from the Internet allows you to find, select and download the RINEX files from the remote host(s) to your current job. The import process involves three components:

1. Hosts - the ftp server(s) with RINEX data.
2. Topcon Server - a combination of software and hardware used to exchange data between Spectrum Survey Office and remote host(s). Topcon Server is managed by TPS personnel.
3. RINEX data - archived RINEX observation and navigation files.

When the user selects the *Import from Internet* option (click **Job ▶ Import from Internet**), Spectrum Survey Office automatically requests the Topcon Server.

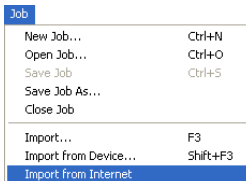


Figure 3-39. Job->Import from Internet

Then this server generates the *Web Import* page and the page is displayed in Spectrum Survey Office (see Figure 3-40).

Figure 3-40. Web Import page

NOTICE

### NOTICE

*The type of the Web Import page depends on the version of Topcon Server's software and can be updated regardless of Spectrum Survey Office version.*

After receiving the request, Topcon Server analyses point coordinates of the job and start/end time of GPS occupations. Using this information, Topcon Server calculates and displays the coordinates of the job's geometric center and common time interval for raw GPS data (see Figure 3-40 on page 3-33). Also this page contains a field to enter the radius from the center of the job to search for reference stations.

NOTICE

### NOTICE

*The coordinates of the geometric center, start/end time and radius are editable parameters in the Web Import page*

To define the data which must be present in the RINEX file of the station obtained, click [\(Show >>\)](#) in the *Advanced options* line. The Figure 3-41 displays default requirements to the raw data:

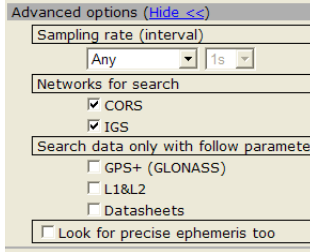
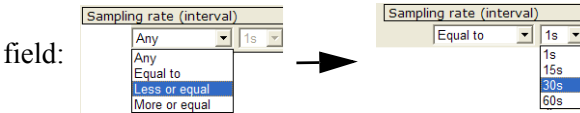


Figure 3-41. Advanced Option for Raw Data Files

1) If *Any* is set in the *Sampling rate (Interval)*, Topcon Server will search for RINEX data files with any record interval. The user can set the desired record interval to search using the drop-down list in this



2) If the type of network is checked, Topcon Server will search all servers of this network for RINEX data files. By default, Topcon Server will search in CORS' and IGS' servers.

3) To search for precise ephemeris for the common time interval, checkmark the box  [Look for precise ephemeris too](#) . Topcon Server will search for precise orbits of the SP3 file format.

**NOTICE**

*If the user close the *Advanced options*, all selected options will be ignored while searching.*

To start searching for a reference station of the selected networks, click [Search points](#)

After clicking this button, the Topcon Server will calculate the distances from the geometric center of the current job to all reference stations presented in the base data of the Topcon Server. When meeting the following conditions:

- distance to a station is less than the value entered in the *Radius* field,
- reference station belongs to the selected network(s) and the collected files,
- raw data collected at this point exists for a period before and after the given time interval (calculated or entered in the *Web Import* window),

the station(s) will display in the window (see Figure 3-42):

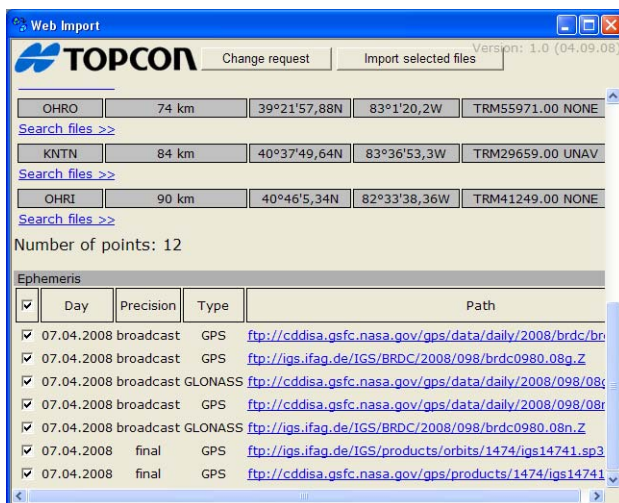


Figure 3-42. The List of the Station Obtained

Pointing in the *Point name* and *Latitude / Longitude* fields enables the floating information screens to display the receiver type, channels, the coordinates in the cartesian system for this station

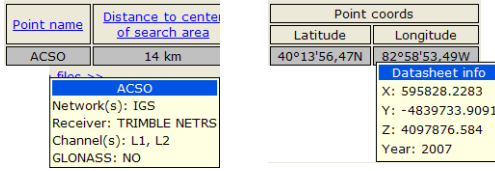


Figure 3-43. Floating Information Screens for the Selected Station

Click on a column's heading to sort *Point name* and *Distance to center of search area* tabs information in alphabetical order (point names) and increasing/decreasing order (distance to center):

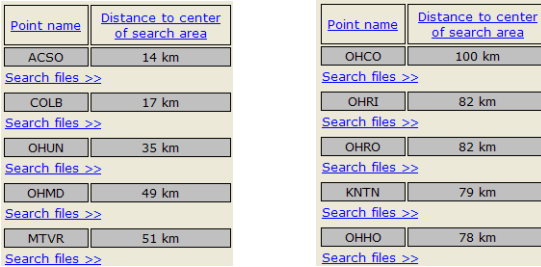


Figure 3-44. Example of sorting by distance to center

By default, this table is sorted by *Distance to center of search area* in increasing order.



Click [Show points on map](#), to view all found points on the map before downloading the corresponding file(s) to the current job.

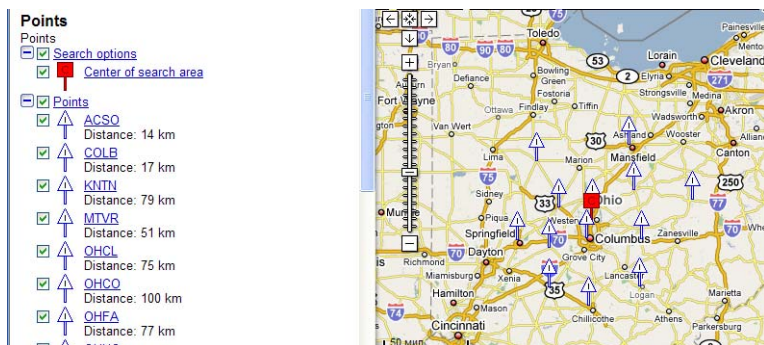


Figure 3-45. Map View of the found points with the legend

To search for a file collected at a point, click [Search files >>](#) below the point name. If the Topcon Server finds the desired RINEX and ephemeris files for the corresponding point (the ephemeris files list is located after the point list on the *Web Import* window), the list of the files will display. The user can select any needed file(s) to import:

COLB	17 km	39°57'35.11N	83°2'44.75W	TRMS5971.00 NONE		
<<	<input checked="" type="checkbox"/>	File link	Start time	End time	Sampling rate, sec	File size, Kb
	<input checked="" type="checkbox"/>	.../colb0980.08d.Z	07.04.2008 0:00:00	08.04.2008 0:00:00	30	335
	<input type="checkbox"/>	.../colb0990.08d.Z	08.04.2008 0:00:00	09.04.2008 0:00:00	30	335
	<input checked="" type="checkbox"/>	.../colb1000.08d.Z	09.04.2008 0:00:00	10.04.2008 0:00:00	30	334
Number of files: 3						

### Ephemeris file(s)

Ephemeris						
<input checked="" type="checkbox"/>	Day	Precision	Type	Path	Size, Kb	
<input checked="" type="checkbox"/>	09.04.2008	broadcast	GPS	<a href="ftp://igs.ifag.de/IGS/BRDC/2008/100/brdc1000.08g.Z">ftp://igs.ifag.de/IGS/BRDC/2008/100/brdc1000.08g.Z</a>	54	
<input checked="" type="checkbox"/>	08.04.2008	broadcast	GLONASS	<a href="ftp://igs.ifag.de/IGS/BRDC/2008/099/brdc0990.08n.Z">ftp://igs.ifag.de/IGS/BRDC/2008/099/brdc0990.08n.Z</a>	67	
<input checked="" type="checkbox"/>	08.04.2008	broadcast	GPS	<a href="ftp://igs.ifag.de/IGS/BRDC/2008/099/brdc0990.08g.Z">ftp://igs.ifag.de/IGS/BRDC/2008/099/brdc0990.08g.Z</a>	52	
<input checked="" type="checkbox"/>	09.04.2008	broadcast	GLONASS	<a href="ftp://igs.ifag.de/IGS/BRDC/2008/100/brdc1000.08n.Z">ftp://igs.ifag.de/IGS/BRDC/2008/100/brdc1000.08n.Z</a>	65	
<input checked="" type="checkbox"/>	07.04.2008	broadcast	GPS	<a href="ftp://igs.ifag.de/IGS/BRDC/2008/098/brdc0980.08g.Z">ftp://igs.ifag.de/IGS/BRDC/2008/098/brdc0980.08g.Z</a>	89	
<input checked="" type="checkbox"/>	07.04.2008	broadcast	GLONASS	<a href="ftp://igs.ifag.de/IGS/BRDC/2008/098/brdc0980.08n.Z">ftp://igs.ifag.de/IGS/BRDC/2008/098/brdc0980.08n.Z</a>	66	

Figure 3-46. List of found files for existing point

If the Topcon Server find no files, the following message will

appear:

COLB	17 km
<<	No match files on specified time interval

This notation means that raw data is absent in the database of Topcon Server for the given time interval.

**NOTICE** *NOTICE*

*If a file is not found for the existing point the user can repeat the search for the file later, or can expand the time range for the search and repeat the search again.*

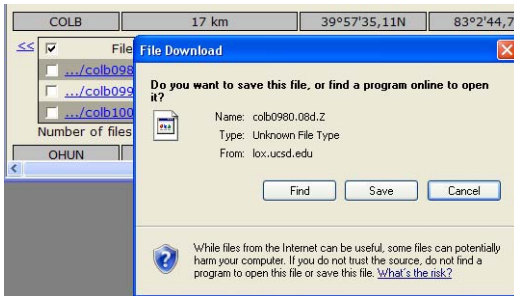
To download the selected file(s) to the current Spectrum Survey Office job, click  . Only selected file(s) in the opened list for the corresponding point will be downloaded to the job.

**NOTICE** *NOTICE*

*If the user closes the list of files for the corresponding point, all selected files will be available for selection again.*

The Points tab/Occupations tab and Map View/CAD View display this downloaded point/occupation.

It is possible to download any found file to the computer. To do it, click file in the list of the files and press the *Save* button in the *File Download* dialog box (Figure 3-47). This way allows the user to save RINEX observation file in the selected folder, but does not download it to the Spectrum Survey Office job



**Figure 3-47. Saving RINEX Observation file into the computer**

To download the corresponding ephemeris file, click a desired ephemeris file from the *Ephemeris* pane (Figure 3-48):

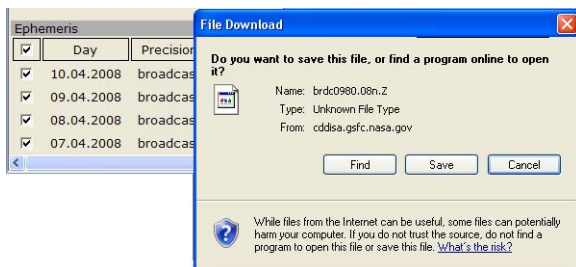
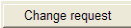


Figure 3-48. Saving Ephemeris file into the computer

The user can change the settings for search before or after downloading a file by clicking . After clicking this button, the *Web Import* page will display (Figure 3-40 on page 3-33).

Also Spectrum Survey Office allows one to download RINEX data using a pop-up menu for a point. To activate the *Import from Internet* option, right-click the desired point in the *Points* tab and select the corresponding command from the pop-up menu (Figure 3-49)

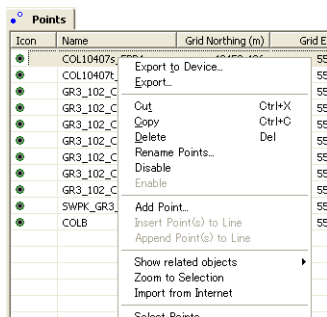


Figure 3-49. The Points Tab

In the given case, the Topcon Server generates a request to search for a RINEX file taking into account the coordinates and the start time / end time of the occupation for this point only.

# Viewing, Selecting, & Filtering Data

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

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

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

## Data Views

Spectrum Survey Office provides several data views for editing, managing, and processing data.

- The Tabular view contains tabs with tables of information on the points, occupations, observations, linework used in the job.
- The Map view displays a graphical representation of the points and vectors used in the job.
- The Occupation view is a time-scale chart of the occupations used in the job.
- The CAD View displays linework in the different layers. Objects are displayed with the color/width/style of the corresponding

layer. Selecting a corresponding attribute in the Layers screen or the Filter screen will show/hide objects in a given layer.

- The Codes view lists all codes and their attributes used in the job. This view is also used to add codes to the job.
- The Layers view lists all layers, and associated parameters, used in the job. This view is also used to add layers to the job.

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

## Tabular View

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

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

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

## Points Tab

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

- Icon – displays a symbol associated with the point.
- Name – displays the name of the point.
- Point coordinates – displays the coordinates of the point, and depends on the coordinate type selected in the Job Configuration.
- Code – displays the primary code used for the point.
- Control – the coordinate fix of the point for adjustment.
- Note – displays user comments.
- Photo Notes – displays the number of a photo note per point.
- Layer – displays the layer in which the point resides.
- Source – displays the path of the source information on the computer disk drive, local area network, or storage media.
- Standard Deviations – the standard deviations for the point, in selected units, after adjustment.
- Combined Scale Factor – the scale factor applied to convert grid distances to ground distances.
- Convergence – the angle between geodetic north and grid north.
- Color/Point Style – the point plotting style.

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

Figure 4-1. Points Tab

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

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

## GPS Occupations Tab

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

Click the **GPS Occupations** tab to view GPS occupation information (Figure 4-2 on page 4-5).

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

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

- Antenna Centering - centering error of Antenna Reference Point (ARP) position over the mark. This error will be take into account when estimating adjustment results.
- Antenna Height Error - measurement error of the antenna height over the mark. This error will be take into account when estimating adjustment results.
- Offset Azimuth – the azimuth of offset defines the direction from occupation other horizontal offsets (distance and cross) are given.
- Offset Dist – displays the occupation’s distance offset.
- Offset dHt – displays the occupation’s height offset.
- Offset Across – displays the occupation’s across offset.
- H RMS - horizontal position error for the given occupation
- V RMS - vertical position error for the given occupation

Icon	Point Name	Original Name	Antenna ...	Antenna Height (m)	Ant Height Method	Start Time	Stop Time	Duration	Met
	BL1	BL1	Legant	2,000	Vertical	3/18/2003 1:0...	3/18/2003 2...	1:46:00	Stat
	BL1	BL1	Legant	2,000	Vertical	3/19/2003 1:3...	3/19/2003 1...	0:06:15	Stat
	BL1	BL1	Legant	2,000	Vertical	3/21/2003 8:5...	3/21/2003 9...	0:09:30	Stat
	BL2	BL2	Legant	2,000	Vertical	3/18/2003 1:0...	3/18/2003 1...	0:10:15	Stat
	BL2	BL2	Legant	2,000	Vertical	3/19/2003 12:...	3/19/2003 1...	1:02:00	Stat
	BL2	BL2	Legant	2,000	Vertical	3/19/2003 1:2...	3/19/2003 1...	0:04:15	Stat
	BL3	BL3	Legant	2,000	Vertical	3/18/2003 1:2...	3/18/2003 1...	0:10:00	Stat

Figure 4-2. GPS Occupations Tab

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

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

## TS Obs Tab

The *TS Obs* tab displays only when the job contains TS raw data and the TS module of Spectrum Survey Office is activated.

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



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

- Icon – displays a symbol associated with the observation.
- # – point number
- Point Name – displays the name of the point.
- Instrument Height – the height of the instrument at that point.
- Instrument Type – the type of instrument used.
- Point From and Point To – the origin and direction of the observation.
- Reflector height – the height of the reflector.
- Azimuth – if entered, displays the azimuth of the observation.
- Measured values – depending on the parameters selected in the Options dialog box, the following measured values can display: Horizontal Circle, Zenith Angle, Vertical Angle, Slope Distance, Horizontal Distance, Vertical Distance.
- Date – displays the date of observation.
- Note – displays additional information for the observation, such as comments.
- Code – displays the primary code used for the point.
- Source – displays the path of the source information on the computer disk drive, local area network, or storage media.
- Type – displays the type of observation (BS, SS, FS, BKB, or Resection).
- AutoReject – allows or disallows observations to be rejected by adjustment.
- Adjustment status – indicates whether or not the observation has been adjusted, auto-rejected, disabled, or not adjusted.
- Azimuth Residual – displays the adjustment residual for the azimuth of offset.

Residuals – depending on the parameters selected in the Options dialog box, the following residuals can display for the observation: Horizontal Circle Residual, Zenith Angle Residual, Vertical Angle

Residual, Slope Distance Residual, Horizontal Distance Residual, Vertical Distance Residual, Cross Residual.

Icon	#	Point Name	Instrument H	Icon	#	Point From	Point To	Reflector Heigh...	Azimuth	Horizontal Circle	Slope Distance
📍	1	ST2		📍	1	ST2	ST1	2.077		1247.24938	80.
📍	2	P1		📍	2	ST2	P4	2.077		2756.84938	29.
📍	3	P2		📍	3	ST2	P1	2.077		4551.98025	105.
📍	4	P3									
📍	5	P4									

Figure 4-3. TS Obs Tab

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

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

## GPS Obs Tab

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

Click the **GPS Obs** tab to view GPS observation information (Figure 4-36 on page 4-33).

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

- Icon – displays a symbol associated with the observation.
- Point From, Point To – the beginning and end points of the vector.
- Start Time and Stop Time – the first and last epoch times of common interval for the vector.
- Duration – the time duration of observation in a common time interval.
- GPS week, day – displays the GPS week and day of the occupation start time.
- Note – displays additional information for the vector, such as comments, epochs, etc.

- Horizontal Precisions, Vertical Precisions – displays horizontal and vertical precision estimates of the vector solution.
- GPS observations solution components – displays vector increments; north/east/up, x/y/z, azimuth/elevation/distance. NOTE: PP observation solutions include antenna heights and phase center, while RTK observation solutions do not.
- Method – displays the observation survey method.
- Solution type – displays the type of solution used for the vectors/trajectory;
  - Fixed: all ambiguities have been fixed to integers,
  - Float: all ambiguities are float numbers,
  - Partial: some ambiguities may be fixed while others are kept float,
  - Fixed/Float, mmGPS: for RTK solution with mmGPS,
  - Code Diff: the solution is computed pseudo-ranges only,
  - Failed, No Ephemeris: the vector is not processed; the corresponding navigation file is absent,
  - Failed, No Satellites: the vector is not processed; the data from satellites are absent.
- Orbit – if the observation is not yet processed, displays the type of orbit data (Broadcast, Precise, or None) available for processing this observations; if the observation is processed, displays the type of orbit data used in the processing; not applicable to RTK observations.
- AutoReject – allows or disallows observations to be rejected by adjustment.
- Adjustment status – indicates whether or not the observation has been adjusted, auto-rejected, disabled, or not adjusted.
- Residuals – displays adjustment residuals for the vector, Res n/ Res e/Res u, Res x/Res y/Res z, Res Az/Res El/Res Dist.
- Epochs – displays the number of epochs over the common data time interval.

- GPS Satellites /GLONASS Satellites – displays the number of GPS/GLONASS satellites. For RTK observation, the common number of SV’s observed by the base and rover in the last common epoch. For PP observation, the common number of SV’s observed by the base and rover during the whole observation time.
- Base Antenna Type – the antenna type used on the base station.
- Base Antenna Height – the base antenna height.
- Base Antenna Height Method – the method used to measure the base antenna height, either Vertical or Slant.
- Rover Antenna Type – the antenna type used on the rover station.
- Rover Antenna Height – the rover antenna height.
- Rover Antenna Height Method – the method used to measure the rover antenna height, either Vertical or Slant.
- HDOP/VDOP/PDOP – displays the horizontal/vertical/total position dilution of precision either in the last common epoch for RTK observation (taken from the Spectrum Survey Field RTK job) or the average values for the post-processed GPS occupations. PDOP is equal the square root of the sum of square HDOP and VDOP.

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

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

Figure 4-4. GPS Obs Tab

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

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

## DL Obs Tab

The *DL Obs* tab displays only if the job contains data collected on Topcon’s Digital Level and the TS, PP, or RTK module of Spectrum Survey Office is activated. Figure 4-5 shows an example of digital level data.

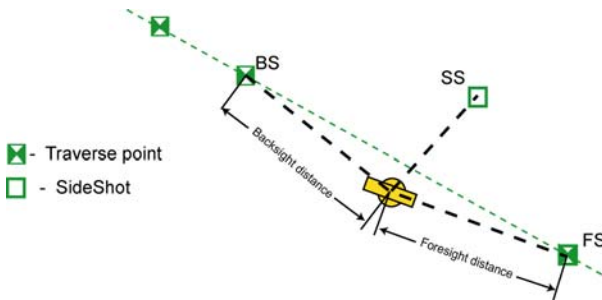


Figure 4-5. Example of Level Measurements

Click the **DL Obs** tab to view digital level information (Figure 4-6 on page 4-12).

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

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

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

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

Icon	#	Point	BS (m)	Instrument Elevation (m)	SS (m)	FS (m)	Elevation (m)	Distance (m)	Note	Std Dev (m)	Date	AutoReject	Adjustment Status
<b>D</b>	1	WT	1,470	1,470		179,800	6,532	0,000	24.02.2005 15:09:00	0,000	24.02.2005 15:09:00	Allowed	Adjusted
<b>D</b>	2	10		0,004		179,776	6,213	0,000	24.02.2005 15:11:00	0,000	24.02.2005 15:11:00	Allowed	Adjusted
<b>D</b>	3	10	1,444	1,440		179,776	6,157	0,000	24.02.2005 15:22:00	0,000	24.02.2005 15:22:00	Allowed	Adjusted
<b>D</b>	4	17		-0,004		179,741	6,000	0,000	24.02.2005 15:24:00	0,000	24.02.2005 15:24:00	Allowed	Adjusted
<b>D</b>	5	17	1,410	1,414		179,741	5,006	0,000	24.02.2005 15:26:00	0,000	24.02.2005 15:26:00	Allowed	Adjusted

Figure 4-6. The DL Obs Tab

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

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

## Map View

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

The Map view is a graphical latitude/longitude or northing/easting plot of points, observations and background map (Figure 4-7 on page 4-13).

- Bolded lines indicate repeated observations; mixed lines of color indicate observations have different statuses.
- Use the right-click pop-up menu or a scroll wheel on a mouse to zoom in and out.

- Press down on a scroll wheel or select Pan mode from the right-click pop-up menu to dynamically “grab” and move the view.

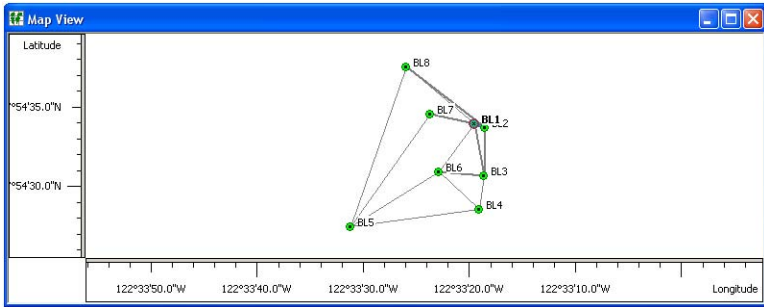


Figure 4-7. Map View

To edit in the Map view, right-click a point or vector and click **Properties** on the pop-up menu. See “Editing Data Properties” on page 5-62 for details on editing in the **Properties** dialog box.

## Occupation View

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

The Occupation view is a graphical view of points and their GPS time plot (Figure 4-8 on page 4-14). In Occupation view, a variety of view occupations are possible, including the following:

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



After the Occupation view is selected, an ‘Occupations by points’ graph will display on the screen, for example (Figure 4-8):

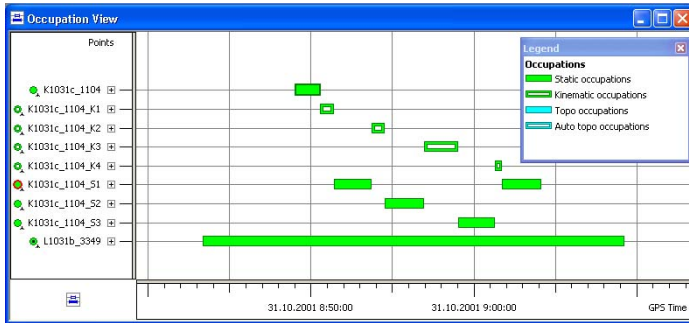


Figure 4-8. Occupation View by Points

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

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

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

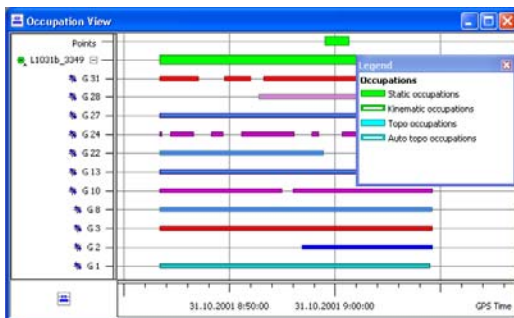


Figure 4-9. Available Satellites for the Occupations

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

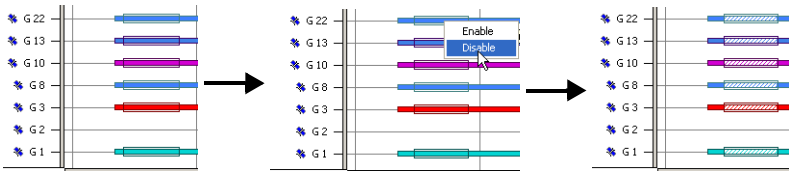


Figure 4-10. Cutting the Satellite's Observations

Spectrum Survey Office's engine does not use the cutting intervals when computing the corresponding baselines or trajectories.

If 'Occupations by receivers' is selected from the *Occupation View* tab of the *Occupation View Options* dialog box, the vertical axis of the occupation view graph will show the receivers' serial numbers, for example (Figure 4-11):

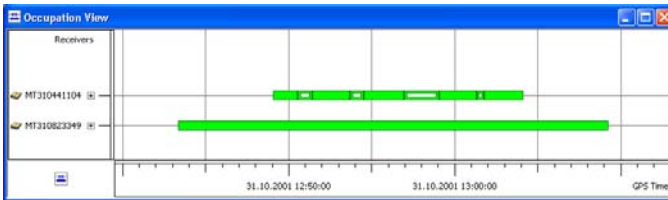


Figure 4-11. Occupations View by the Receivers

To set the horizontal axis of the occupation view in the local Time zone, click **Job ▶ Job Configuration**, then in the *Display* panel, click the *Time* tab. Set a desired time offset (Figure 4-12).



Figure 4-12. Setting GPS Time Zone Offset

See "Editing Data Properties" on page 5-62 for details on editing in the *Properties* dialog box.

## CAD View

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

The CAD view is a graphical view of linework with the associated points (Figure 4-13). Unless filtered, the following information displays:

- Points and their symbols display on the CAD view. If the point does not have a symbol, its survey symbol will be used.
- Lines display using the code's/layer's color, style, and width.
- If a line contains valid /AS, /AE, /R, /C control codes, it will display as arc, rectangle or closed, respectively.
- If a code includes a polygon entity type, it will display as closed and filled (if a fill color has been set).
- Raster and vector background images.

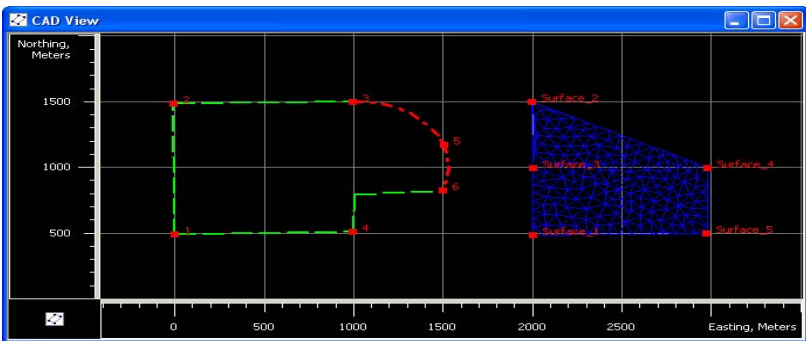


Figure 4-13. CAD View with Linework

To edit in the CAD View, right-click a point or line and click **Properties** on the pop-up menu. See “Editing Data Properties” on page 5-62 for details on editing in the **Properties** dialog box.

## Google Earth

The Google Earth is a client application to work with a 3D map of the Earth created using live satellite imagery.

To view objects of current Spectrum Survey Office's job in Google Earth, you need the following:

- a connection with the Internet
- the Google Earth program installed on the computer.

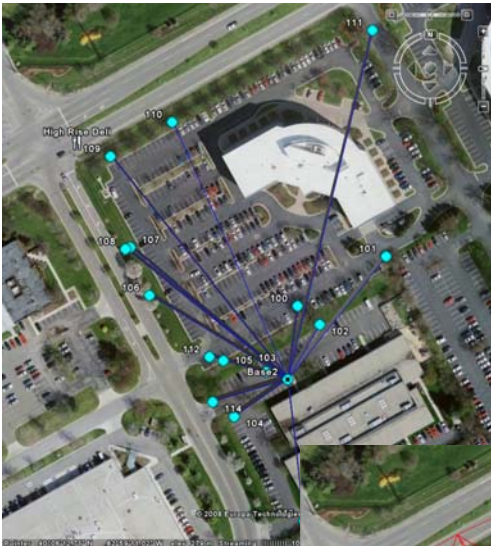
To download the Google Earth to the computer, please visit the site:<http://earth.google.com/intl/en/download-earth.html>.

The internal coordinate system of the Google Earth is geographic coordinates (latitude/longitude) on the WGS84 datum.

To view or hide objects of current Spectrum Survey Office's job in Google Earth, click **View ► Google Earth**. Then the user can select the data (Map or CAD) which will display on the satellite imagery. Available viewer modes are Map View and CAD View.



After the corresponding viewer is selected, Spectrum Survey Office will recalculate, coordinate all objects (which are displayed by the current viewer) from the job's coordinate system to the WGS-84 coordinate system and Spectrum Survey Office will import these coordinates to the Google Earth . This software will automatically search the desired images and displays all the job's points (Figure 4-14 on page 4-18).



Map View



Map View and CAD View

Figure 4-14. Google Earth with in Map and CAD Viewers

If there are no transformation parameters between these coordinate systems, the objects do not display in Google Earth.

Normally, Google Earth displays all objects (observations, lines) excepting points, if the objects are above some earth surface created from satellite imagery. To view all objects, turn on the Terrain option

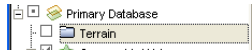
 . In this mode Google Earth displays the earth's surface for zero elevation height:



Figure 4-15. Example of Applying the Terrain option

After closing Spectrum Survey Office, all objects of the current job will not be shown in Google Earth.

To view the objects in Google Earth without running Spectrum Survey Office, use the KML format.

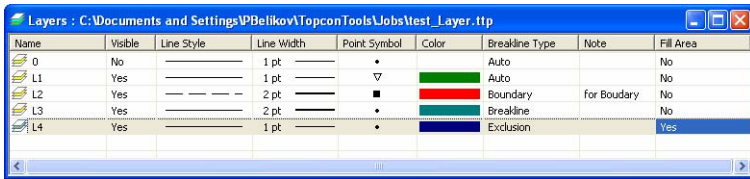
## Layers View

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

The Layers view lists all layers and their plotting style used in the job (Figure 4-16 on page 4-20). On the **Layers** dialog box, enter the information for the following parameters:

- Name – the name of the layer.
- Visible – shows (select Yes) or hides (select No) the layer on the *CAD View*.
- Line Style/Line Width/Line Color/Point Symbol – displays the plotting style (attributes) of the layer.

- Note – displays user comments.
- Fill Area – displays whether or not (Yes or Not) the areas of this layer are filled.
- Breakline types – displays the type of the layer. If Breakline type is set to *Auto*, triangulation will be automatically determined by the boundary, exclusions, and breaklines. If Breakline type is set to *Breakline*, *Boundary*, or *Exclusion*, the line will be treated exactly this way in the triangulation.



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

Figure 4-16. Layers View

To edit data in the Layers view, see “Editing Linework” on page 5-19 for details.

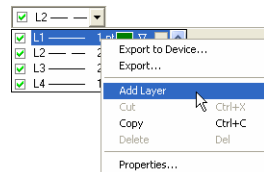
Layers are frequently used to group information by function and by assigning line types, colors, and other attributes to distinguish this information from other data. By default, every Spectrum Survey Office job includes a layer named 0 (zero). Layer 0 cannot be deleted or renamed; however, the attributes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

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

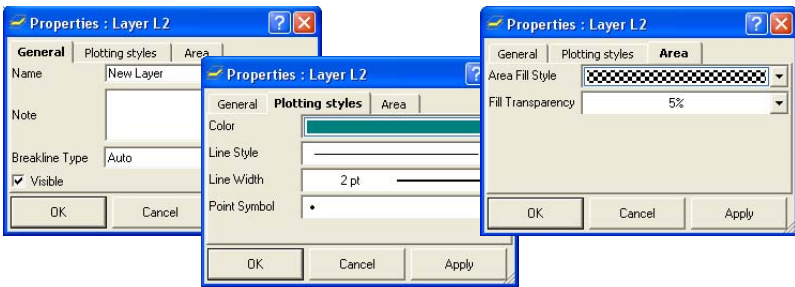
- Click **Add ► Layer**. Or in the *Layers* view, click **Add Layer** on the pop-up menu.
- Open the list in the Layer combo box, right-click in the list and select “Add Layer” from the pop-up menu.

1. On the *General* tab, enter the following general parameters for the layer (Figure 4-17):

- Name – the name of the layer.



- Visible – select Yes to show the layer on the CAD view; select No to hide the layer.
  - Note – enter desired comments.
  - Breakline type-select desired type (*Auto, Breakline, Boundary or Exclusion*) for line type.
2. On the *Plotting Styles* tab, select the following parameters for the layer (Figure 4-17):
    - Line Style – select the type of line to display for line information in the layer.
    - Line Width – select a width for lines in the layer.
    - Color – select a color for all data (point and line) in the layer.
    - Point Symbol – select a symbol to represent all points in the layer.
  3. On the *Area* tab, select the fill style and transparency for the areas of this layer (Figure 4-17).



**Figure 4-17. Enter and Select Layer's Properties**

Any created layer can be set as an active layer. To set an active layer for the job, open the Layer combo box in the Toolbar and check mark the box  L1 — to select the layer as active. In this case, any point, linework created will have the same plotting style as defined by the active layer.



## Setting the Layer for New Codes

When creating a new code, the user can select a layer. In this case, the plotting style for this code will be taken from the layer parameters (Figure 4-18).

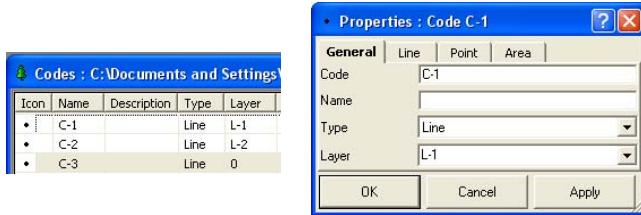


Figure 4-18. Codes and Layers

To edit the plotting style for any code with Layers or without the layer, use the *Plotting styles* tab on the code's *Properties* dialog box (Figure 4-19).

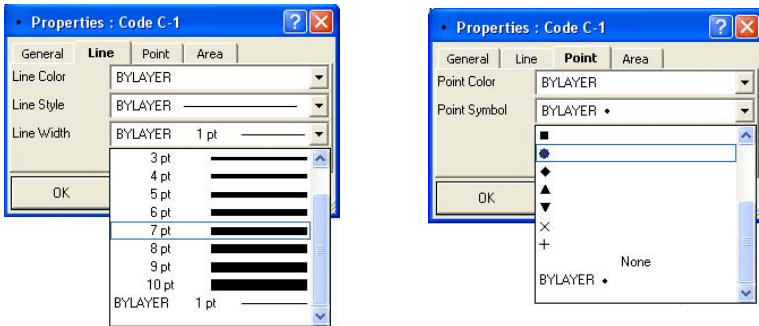


Figure 4-19. Editing Plotting Styles (Point Symbol) for Code

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

## Setting the Layer for a New/Existing Point

To set the layer for a new point, select the layer using the *General* tab in the *Add Point* dialog box (Figure 4-20 on page 4-23). The attributes (color and point style) for the selected layer will be assigned to this point. The user can set a new layer for the selected

points. Select the desired points, right-click and select **Properties**. Set the layer for all selected points.

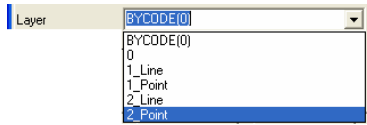


Figure 4-20. Setting Layer for Points

To apply codes (instead of layers) for a point, select the desired code in the *Code* field and set “BYCODE” in the *Layer* field. The attributes (color and point style) for the layer will be assigned to this point. Figure 4-21 shows an example of a point with code “101” in the *Cad View*. For this point, the layer was set to “BYCODE (For Points)” and this code uses the layer “For Points” (Figure 4-21).

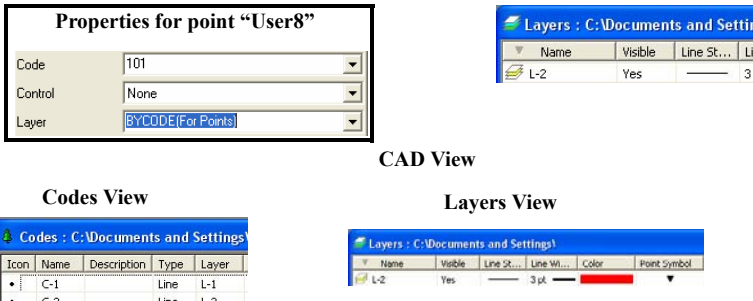


Figure 4-21. Setting Code for Point and Viewing Point

- If the point has multiple codes, setting the Layer to “BYCODE” forces it to belong to multiple layers (Figure 4-22).
- If the point has no code, setting Layer to “BYCODE” forces the point to belong to layer 0 (zero) (Figure 4-22).

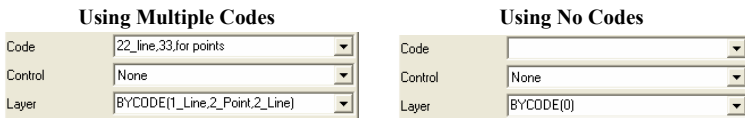


Figure 4-22. Layer Determination when Applying Codes

## Setting the Layer for a New/Existing Line

To set the layer for a new line, select any layer from the list of existing layers in the Toolbar (Layer combo box). The plotting styles of the new line will be assigned by the active layer (Figure 4-23).

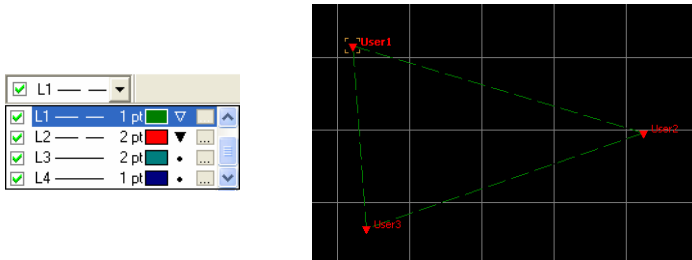


Figure 4-23. Setting the Layer for Linework

To change the layer for an existing line, do one the following:

- Double-click in the *Layer* column and select a different layer from the drop-down list in the left panel of the *Line* tab (Figure 4-24).

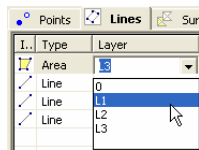


Figure 4-24. Selecting a Layer in the Line Tab

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

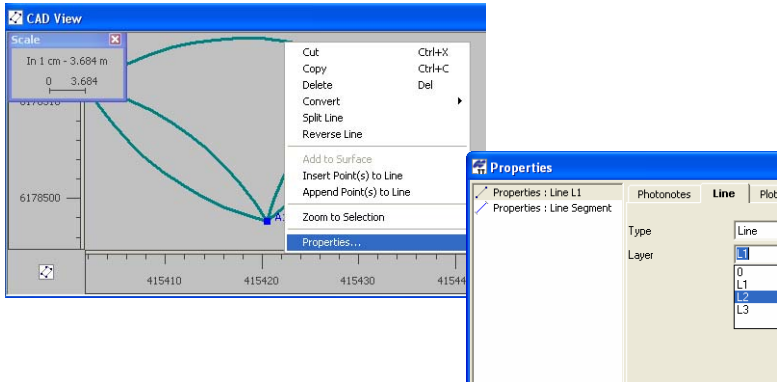


Figure 4-25. Selecting a Layer in the Properties Window

## Codes View

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

The Codes view lists all codes and their attributes used in the job (Figure 4-26 on page 4-26).

- For Codes, the left panel lists:
  - Icon: the image associated with the code
  - Name: the name of the code
  - Description: the name of the description
  - Layer: the name of the layer that uses the code
  - Line plotting style (color, style,width)
  - Point plotting style (symbol, color)
  - Area plotting style (color, fill style, fill transparency)
- For Attributes, the right panel lists:
  - Icon: the image associated with the attribute
  - Attribute Name: the name of the attribute
  - Default Value: a value acquired by default when assigning a code to a point

- Type: the type of entity of the code attributes (Integer, Real Number, Text, Menu)
- Required: this parameter is used in the software for surveying. If it is set to "Yes", the user will be asked to enter the attribute value every time he (or she) uses the corresponding code. If it is set to "No", the default attribute value will be used automatically. In Topcon Tools this parameter is used only for displaying attribute status for the corresponding codes during data collection.

To edit in the Codes view, see “Editing Codes in the Codes View” on page 5-41 for details.

left panel:

Icon	Name	Description	Type	Layer	Line Color	Line Style	Line Width	Point Symbol	Point Color	Area Color	Area Fill Style	Fill Transparency
●	cod...		Line	laye...			BYL...	●	BYL...	BYL...		0%
●	fen...	for wood...	Line	fence	BYL...	BYLA...	BYL...	BYLAYER	BYL...	BYL...	BYLAYERN...	0%
●	field		Area	field	BYL...	BYLA...	BYL...	BYLAYER	BYL...	BYL...	BYLAYERN...	0%
◇	fire ...		Point	Fire...	BYL...	BYLA...	BYL...	BYLAYER	BYL...	BYL...	BYLAYERN...	0%
●	for ...		Area	0	BYL...	BYLA...	BYL...	BYLAYER	BYL...	BYL...	BYLAYERN...	0%

right panel:

1..	Attribute Name	Default Value	Type	Required
1..	length		Real Number	No
1..	type of wood	pine	Menu	No
1..	gate	False	Boolean	No

Figure 4-26. Codes View

## Setting View Options

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

### Map View Options

The view options for the Map View include displaying a coordinate grid, the symbol legend and the QC message for the selected object

that failed QC, selecting labels to display for static and kinematic points.

1. Click **View ▶ Options ▶ Map View Options** or right-click on an empty portion of the Map View and click **Options** on the pop-up menu (Figure 4-27 on page 4-27). The *Map View Options* dialog boxes display.

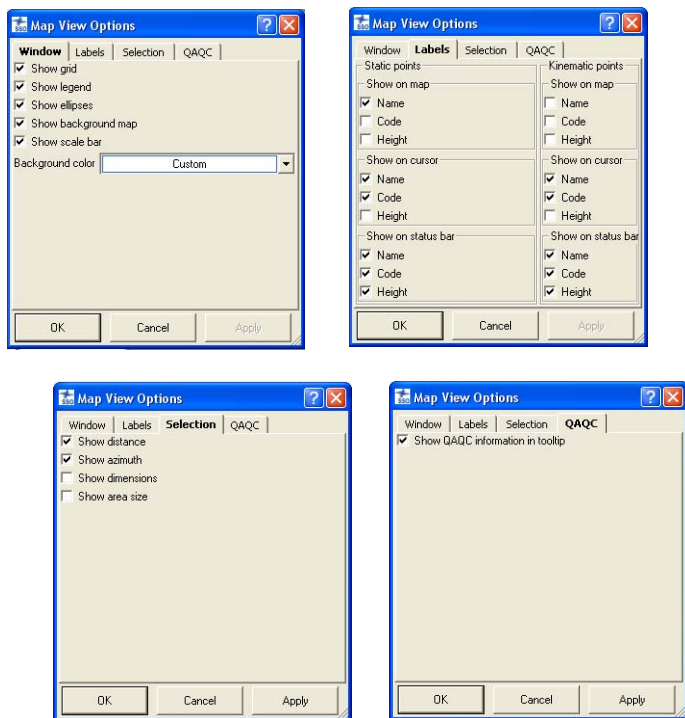


Figure 4-27. Map View Options – Window, Labels, Selection, and QAQC

2. On the *Windows* tab, enable the desired settings (Figure 4-27). Click **OK** to save the settings.
  - Show grid – makes visible a coordinate grid on the Map View
  - Show legend – displays a window describing the symbols used on the Tabular and Map Views
  - Show ellipses – turn on/off the 3-D graphic accuracy indicators for the adjusted points and processed baselines.

The plane errors are represented as ellipses with the semi-axes proportional to  $Std\ e$  and  $Std\ n$  for the vector/point. The vertical error is represented as a segment with the length equal to  $Std\ u$  for the vector/point.

- Show Background Map – displays the background image file(s) selected in the **Background image** dialog box.
  - Show scale bar - displays the bar with the current scale value for the Map View
  - Background color - allows one to set the background color for the Map View.
3. On the *Labels* tab, enable the desired settings for static and kinematic points (Figure 4-27 on page 4-27). Click **OK** to save the settings.
- Name – enable to display the point’s name on selected map, cursor, and status bar positions
  - Code – enable to display the point’s code on selected map, cursor, and status bar positions
  - Height – enable to display the point’s height on selected map, cursor, and status bar positions
4. On the *Selection* tab enable the desired settings (Figure 4-27 on page 4-27). Click **OK** to save the settings and make further changes.
- Show distance – enable to display a distance between corners of the rectangle in the Status Bar when the user drags the rectangle on the Map View.

- Show azimuth – enable to display an azimuth (from the start point to the end point of the rectangle) in the Status Bar when the user drags the rectangle on the Map View (Figure 4-28).

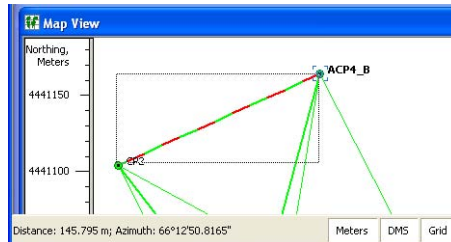


Figure 4-28. Show Azimuth

- Show dimensions – enable to display a dimension (length and height) of the rectangle in the Status Bar when the user drags the rectangle on the Map View.
- Show area size – enable to display an area of the rectangle in the Status Bar when the user drags the rectangle on the Map View (Figure 4-29 on page 4-29).

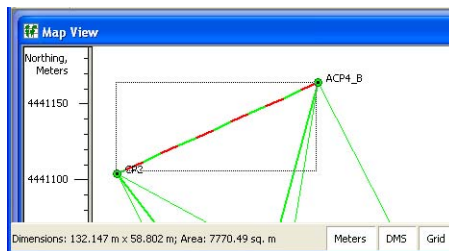


Figure 4-29. Show Area Size

5. On the *QAQC* (Quality Analysis Quality Control) tab, if desired, enable the following setting (Figure 4-27 on page 4-27). Click **OK** to save the setting.



Show QAQC information in tooltip – enable to display the QC message in the tooltip for the selected object that failed QC (Figure 4-30).

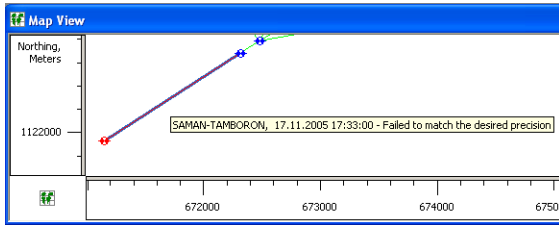


Figure 4-30. Show QAQC

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

## Occupation View Options

View options for the Occupation View include displaying a time scale, the symbol legend and the QC message for the selected occupation that failed QC, and selecting the source of the occupation to display.

1. Click **View ▶ Options ▶ Occupation View** or right-click on an empty portion of the Occupation view and click **Options** on the pop-up menu. The **Occupation View Options** dialog box displays (Figure 4-31 on page 4-30).
2. On the *Show* tab, enable the desired parameters (Figure 4-31). Click **Apply** to save the settings and make further changes.
  - Show grid – displays a GPS time scale grid on the Occupation View.
  - Show legend – displays a window describing the symbols used on the Occupation View.



Figure 4-31. Occupation View Options

3. On the *Occupation View* tab, select the desired view options (Figure 4-32). Click **Apply** to save the settings.
  - Show occupations by receivers – select to display occupations based on the receiver used.
  - Show occupations by points – select to display occupations based on the points recorded.



Figure 4-32. Occupation View Options

4. On the *QAQC* (Quality Analysis Quality Control) tab, if desired, enable the following setting (Figure 4-33 on page 4-31). Click **Apply** to save the setting.

Show QAQC information in tooltip – enable to display the QC message in the tooltip for the selected occupation that failed QC.



Figure 4-33. Occupation View QAQC

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

## CAD View Options

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

1. Right-click on an empty portion of the CAD View and click **Options** on the pop-up menu. The Options dialog box displays (Figure 4-34).

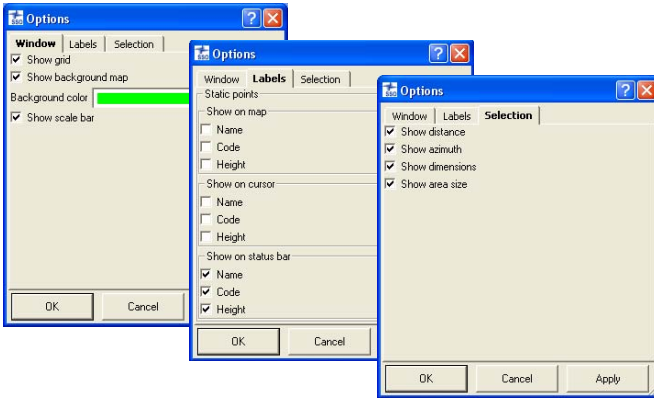


Figure 4-34. Window, Labels, Selection Tabs of the CAD View Options

2. On the *Windows* tab, check mark the desired settings (Figure 4-34). Click **Apply** to apply the changes, then click **OK** to save the settings and make further changes.
  - Show grid – makes a coordinate grid visible on the CAD View
  - Show Background Map – displays the background image file(s) selected in the *Background image* dialog box.
  - Background color - allows one to set the background color for the CAD View.
3. On the *Labels* tab, enable the desired settings (Figure 4-34 on page 4-31). Click **Apply** to apply the changes, then click **OK** to save the settings and make further changes.
  - Name – enable to display the point’s name on selected map, cursor, and status bar positions
  - Code – enable to display the point’s code on selected map, cursor, and status bar positions
  - Height – enable to display the point’s height on selected map, cursor, and status bar positions

4. On the *Selection* tab enable the desired settings (Figure 4-34 on page 4-31). Click **Apply** to apply the changes, then click **OK** to save the settings and make further changes.
- Show distance – enable to display a distance between corners of the rectangle in the Status Bar, when the user drags the rectangle on the CAD View:
  - Show azimuth – enable to display an azimuth (from the start point to the end point of the rectangle) in the Status Bar, when the user drags the rectangle on the CAD View (Figure 4-35).



Figure 4-35. Show Azimuth

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

- Show area size – enable to display an area of the rectangle in the Status Bar, when the user drags the rectangle on the CAD View (Figure 4-36).



Figure 4-36. Show Area

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

## Tab Options in the Tabular View

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

1. Click **View ▶ Options ▶ Tabular View** or right-click on an empty portion of the desired tabular view and click **Options** on the pop-up menu.
2. Select and arrange the desired columns (Figure 4-37 on page 4-35).
  - Use the >> and << buttons to move the selected column between fields.
  - Use the **Move Up** and **Move Down** buttons to move the selected column up or down in order in the *Selected columns* field.
3. Click **OK** to apply the changes to the table.

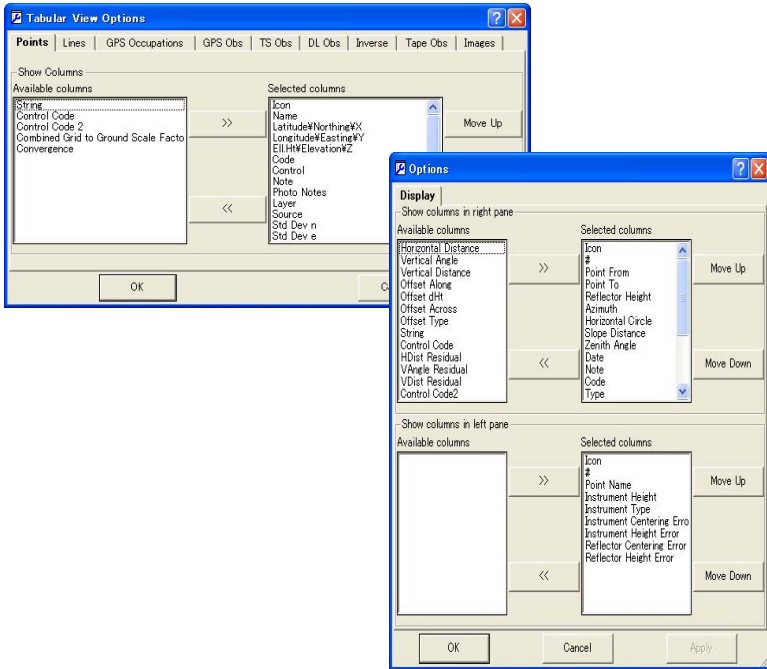


Figure 4-37. Example Tab Options for Points and TS Obs

## Image Options

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

1. Right-click on an empty portion of the *Image* tab and click *Options* on the pop-up menu. The Options dialog box displays (Figure 4-38).

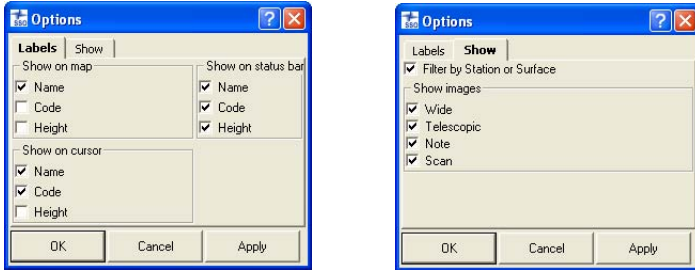


Figure 4-38. Image tab -> Labels and Show Options

2. On the *Labels* tab, enable the desired settings (Figure 4-38). Click **Apply** to apply the changes, then click **OK** to save the settings.
  - Name – enable to display the point's name on selected map, cursor, and status bar positions
  - Code – enable to display the point's code on selected map, cursor, and status bar positions
  - Height – enable to display the point's height on selected map, cursor, and status bar positions
3. On the *Show* tab, enable the desired settings (Figure 4-38). Click **Apply** to apply the changes, then click **OK** to save the settings.
  - *Filter by Station* – check mark (enable) to apply a filter. If the filter is applied only points taken from the Station is displayed.
  - *Show Images panel* – check corresponding check boxes for displaying certain types of images.

- Wide: images obtained by the Topcon Total Station in Wide mode.
  - Telescopic: images obtained by the Topcon Total Station in Telescopic mode.
  - Note: any photo notes in the job. Photo notes (jpg images) can be attached to points in Spectrum Survey Office. There can be multiple images per point.
  - Scan: any images, attached to the Scan Session
4. Click **Apply** to apply the changes, then click **OK** to save the settings.

## Selecting Data

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

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

## Selecting Data in Map, Occupation, and CAD Views

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

- A. Click on the desired point, vector, occupation, epoch, or line.  
To select several points, vectors, occupations, epochs or lines,



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

See “Editing Data Properties” on page 5-62 for details on editing selected data.

## Selecting Data in Tabular and Codes Views

To select data in the Tabular view or Codes view:

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

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

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

- Press **Esc** to cancel a change.

See “Editing in the Tabular View” on page 5-1 and “Editing Codes in the Codes View” on page 5-41 for more details.

## Selecting Points

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

On the **Select Points** dialog box, enter the following information and click **OK** (Figure 4-39 on page 4-39).

- Name / Note / Code / Layer / Source – enter a name/note/code/layer/source, or part of a name/note/code/layer/source and a wildcard, to select all points with the indicated elements.
- Std Dev Horizontal / Std Dev Vertical – select Less than, Greater than, or Don’t use. If using a deviation, enter in meters.
- Point type – select the type of point from the spin list to select all points of that type. To select unconnected points (without observations), select “Unconnected”.
- Enable for adjustment – select Enabled, Disabled, or Don’t use to select points based on this parameter.
- Clear current selection – all currently selected items will be deselected. If not enabled, currently selected points will remain selected.

Click **Set default** to apply the defaults shown in Figure 4-39.

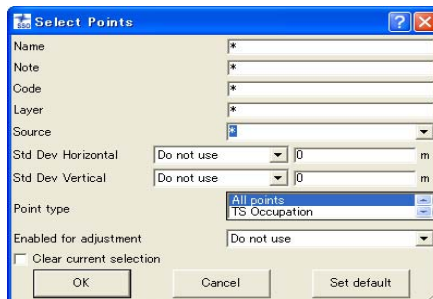


Figure 4-39. Select Points

## Selecting TS Occupations

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

On the *Select TS Occupations* dialog box, enter the following information and click **OK** (Figure 4-40 on page 4-40).

- Point name / Source – enter a name/source, or part of a name/ source and a wildcard, to select all TS occupations with the indicated element.
- Instrument height – select Less than, Greater than, Equal to, or Don't use. If using an instrument height, enter the height in meters.
- Related point – if enabled, the points for the TS occupation(s) selected by criteria will also be selected.
- Related obs – if enabled, the observations for the TS occupation(s) selected by criteria will also be selected.
- Clear current selection – all currently selected items will be deselected. If not enabled, currently selected occupations will remain selected.
- Click **Set default** to apply the defaults shown in Figure 4-40.



Figure 4-40. Select TS Occupations

## Selecting GPS Occupations

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

On the *Select GPS Occupations* dialog box, enter the following information and click **OK** (Figure 4-41 on page 4-41).

- Point name / Original name / Point code / Source – enter a name/code/source, or part of a name/code/source and a wildcard, to select all GPS occupations with the indicated element.
- Method – select the type of method from the spin list to select all GPS occupation that use the selected method.
- Antenna height – select Less than, Greater than, Equal to, or Don't use. If using an antenna height, enter in meters.
- Start time / End time – select Less than, Greater than, or Don't use. If using a start time/end time, enter the date and time of the start/end of the occupation measurement.
- Durations – select Less than, Greater than, or Don't use. If using duration, enter the number of days, hours, minutes, and seconds the duration lasted for the occupation measurement.
- Related point – if enabled, the points for the GPS occupation(s) selected by criteria will also be selected.
- Related obs – if enabled, the observations for the GPS occupation(s) selected by criteria will also be selected.
- Clear current selection – all currently selected items will be deselected. If not enabled, currently selected occupations will remain selected.
- Click **Set default** to apply the defaults shown in Figure 4-41.

The screenshot shows the 'Select GPS Occupations' dialog box with the following settings:

- Point name: \*
- Original name: \*
- Point code: \*
- Source: \*
- Method: All methods
- Antenna height: Do not use, 0 m
- Start time: Do not use, 4/15/200E, 4:39:41 PM
- End time: Do not use, 4/15/200E, 4:39:41 PM
- Duration: Do not use, 0 days, 0 h, 0 m, 0 s
- Related point:
- Related obs:
- Clear current selection:

Figure 4-41. Select GPS Occupations

## Selecting TS Observations

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

On the **Select TS Obs** dialog box, enter the following information and click **OK** (Figure 4-42 on page 4-43).

- From point / To point – enter a from/to point name, or part of a from/to point name and a wildcard, to select all TS observations with that from/to point.
- Enabled – select Enabled, Disabled, or Don't use to select points based on this parameter for adjustment.
- Hz residual / V residual – select Less than, Greater than, or Don't use. If using a residual, enter in meters.
- Reflector height – select Less than, Greater than, or Don't use. If using a reflector height, enter in meters.
- Hz angle / V angle / Z angle – select Less than, Greater than, or Don't use. If using an angle, enter in degrees.
- Hz dist / V dist / Slope dist – select Less than, Greater than, or Don't use. If using a distance, enter in meters.
- Related point – if enabled, the points for the TS observation(s) selected by criteria will also be selected.
- Clear current selection – all currently selected items will be deselected. If not enabled, currently selected observations will remain selected.

- Click **Set default** to apply the defaults shown in Figure 4-42.

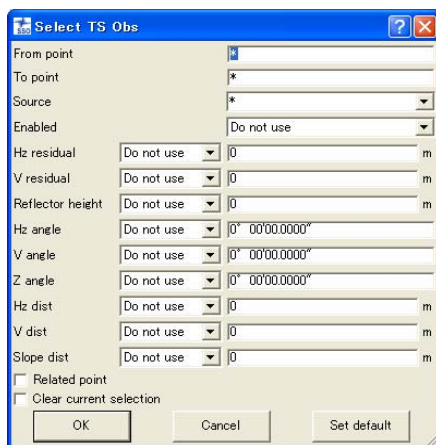


Figure 4-42. Select TS Observations

## Selecting GPS Observations

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

On the **Select GPS Obs** dialog box, enter the following information and click **OK** (Figure 4-43 on page 4-44).

- From point / To point – enter a from/to point name, or part of a from/to point name and a wildcard, to select all TS observations with that from/to point.
- Type – select the type of method from the spin list to select all GPS observation that use the selected method.
- Start time – select Less than, Greater then, or Don't use. If using a start time, enter the date and time of the start of the observation measurement.
- Duration – select Less than, Greater then, or Don't use. If using a duration, enter the number of days, hours, minutes, and seconds the duration lasted to select observations with this duration measurement.

- Solution type – select the type of observation solution from the spin list to select observations of this solution.
- Hz precision / V precision – select Less than, Greater than, or Don't use. If using a precision, enter in meters.
- Hz residual / V residual – select Less than, Greater than, or Don't use. If using a residual, enter in meters.
- Length – select Less than, Greater than, or Don't use. If using a length, enter in meters.
- Enabled – select Enabled, Disabled, or Don't use to select points based on this parameter for adjustment.
- Clear current selection – all currently selected items will be deselected. If not enabled, currently selected observations will remain selected.
- Click **Set default** to apply the defaults shown in Figure 4-43 on page 4-44.

Figure 4-43. Select GPS Observations

## Inverting Selections

To quickly select unselected occupations or observations, and to deselect the selected occupations or observations, use the Invert Selection tool in Spectrum Survey Office.

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

The selected occupations or observations become deselected, and the unselected occupations or observations become selected (Figure 4-44).

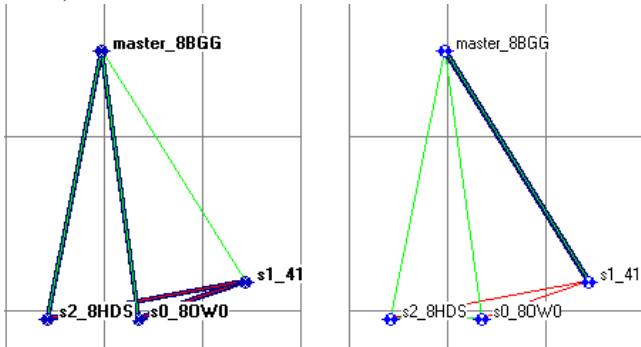


Figure 4-44. Before and After Inverting a Selection

## Filtering Data

Filtering data is a way of hiding or displaying points, occupations, and observations in all Spectrum Survey Office viewers.

Filtering data is performed by:

- type, time, quality control test and/or code selected in the Filters dialog box
- selection of desired objects

Hidden points, occupations, and observations will be excluded from processing, adjustment, exporting, and reports.



### NOTICE

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


Spectrum Survey Office allows you to:

- create unlimited number of the filters with individual names for each set of hidden / displayed objects.



- select the current filter from the created filter list. The name of the current filter is displayed in the *Filters* control of the Toolbar.

To create the filter by type, time, quality control test and code, click

on the **Filters** control  and select **Add filter by parameters**. The *Filter by parameters* dialog box displays (Figure 4-45 on page 4-46).

This dialog box has four filter types: *By Type*, *By QAQC*, *By Code*, and *By Time* (Figure 4-45).

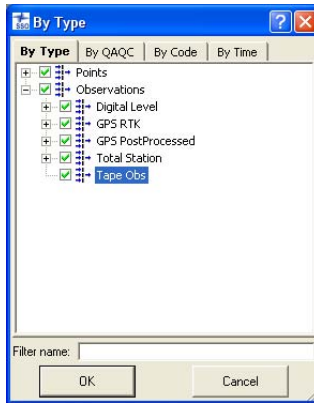


Figure 4-45. Filter by Parameters Dialog Box

## Filtering By Type

To hide/display data based on its type, select the *By Type* tab on the *By Type* dialog box (Figure 4-46 on page 4-47).

1. On the *By Type* tab, click the desired check marks to filter data and data types (Figure 4-46 on page 4-47).
  - Data types marked in red are hidden; data types marked in green are displayed
  - Points that belong to different data types simultaneously (for example, both a GPS and TS point, or also a GPS control point, etc.) are hidden only if all data types the point belongs to are hidden

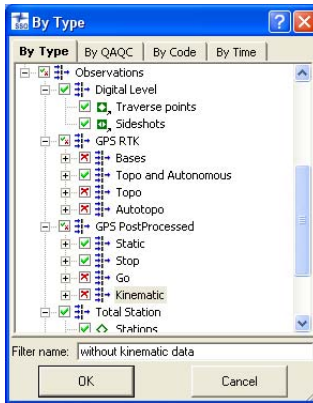


Figure 4-46. Select By Type Filter

2. Type in the desired name for this filter and click **OK** to save the filter settings. The created filter displays in the *Filters* control:

Codes : C:\Documents and Settings\TopconTools\Jobs\codes_libr.ttp								
Icon	Name	Description	Type	Layer	Line Color	Line Style	Line Width	Point :
•	cod...		Line	laye...		—	BYL... ..	Point :
•	fen...	for wood...	Line	fence		BYLA... —	BYL... ..	BYLA...

## Filtering By Quality Control

To set a quality control filter, select the *By QAQC* tab on the *By Time* dialog box (Figure 4-47 on page 4-48) and do the following:

1. On the *By QAQC* (Quality Analysis Quality Control) tab, click the desired check marks to filter data and data types (Figure 4-47 on page 4-48).

Data types marked in red (with an X) are hidden; data types marked in green (with a check mark) are displayed.

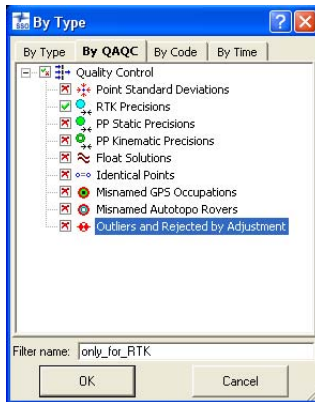
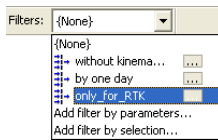


Figure 4-47. Select Quality Control Filter

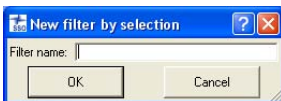
2. Type in the desired name for this filter and click **OK** to save the filter settings. The created filter displays in the *Filters* control.



**NOTICE**

*All filters are created by the 'Add filter by parameters' option are saved after closing this job and will display for other Spectrum Survey Office jobs.*

To create the filter by selecting objects, highlight the desired objects, click on the *Filters* control, and select **Add filter by selection**. The *New filter by selection* dialog box displays



Type in the desired name for this filter and

click **OK** to save the filter settings. The created filter displays in the

*Filters control*



If this filter is selected as the current filter for the job, only those objects highlighted for this filter (see Figure 4-47 on page 4-48) will be displayed in all views.



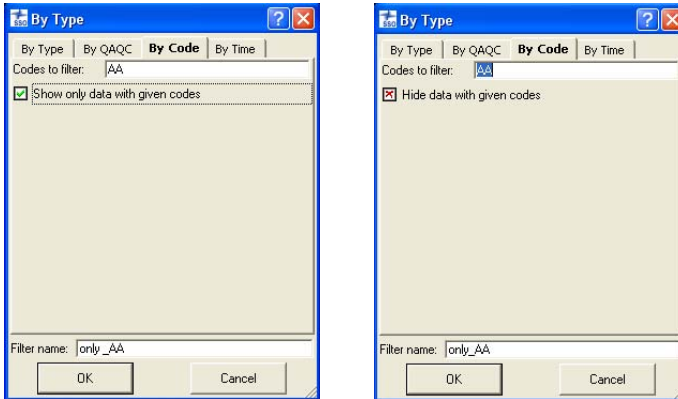
### NOTICE

*All filters created by the 'Add filter by selection' option can be used for the current job only. After closing the job these filters will be removed from the filter list.*

## Filtering By Code

To hide/display data based on code, select the *By Code* tab on the **By Time** dialog box (Figure 4-48).

On the *By Code* tab, type the name of the code/feature to filter data by and select hide/display data with the entered code (Figure 4-48).



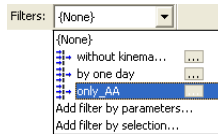
**Figure 4-48. Select By Feature Filter**



## TIP

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

3. Type in the desired name for this filter and click **OK** to save the filter settings. The created filter displays in the *Filters* control.



## Filtering By Time

To hide/display data based on time, select the *By Time* tab on the **By Time** dialog box (Figure 4-49 on page 4-51).

1. To hide data observed during particular time intervals, select the *By Time* tab.
2. On the *By Time* tab, select the *From* and *To* time filters for *interval 1* and *interval 2* to apply to the job and select hide/display data within the entered time interval (Figure 4-49 on page 4-51).

NOTE: Only occupations and observations that lie within the selected time intervals will be hidden. A point is hidden if it is an observed point, as well as all observations on this point that lie within the selected time intervals.

3. Click **Reset** to reset the time intervals (Figure 4-49 on page 4-51).

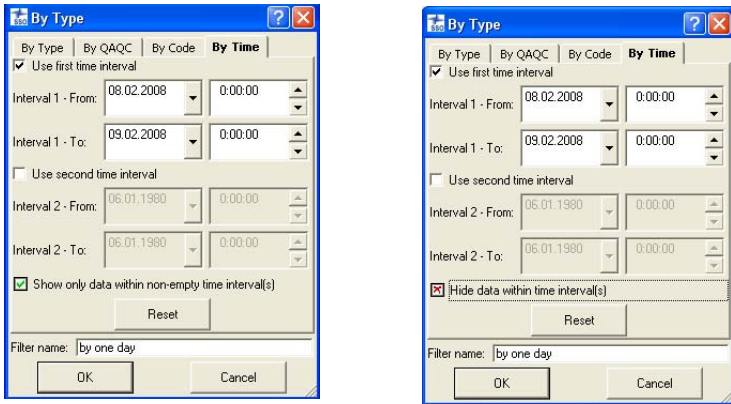
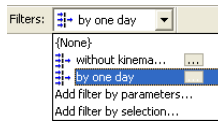


Figure 4-49. Select By Time Filter

4. Type in the desired name for this filter and click **OK** to save the filter settings. The created filter displays in the *Filters* control:



## Editing Filters

Spectrum Survey Office allows the user to edit the created filters. To edit a filter, right-click on the *Filters* control, highlight the filter, and select the desired command (Figure 4-50).

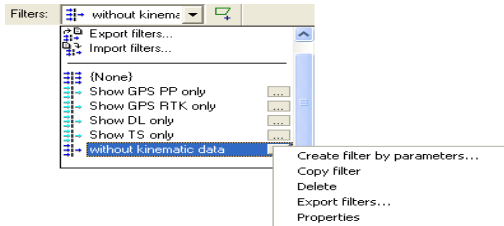


Figure 4-50. Edit the Created Filter(s)

The user can do the following operations with filters:

- copying the contents of any existing filter to a filter with other name

- deleting user-defined filter (not pre-defined filter),
- importing/exporting any filter to a Topcon filter (\*.tf) file format
- activating properties for the select filter, and changing the filter type.

## Viewing Properties of Data

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

To view the *Properties* dialog box for selected single or multiple data types in the Tabular, Map, Occupation, or CAD view (Figure 4-51), do the following:

- Select a point/observation/occupation/line and click **Edit ▶ Properties**
- Right-click a point/observation/occupation/line on the graphical or tabular view and click **Properties** (Figure 4-51).

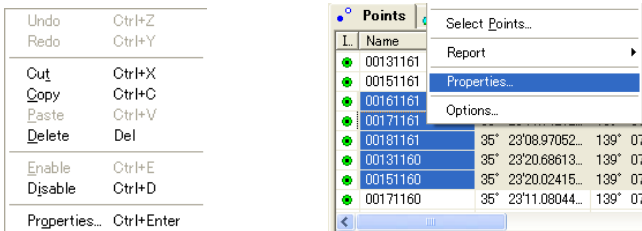


Figure 4-51. Display Properties Dialog Box

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

- For points properties, the *Name* field and *CAD* tab are not available when viewing the properties of multiple points.
- For GPS occupation properties, the occupation type (PP or RTK) determines the available fields.

- For GPS observation properties, the observation type (static or kinematic) determines the available fields.
- For line properties, if selecting multiple lines, only the General tab displays.
  
- For the TS Obs tab, Tape Dimensions tab, and Linework tab, the panel in which data is selected determines the properties that display.

For details on the **Properties** dialog boxes, see “Editing Data Properties” on page 5-62.



# Editing Data

Spectrum Survey Office provides numerous editing features for changing, consolidating, and updating data in preparation for post processing and adjusting.

## Editing in the Tabular View

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

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

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

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

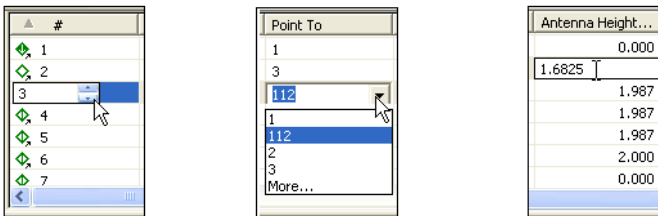


Figure 5-1. Fields for Editing Data

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

**Table 5-1. Tabular View Editable Fields**

	<b>Editable Fields</b>	<b>Static Fields</b>
Point Tab	Name Coordinates Code Control Note String Control Code Layer Color Point symbol	Icon Source Standard deviations String <sup>a</sup> Control Code <sup>b</sup> Combined scale factor Convergence Photo Notes
GPS Occupations Tab	Point Name Original Name Antenna Type Antenna Height Antenna Height Method Note Offset Distance Offset Height Offset Across Antenna Centering Error Antenna Height Error	Icon Interval Start Time Stop Time Duration Method Source Receiver HRMS VRMS GPS week, day NEpoch
DL Obs Tab, Left Panel	# Point Name Instrument Height Instrument Type	Icon
TS Obs Tab, Right Panel	# Point To Reflector Height Azimuth Note Code AutoReject Offsets	Icon Point From Horizontal Circle Slope Distance Zenith Angle Vertical Angle Horizontal Distance Vertical Distance Date Type Adjustment Status Source

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

	Editable Fields	Static Fields
GPS Obs Tab	Note AutoReject Point To (RTK autotopo observations only)	Icon Point From / Point To Start Time Duration Precisions Solutions Method Solution Type Orbit Adjustment Status Residuals HDOP / VDOP GPS / GLONASS Satellites Epoch Stop time GPS week, day
TS <sup>c</sup> Obs Tab, Left Panel	# Note Name of DL job	Icon From / To Date Distance Balance
DL <sup>d</sup> Obs Tab, Right Panel	Point Note Auto Reject Vertical Offset Standard Deviations Distance	# Elevation Instrument Elevation Icon BS / SS / FS Date Adjustment Status Height Residual Level Run Source

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

	Editable Fields	Static Fields
Linework Tab, Left Panel	Layer Color Line Style Line Width Area Color Area Fill Style Fill Transparency Point Type Point Color Type	Icon Type Code String Distance
Linework Tab, Right Panel	Order Point	Icon Point Distance from start Distance from prev Entry azimuth Exit azimuth

- a. For Control Code, the Code column must contain data to be editable.
- b. For String, the Code column must contain data to be editable.
- c. The TS - and DL - parameters which were measured in the field are uneditable.
- d. The TS - and DL - parameters which were manually created are editable.

## Editing Antenna Parameters

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

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

### Option 1: Edit in the Tabular View

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

To select GPS occupations with certain parameters, use the **Select GPS Occupations** dialog box (see “Selecting GPS Occupations” on page 4-40 for details).

- Click a highlighted cell (or press **F2**) and edit the desired information (Figure 5-2).
  - Antenna Type* – select a different antenna from the drop-down list.
  - Antenna Height* – type a new height for the antenna.
  - Antenna Height Method* – select the method from the drop-down list.

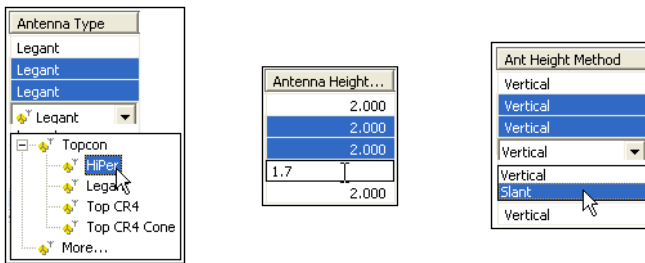


Figure 5-2. Editable Antenna Cells in Tabular View

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

Point Name	Original Name	Antenna Type	Antenna Height...	Ant Height Method	Start Time	Stop Time	Durati...
BL1	BL1	Legant	2.000	Vertical	3/21/2003 8:50...	3/21/2003 9:00...	0:09:3
BL2	BL2	HIPer	1.700	Slant	3/18/2003 1:07...	3/18/2003 1:18...	0:10:1
BL2	BL2	HIPer	1.700	Slant	3/19/2003 12:1...	3/19/2003 1:19...	1:02:0
BL2	BL2	HIPer	1.700	Slant	3/19/2003 1:21...	3/19/2003 1:25...	0:04:1
BL3	BL3	Legant	2.000	Vertical	3/18/2003 1:22...	3/18/2003 1:32...	0:10:0
BL3	BL3	Legant	2.000	Vertical	3/19/2003 1:12...	3/19/2003 2:15...	1:03:1
BL3	BL3	Legant	2.000	Vertical	3/21/2003 8:25...	3/21/2003 8:32...	0:07:0

Figure 5-3. Edited Antenna Parameters

## Option 2: Edit in the Properties Dialog Box

- Select the desired occupations.

To select GPS occupations with certain parameters, use the **Select GPS Occupations** dialog box (see “Selecting GPS Occupations” on page 4-40 for details).

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

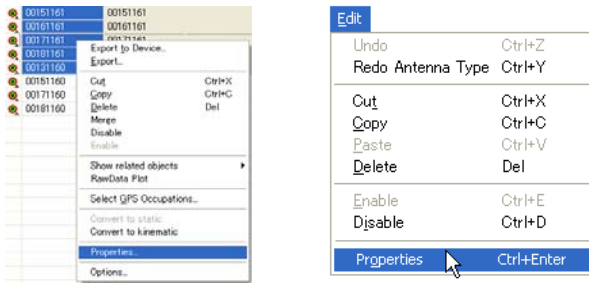


Figure 5-4. Ways to Open the Properties Dialog Box

- On the *Antenna* tab change the *Antenna Type*, *Antenna Height*, and *Ant Height Method*, *Antenna centering error*, *Antenna height error* as needed (Figure 5-5 on page 5-6).
- Click **OK** to save the edited information, which can be viewed on the *GPS Occupations* tab (Figure 5-3).

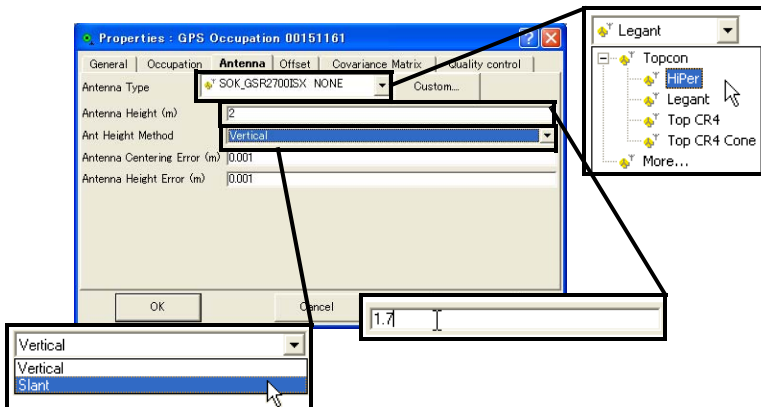


Figure 5-5. Enter New Parameters

## Editing Antenna Offsets

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

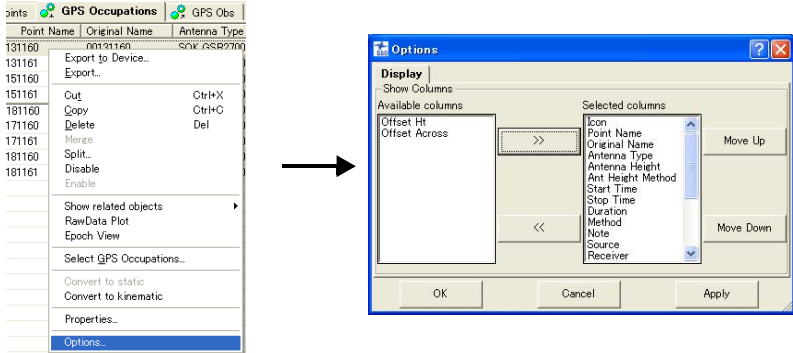


Figure 5-6. View Options

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

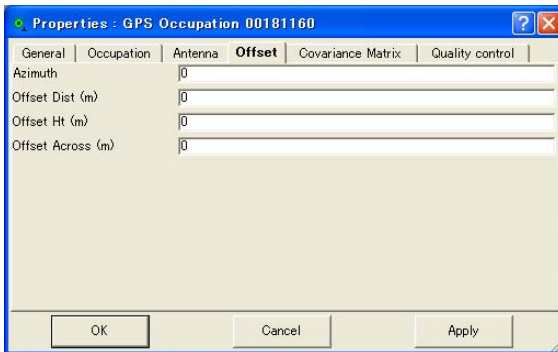


Figure 5-7. GPS Occupations Properties – Offset Tab

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

## Adding Antennas Using the Custom Antenna List

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

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

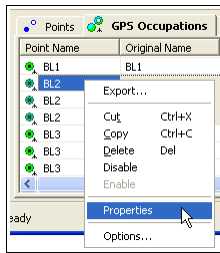


Figure 5-8. Open Properties

2. On the *Antenna* tab, click **Custom** (Figure 5-9) to display the *Custom Antennas List* dialog box (Figure 5-10).

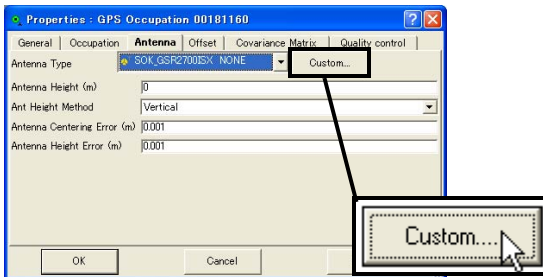


Figure 5-9. Custom Antennas List



- On the **Custom Antennas List** dialog box, click **Add** (Figure 5-10). To remove an antenna, click on the antenna's row and click **Remove**.

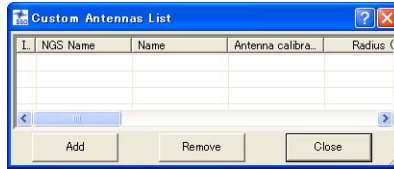


Figure 5-10. New Custom Antenna

- On the **General** tab of the **New Custom Antennas** dialog box, edit the *NGS Name*, *Name*, *Manufacturer*, *Note*, and *Antenna calibration set* fields (Figure 5-11 on page 5-9). Then click **Apply** to save the information.
- On the **Parameters** tab of the **New Custom Antennas** dialog box, enter the *Radius*, *offsets*, and *Measured Height Method* parameters for the antenna (Figure 5-11 on page 5-9). Then click **Apply** to save the information.

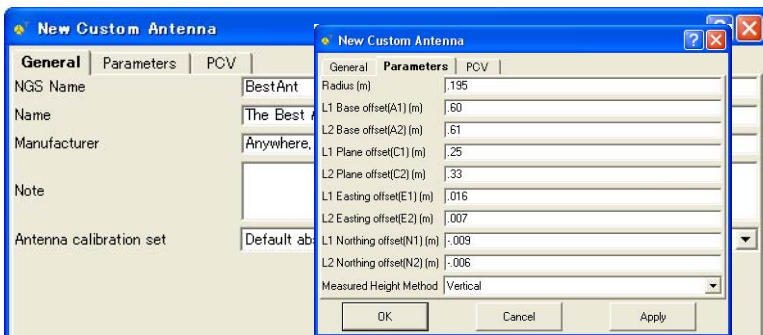


Figure 5-11. New Custom Antennas – General and Parameters Tabs

6. On the *PCV* tab of the *New Custom Antenna* dialog box, enter parameters for the antenna phase center variation (Figure 5-12).

PCV, GPS L1 (mm)			PCV, GPS L2 (mm)		
0°	0	50°	0°		50°
5°	0	55°	5°		55°
10°	0	60°	10°		60°
15°	1	65°	15°		65°
20°	1	70°	20°		70°
25°	1	75°	25°		75°
30°	2	80°	30°		80°
35°	2.2	85°	35°		85°
40°	2.7	90°	40°		90°
45°			45°		

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

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

## Editing Points

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

### Option 1: Editing in the Tabular View

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

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

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

1. Click a highlighted point name cell, or press **F2** (Figure 5-13). To select data with certain parameters, use the appropriate dialog box (see “Selecting Data” on page 4-37 for details).

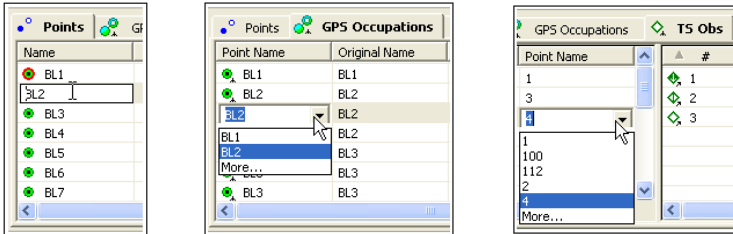


Figure 5-13. Select Point Name to Edit

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

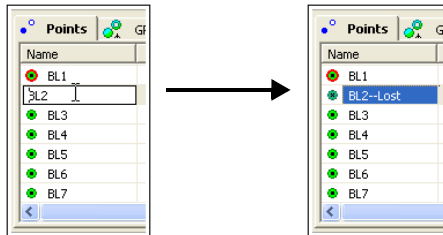


Figure 5-14. Edit Point Name

## Option 2: Editing in the Properties Dialog Box

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

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

To select data with certain parameters, use the appropriate dialog box (see “Selecting Data” on page 4-37 for details).

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

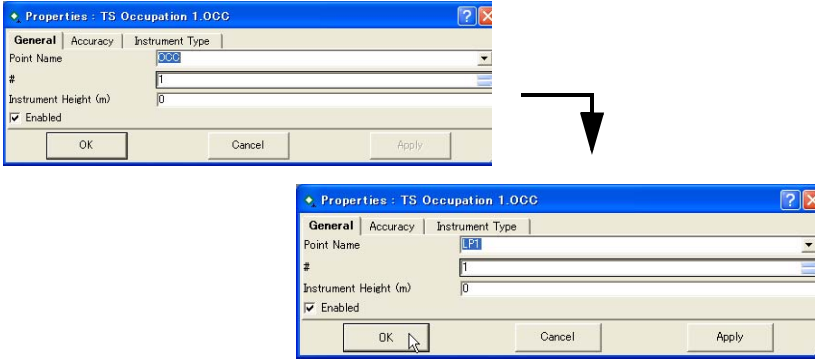


Figure 5-15. Edit Point Name

## Renaming Points on the Points Tab

In addition to changing the name of a single point (see page 5-13), Spectrum Survey Office allows changing the names for the highlighted points in the *Points* tab. Right-click on any highlighted point and select *Rename Points* in the pop-up menu (Figure 5-16).

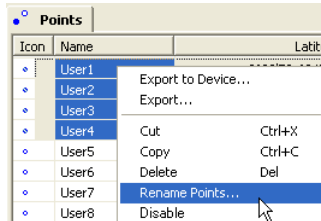


Figure 5-16. Rename a Point on the Points Tab

The *Points renaming* dialog box displays (Figure 5-17).



Figure 5-17. Point Renaming Window

In the *Points renaming* dialog box you can change point names using two methods by:

- renaming the point name (Figure 5-18 on page 5-13)
  - When selecting “Use starting number”, type in the name in the field and click **OK**, Spectrum Survey Office will:
    - alphanumerically sort the selected points
    - set this name for the first point of the sorted points
    - add the increment “1” to the name of the next point after the sorted points if it has a digit as the last symbol
    - add “2” to the name of the second point from the sorted points and then add the increment “1” to the next point from the sorted points



Figure 5-18. Change Point Names – Method One

- adding a prefix and/or suffix to the old name
  - When selecting “Use prefix and/or suffix”, type in the name in the corresponding field(s) and click **OK**, Spectrum Survey Office will add the prefix and/or suffix to the existing name of the selected point(s)

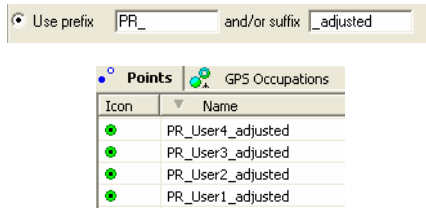


Figure 5-19. Change Point Names – Method Two

Spectrum Survey Office does not rename the selected points, if the current job already has points with the same names. The following dialog box will display:

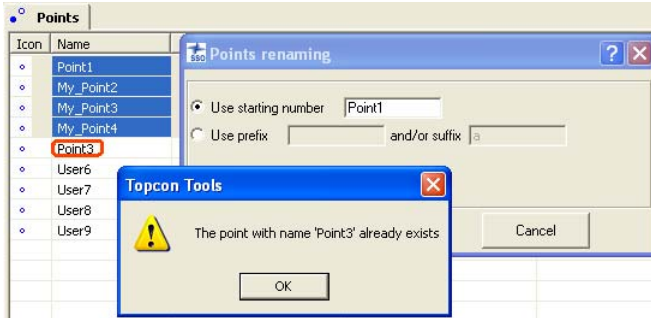


Figure 5-20. Renaming Points

## Merging Points

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

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

## Resolving Duplicate Points

Often, the surveying software collecting RTK data uses a default number scheme to number topo/auto topo points. After importing two different jobs with such observations, physically different points may have the same names. To save information about the names and coordinates of the points which have identical names in the imported jobs/files, Spectrum Survey Office compares the plane and vertical coordinates for the points with identical names. If the difference:

- for navigation solution is more than 30 m

or/and

- for any other solution and any types of points (control, design , etc..) is more than 1 mm,

the software displays the **Resolve duplicate points** dialog box. This dialog box allows the user to consider which points to use in the job and how to rename the points with identical names.

**Resolve duplicate points** dialog box (Figure 5-21 on page 5-15) consists of two panes. The right pane contains a list of points with duplicate names in the project, and the left pane contains a list of duplicate points in the imported file/job (the name of the file is displayed in the window title).

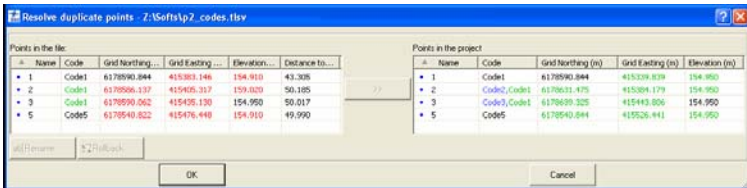


Figure 5-21. The Resolve Duplicate Points Dialog Box

The coordinates of the points are displayed in the coordinate system which was set for the current Spectrum Survey Office's job. The points with identical names are located in the same row in both panes of the dialog box.

If the coordinate of the duplicated (imported and existing) point are different, such coordinate value will be colored in red in the left pane and in green in the right pane:

Name	Grid Easting (m)
5	415476.448

Name	Grid Northing (m)
5	6178540.844

If the coordinates/code of the duplicated (imported and existing) point are identical, they will be black in both panels:

Name	Code	Grid Northing (m)
1	Code1	6178590.844

Name	Code	Grid Northing (m)
1	Code1	6178590.844


If the imported point has a different point code, this code will be merged with the code of the existing point. In this case, both panes will display the code in green:

Points in the file:	
Name	Code
• 2	Code1

Points in the project	
Name	Code
• 2	Code2, Code1

While in the *Resolve duplicate points* dialog box, the user can:

- A. Use the coordinates of the imported point in the current job instead of the ones that already exist.

- Select the desired point(s) in the left pane and either
  - click the **Move to Right**  button,

or

- right-click and select *Use the Point* on the pop-up menu

Points in the file:			
▲	Name	Code	Grid N
•	1	Code1	61788
•	2		
•	3		
•	5		

Context menu options: Select All, Use the Point, Rename..., Rollback

- Then the coordinates of the imported point override the old coordinates and the left pane displays the new coordinates of the point(s)


Points in the job					
▼	N...	Code	Grid Northing (m)	Grid Easting (m)	Elevation
•	2	Code2, C...	6178586.137	415405.317	154.950
•	3	Code3, C...	6178590.062	415435.130	154.950

- Click **Ok** to start import of the file and save all changes. The *Points* tab will display the new values of the coordinates and

merged codes

Points					
Icon	N...	Grid Northing (m)	Grid Eastin...	Elevati...	▲ Code
•	2	6178586.137	415405.317	159.020	Code2, Code1
•	3	6178590.062	415435.130	154.950	Code3, Code1

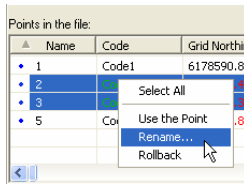
- B. Rename the point(s) in the left pane and import the points to the current Spectrum Survey Office’s job:

- Select the desired point(s) in the left pane and either
  - click the **rename**  button,



or

- right-click and click **Rename** on the pop-up menu



- Then the **Points renaming** dialog box will display (Figure 5-22)

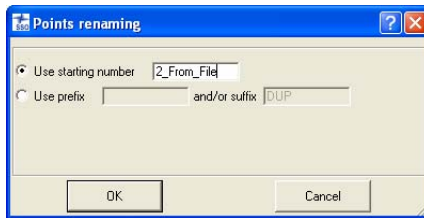


Figure 5-22. Points Renaming Window

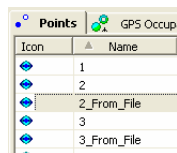
In the **Points renaming** dialog box, the user can select a way to change the point names using two ways. See Step 2 on page 5-16 for more details.

Then the points with the new names or new prefix/suffix are


displayed in the left/right pane

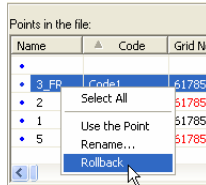
Points in the file:		
Name	Code	Grid Northing (m)
• 2_From_File	Code1	6178586.137
• 3_From_File	Code1	6178590.062

- Click **OK**, to start import of the file with renamed points. The **Points** tab will display the new names of the imported points.



- C. Undo all changes for the selected lines in the left and right pane.

- Select the point(s) with the changes made in the name/coordinate/code in the left/right pane and either
  - click the **Rollback**  button,
- or
  - right-click and select *Rollback* on the pop-up menu.



- D. To cancel import of the file to the current Spectrum Survey Office's job,

click the **Cancel**  button.

**NOTICE** NOTICE

*If the user made no changes in the Resolve Duplicate Points window, after clicking the Ok button in the window, only the new codes of the imported points will be merged with the existing codes of the points with identical names in the current job.*

**NOTICE** NOTICE

*If the coordinates of the imported and existing points in the current job are in the Datum/Grid and Ground coordinates systems (or vice versa) and the job does not have transformation/localization parameters, Spectrum Survey Office will display both lists of the coordinates without any conversion (as is) in the right pane of the Resolve Duplicate Points window. After clicking OK, the points with identical names will have the coordinates in both coordinate system (Figure 5-23 on page 5-19).*

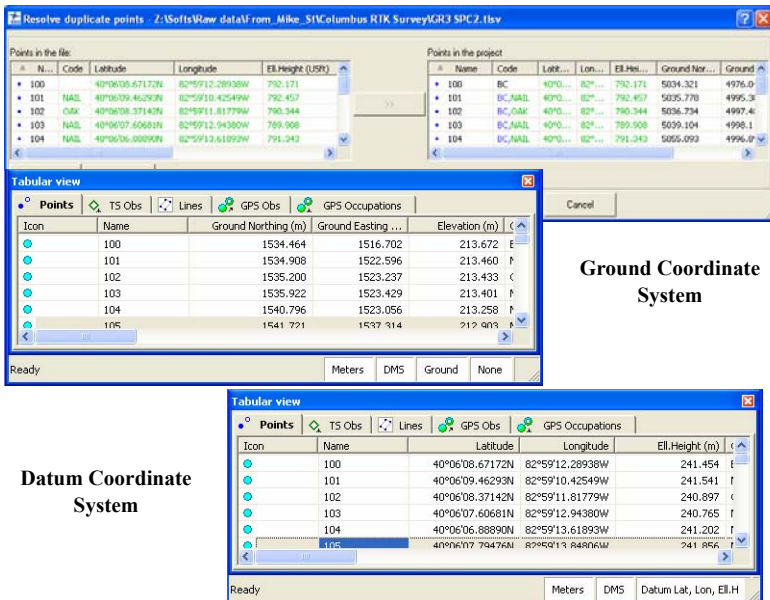


Figure 5-23. Ground/Datum Coordinate System

## Editing Linework

Spectrum Survey Office allows the user to edit a linework using the CAD View and the *Lines* tab. To edit the linework of the current job, click **View** ► **Cad View** and select the *Lines* tab. The user can do the following:

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

## Adding a New Point

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

- To add a point do one of the following:
  - Click **Add ► Point**. Using the cursor, click at the needed place in CAD View.
  - Press *Alt* and click at the needed place in CAD View.
- On the **Add Point** dialog box (Figure 5-24) you can correct the point name (by default “User n” where *n* is the number), the coordinates in the coordinate system set for the current job, enter a code, string, control codes, note and set a control. Click **OK**.

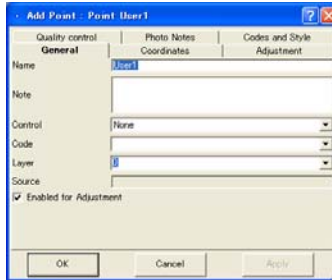


Figure 5-24. Add Point Dialog Box

To set an active layer for the job, open the Layer combo box in the Toolbar and select the layer. In this case, any point created will have the same plotting style as defined by the active layer (Figure 5-25).

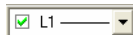


Figure 5-25. Active Layer for Point

To set the layer for a point (Figure 5-26), select the layer using the *General* tab in the **Add Point** dialog box (Figure 5-24). The

attributes (color and point style) for the selected layer will be assigned to this point.

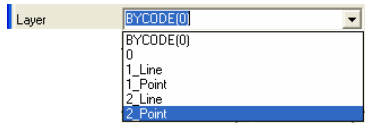


Figure 5-26. Select Layer for Point

To apply codes (instead of layers) for a point, select the desired code in the drop-down list of the *Code* field and set “BYCODE” in the drop-down list of the *Layer* field. The attributes (color and point style) for the layer will be assigned to this point.

Figure 5-27 shows an example of a point with code “101” in the *CAD View*. For this point, the layer was set to “BYCODE (For Points)” and this code uses the layer “For Points”.

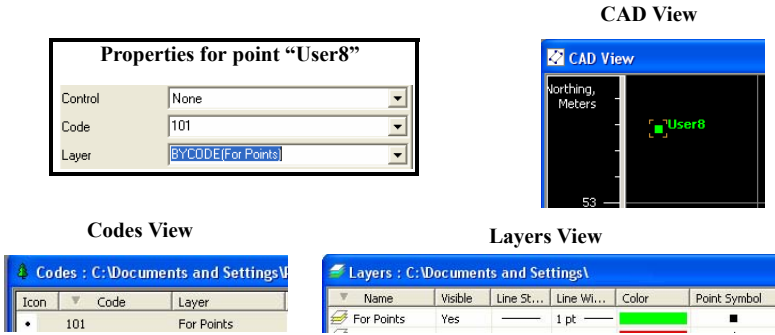
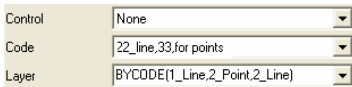


Figure 5-27. Setting Code for Point and Viewing Point

- If the point has multiple codes, setting Layer to “BYCODE” forces it to belong to multiple layers (Figure 5-28).
- If the point has no code, setting Layer to “BYCODE” forces the point to belong to Layer 0 (zero) (Figure 5-28).

Using Multiple Codes



Using No Codes

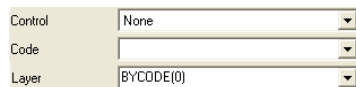


Figure 5-28. Layer Determination when Applying Codes

The Map View, the CAD View, and the *Points* tab displays the created point(s) (Figure 5-29 on page 5-22).

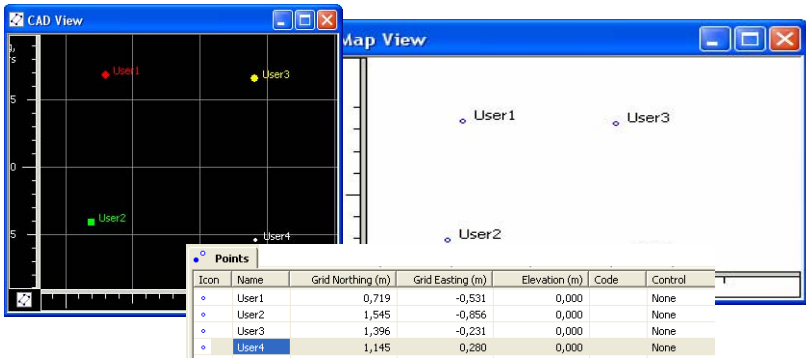


Figure 5-29. Created Points in CAD View, Map View and Points Tab

- To deactivate the *adding point* mode, click **Add ► Point**.

## Deleting a Point

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

## Adding a Line

Before creating a new line, the user has to select the desired layer. To set layer for a new line, select any layer from the list of existing layers in the Toolbar (Layer combo box). The plotting styles of the new line will be assigned by the active layer (Figure 5-30).

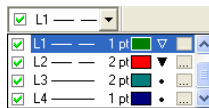
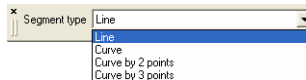


Figure 5-30. Setting Layer for Line

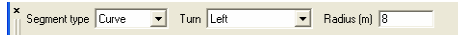
To plot a line, do the following:

- Click **Add ► Line** (or click the *Add Line* button on the Toolbar).
- Select the desired segment type for the line from the drop-down list of the *Segment type* field

If the user selects the *Curve* as type of the created segment, he has to



specify the turn and radius of the curve in the corresponding fields.



The user can select from any of the three available methods to plot a line:

- Between two existing points:
  - To plot a line, click **Edit ▶ Add ▶ Line** (or click the **Add Line** button on the Toolbar), click the ‘*append point*’ cursor on the first point, then click on the second point. The line will be created between those points (Figure 5-31).

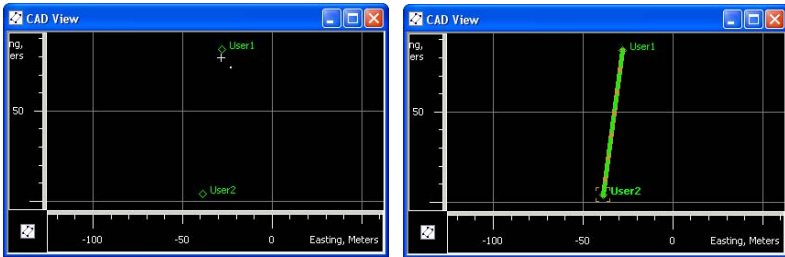


Figure 5-31. Plot A Line Between Two Existing Points

In this case, the right panel of the *Lines* tab displays the name of line vertexes

Icon	Order	Point
•	1	User1
•	2	User2

- between selected points:
  - Spectrum Survey Office allows connecting selected points into the line. Click the **Add Line** button in the Toolbar and select the desired points in the CAD View or *Points* tab. Then the line will be created that connects the points in the order of point numbers/names (Figure 5-32 on page 5-24).

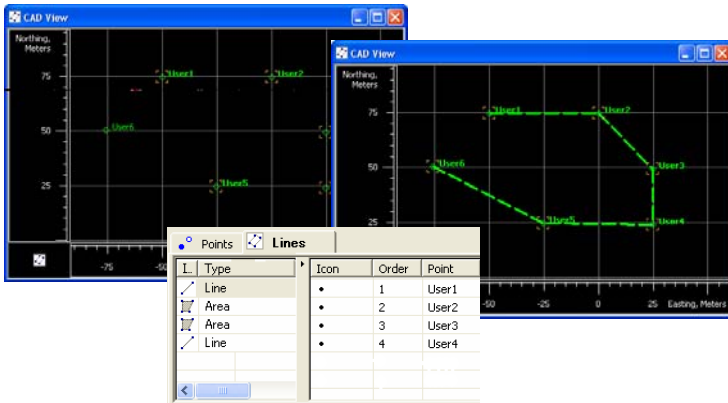


Figure 5-32. Connecting of Selected Points to Line

- Without points:
  - Click the **Add Line** button on the Toolbar and click any area within the CAD view. Repeat this step as needed (Figure 5-33). Vertexes of the line will be appended to the line. These vertexes have no name, and the *Points* tab does not display coordinates for them. The right panel of the *Lines* tab displays only the icon and order for the vertexes (Figure 5-33).

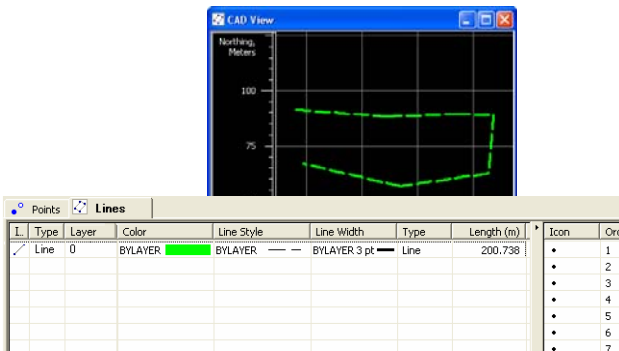


Figure 5-33. Plotting Line in the Cad View

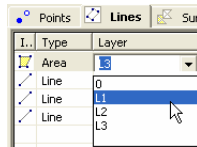


## Edit a Created Line

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

To change the layer for an existing line, do one of the following:

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



- Right-click on the line (or selected lines) in the CAD View and select *Properties* from the pop-up menu. Select a different layer from the drop-down list in the *Properties* dialog box (Figure 5-34).

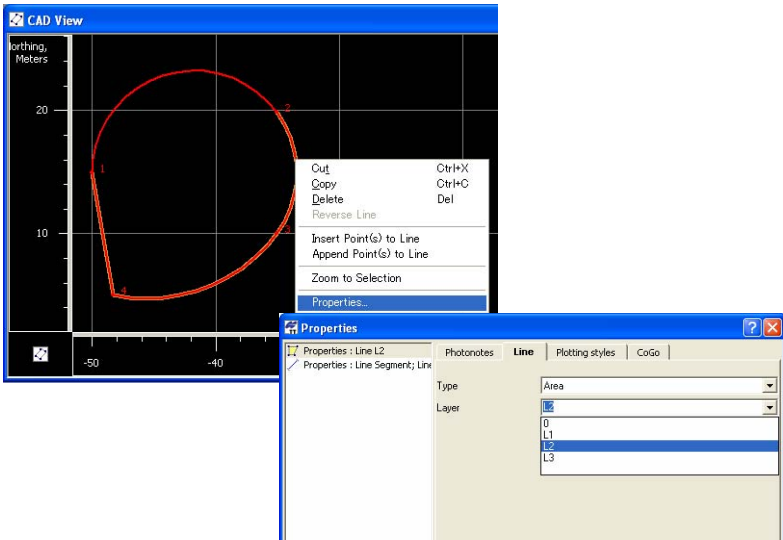
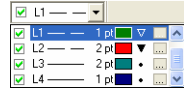


Figure 5-34. Change the Layer of an Existing Line

To change the layer parameters, do one of the following:

- double-click in the Layer combo box on the Toolbar, select the desired layer from the drop-down list and click the **Browse** button.
- Click **View ▸ Layers** and right-click the desired layer, then click **Properties** on the pop-up menu.



The **Properties** dialog box for the line allows editing the plotting style for the line and the type of the selected segment of the given line (Figure 5-35).

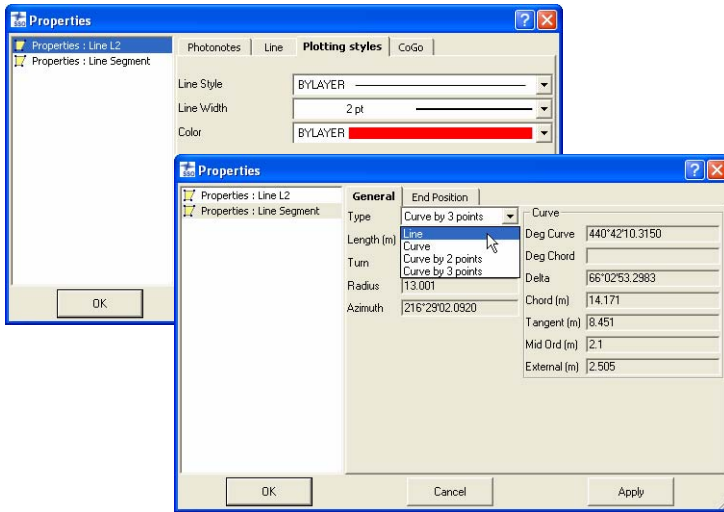


Figure 5-35. Editing Line and Segment Parameters

If the line is imported from a Spectrum Survey Field PC job, the code and the string define the plotting style for the line. To edit line parameters, edit code parameters. Right-click on the line (or selected lines) in the CAD View and select *Properties* from pop-up menu. Select a different code or a layer from the *Layer* drop-down list field in the **Properties** dialog box (Figure 5-36 on page 5-27).

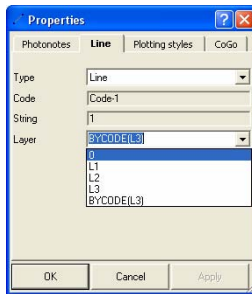


Figure 5-36. Edit Line Properties

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

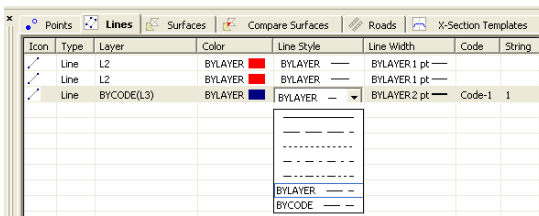


Figure 5-37. Editing Line Parameters in the Left Panel of the Lines Tab

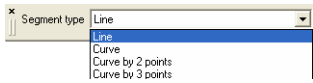
## Appending Points to a Line

The *Append Points to Line* function adds points to the selected line. Two options are available for appending points to the line.

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

1. Select the desired line or create a new line.
2. Click **Add ► Append Points to Line**. The pointer will change after *append points* mode has become active.

3. Select the desired segment type for the line from the list of the

*Segment type* field: . If *Curve* is selected as type of the created segment, you must specify the turn and radius of the curve in the corresponding fields:



4. Click a point on the CAD view to append it to the line. The point will display in the right panel of the *Lines* tab (Figure 5-38) for the line selected in the left panel.

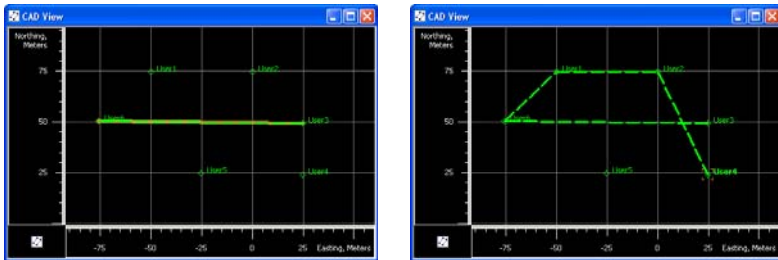
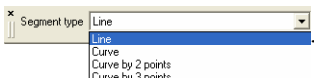


Figure 5-38. Appends Points to Line

5. Click another point to append to the line. The vertexes of the line will display in the right panel of the *Lines* tab (Figure 5-38). Repeat step 4 to append more points to the line. To create a closed figure, append the finish point to the last segment and the start point of the first segment to the line.
6. When finished, click **Add ► Append Points to Line** to deactivate ‘append point’ mode. Save the job.

### Option 2: Selecting the Point, then Selecting the Line

1. Right-click the desired point in the CAD View and click **Append Points to Line** on the pop-up menu (Figure 5-39 on page 5-29). The pointer will change to indicate that ‘append points’ mode has been activated.
2. Select the desired segment type for the line from the list of the

*Segment type* drop-down list field .

If the *Curve* is selected as type of the created segment, specify the turn and radius of the curve in the corresponding fields.

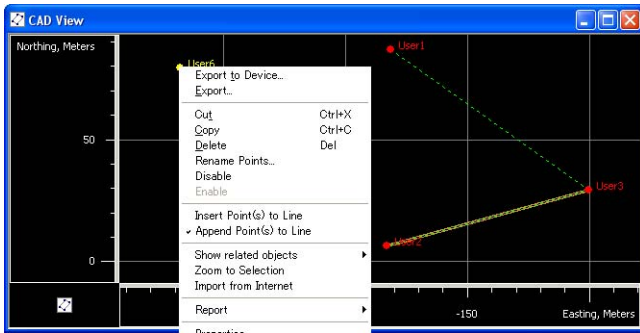
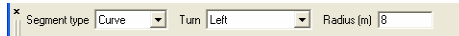


Figure 5-39. Appending Points Using the Pop-up Menu

- Click any line on the CAD view to automatically append the selected point to (Figure 5-40). The *Lines* tab display a new vertex of the line

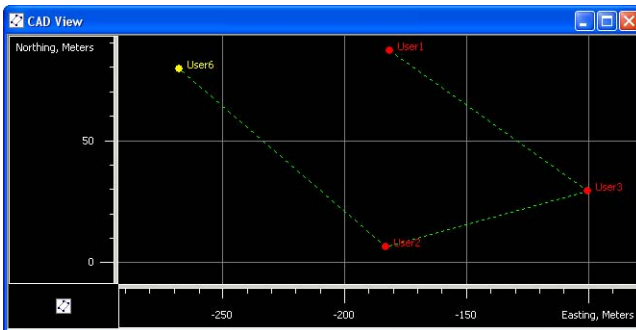


Figure 5-40. Example: Appending Points to the Line

## Inserting Points to a Line

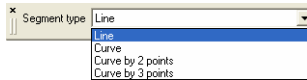
The *Insert Points to Line* function will add a point to the selected segment. When inserting a point to a segment, Spectrum Survey Office creates a new point, deletes the selected segment between the start point and end point, and creates two new segments (from the start point to the new point and from the new point to the end point).

To insert points to a line, select the desired segment in the CAD View or in the right panel of the *Lines* tab and enable *Insert Points to Line* mode. The cursor will change after the *Insert Points to Line* mode has become active. Two options are available for inserting points to a line.

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

1. Select the desired line segment in the CAD View or the corresponding vertexes in the right panel of the *Lines* tab.
2. Click **Edit ► Add ► Insert Points to Line**. The pointer will change to indicate that the ‘insert point’ mode has been activated.
3. Select the desired segment type for the line from the Segment

type drop-down list field



If the *Curve* is selected as type of the created segment, specify the turn and radius of the curve in the corresponding fields.

4. Click at the desired place in the CAD View. A new point will be created, the selected line will be deleted, and three points (the start and end point of selected line and the new point) will create two new segments (Figure 5-41 on page 5-30).

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

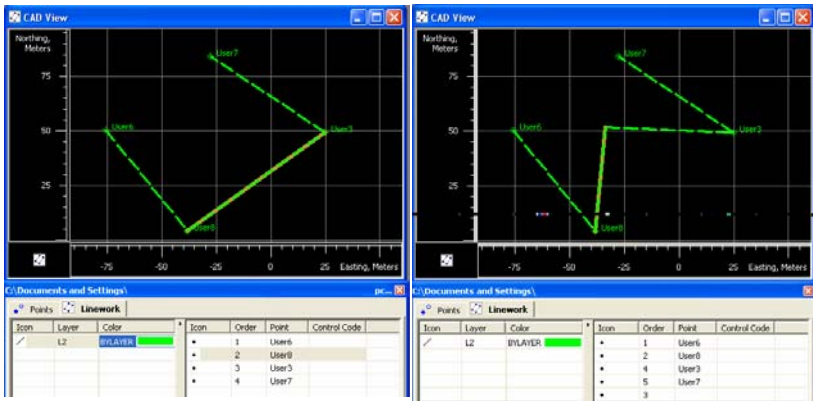


Figure 5-41. Inserting a New Point to the Selected Line

- To edit the point name and view/edit the coordinates of the new (created) point, double click on it's vertex in the right panel of the *Lines* tab and type in a name (Figure 5-42).

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

Figure 5-42. Editing Name's Inserting point

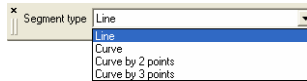
- When finished, click **Add ► Insert Points to Line** to deactivate 'insert point' mode. Save the job.

## Option 2: Selecting the Point, then Selecting the Line

- Right-click on an existing point in the CAD View and click **Insert Points to Line** on the pop-up menu (Figure 5-43 on page 5-32).

The pointer will change to 'insert point' mode.

- Select the desired segment type for the line from the Segment type drop-down list field



If the *Curve* is selected as type of the created segment, specify the turn and radius of the curve in the corresponding fields.

- Click any line segment on the CAD View. The point will be automatically inserted.

The CAD View and the *Lines* tab display new line segments from the start point of the selected segment to this point, and from this point to the end point of the selected segment (Figure 5-43).

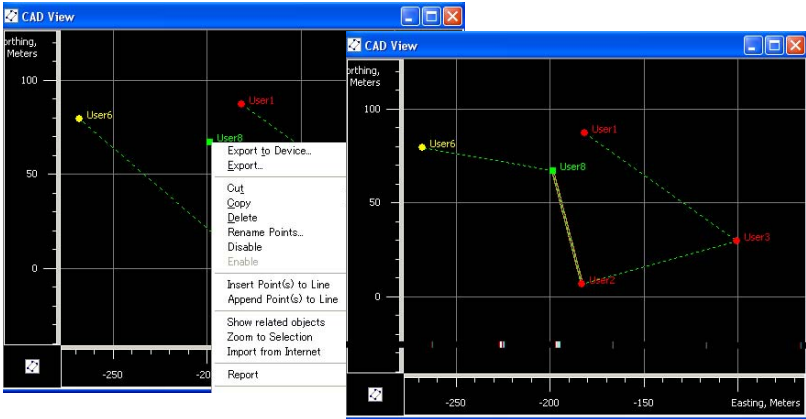
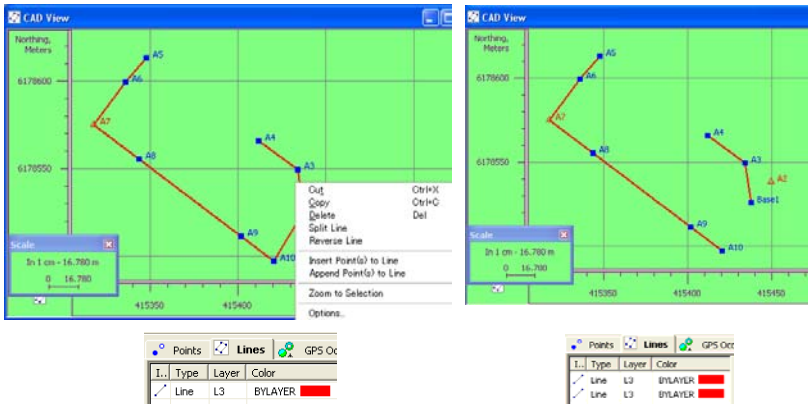


Figure 5-43. Example of Inserting Points to the Line

## Splitting a Line

To divide a line into two separate lines, right-click any segment (except the first and last segment of the line) in the right pane of the *Lines* Tab and click **Split Line**. After that this segment will be deleted and the *Lines* tab and *CAD View* display two lines:



Points				Lines				GPS Oct			
I.	Type	Layer	Color	I.	Type	Layer	Color	I.	Type	Layer	Color
1	Line	L3	BYLAYER	1	Line	L3	BYLAYER	1	Line	L3	BYLAYER

Points				Lines				GPS Oct			
I.	Type	Layer	Color	I.	Type	Layer	Color	I.	Type	Layer	Color
1	Line	L3	BYLAYER	1	Line	L3	BYLAYER	1	Line	L3	BYLAYER
2	Line	L3	BYLAYER	2	Line	L3	BYLAYER	2	Line	L3	BYLAYER



## Merging Lines

Spectrum Survey Office allows one to merge two lines. If these two lines do not have a common point, an additional line will be created between the End point of the first selected line and the Start point of the second line.

To merge two lines, select the desired lines in the left panel, right-click and select **Merge Lines** from the pop-up menu:



## Reverse a Line

To change the order of the segments in the line, right-click any segment in the right pane of the *Lines* Tab and click **Reverse Line**. After that the last segment of the line will be first and so on (Figure 5-44 on page 5-33).

The figure illustrates the process of reversing a line. It shows a table with a context menu open over the third row, and an arrow pointing to the resulting table where the rows are reversed.

**Initial Table:**

Icon	Order	Point	Distance from start	Distance f
·	1	1		
·	2	2	449,929	
·	3	3	054,348	
·	4	4		
·	5	5		

**Context Menu:**

- Cut Ctrl+X
- Copy Ctrl+C
- Delete Del
- Reverse Line

**Resulting Table:**

Icon	Order	Point	D
·	1	5	
·	2	4	
·	3	3	
·	4	2	
·	5	1	

Figure 5-44. Changing of the order of the segments

## Deleting a Line

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

## Deleting a Vertex from a Line

To delete a vertex from the line, right-click the desired point in the right panel of the *Lines* tab and click **Delete** (Figure 5-45).

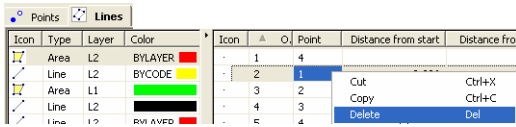


Figure 5-45. Deleting the Vertex From the Line

This function does not delete the points from the job, but only deletes the segments which include the vertex and creates new segment from the previous point to the next point of the line (Figure 5-46).

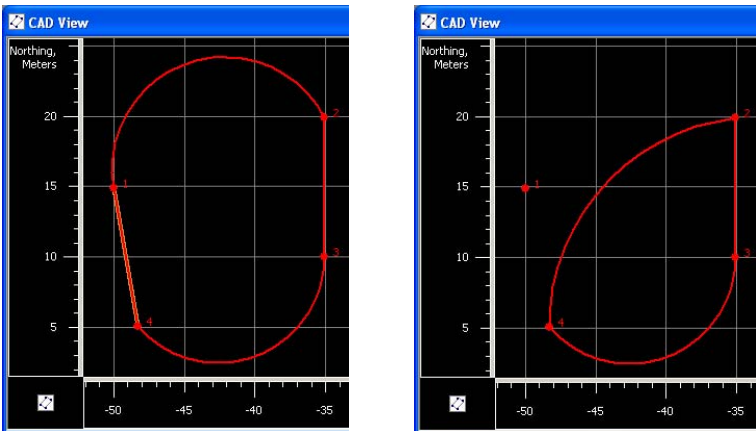


Figure 5-46. Deleting the Segment From the Line

## Selecting Segment Type

To create a new line or to edit an existing line, select any type of segment from the list in the *Segment Type* field (Figure 5-47), or the

*Type* field on the *General* tab of the segment *Properties* dialog box (Figure 5-47), respectively.

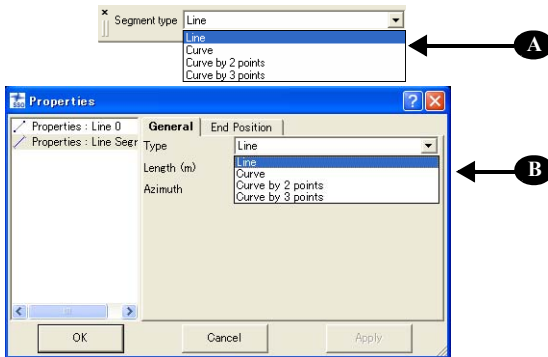


Figure 5-47. Selecting Segment Type

## Creating a Curve

To create a curve, select the direction of curve turning and type in the curve radius in the *Add Line* dialog box.

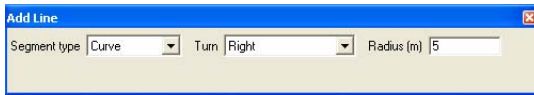
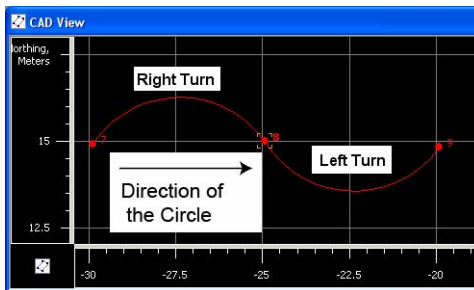


Figure 5-48. Add Line Dialog Box

The *Right* turn of the curve is a turning from the start point to the end point clockwise, the *Left* turn is counterclockwise.



The radius of the curve should be more than the half of the distance between the start and end points of curve. If this condition is not met,

the curve will not be created. In this case, the following message will display (Figure 5-49) and the software will create a two-point curve.



Figure 5-49. Message that a Curve With the Given Parameters Cannot be Built

To view the properties of the created curve, right-click the curve and click *Properties* on the pop-up menu on the CAD View (Figure 5-50 on page 5-36).

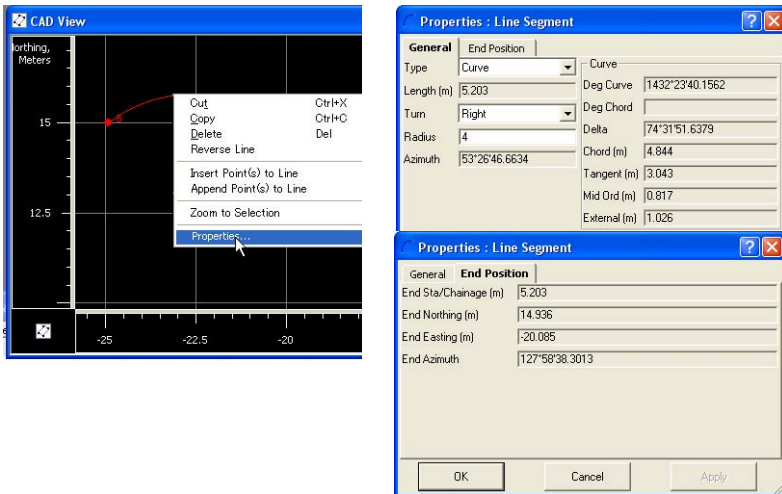


Figure 5-50. Segment Properties

The newly created curve has the following parameters (Figure 5-51 on page 5-37):

- *Length/Chord/Tangent/Mid Ord/External/Delta* – the length of the curve element, or one of five parameters unambiguously defining the curve length: chord, tangent, middle ordinate (the distance from the midpoint of a chord to the midpoint of the corresponding curve), external (the distance from the midpoint of the curve to the intersection point of tangents), or delta (the angle between the radii corresponding to the curve).

- *Start Azimuth/End Azimuth* – the azimuth of the tangent to the start/end point

Figure 5-51 on page 5-37 displays the curve parameters which are calculated.

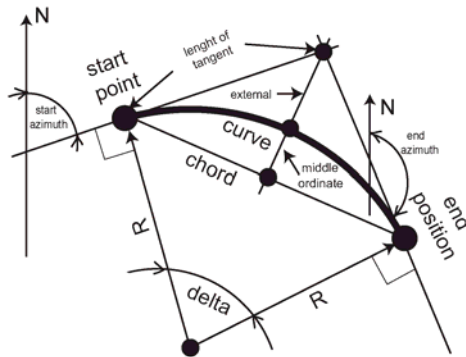


Figure 5-51. curve Parameters

## Creating a Curve by Two Points

To create a curve by two points, select the corresponding segment type in the **Add Line** dialog box.

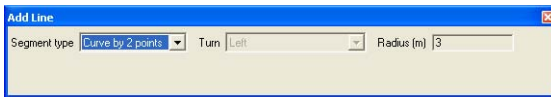


Figure 5-52. Add Line Dialog Box

For the curve type:

- the turn of the curve depends on the end azimuth of the previous segment of this line.
- the radius of the curve depends on both the end azimuth of the previous segment of this line and the start/end point coordinates (Figure 5-53a on page 5-38).

If the previous element is absent, the start azimuth of the curve will be set to “zero” (Figure 5-53b on page 5-38).

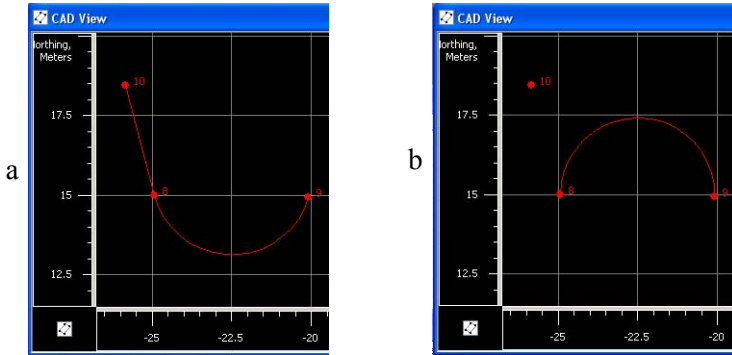


Figure 5-53. Example of curve by 2 points

To view the properties of the created curve, right-click the curve and click *Properties* on the pop-up menu on the CAD View. The previous section describes curve parameters in more detail.

### Creating a Curve by Three Points

Any curve (arc of a circle) can be drawn using any three points not lying on a straight line. The center of this circle is the intersection of perpendiculars from the middle of the chords (Figure 5-54).

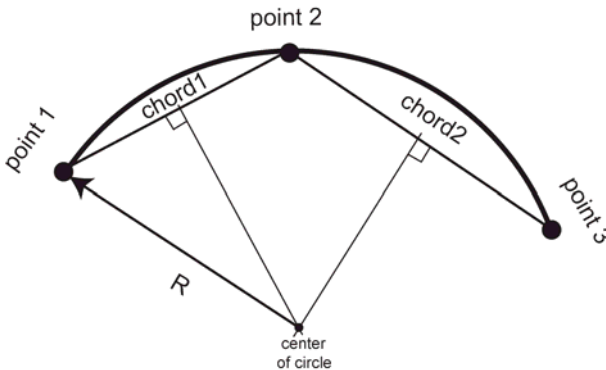


Figure 5-54. Creating Curve by Three Points

To create a curve by three points, select the desired curve type in the *Add Line* dialog box (Figure 5-55 on page 5-39).

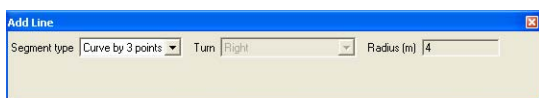


Figure 5-55. Add Line Dialog Box

For the given curve type, the radius and turn of the curve depends on the coordinates of the selected points (Figure 5-56).

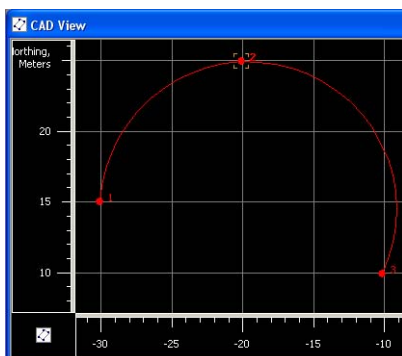


Figure 5-56. Example of curve by 3 points

## Editing GPS Occupation Types

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

To change from static to kinematic, make the point name field for that occupation blank (Figure 5-57 on page 5-40).

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

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

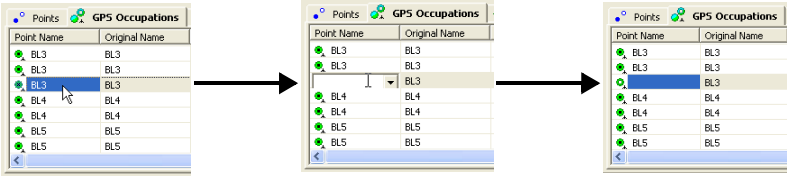


Figure 5-57. Changing GPS Occupation from Static to Kinematic

To change from kinematic to static, enter a name in the point name field for that occupation (Figure 5-58).

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

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

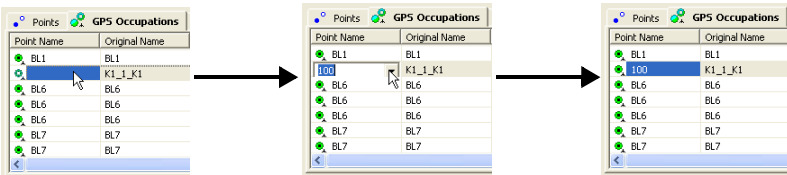


Figure 5-58. Changing GPS Occupation from Kinematic to Static

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



## Editing Codes in the Codes View

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

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



### NOTICE

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

## Adding a Code

With the Codes view open (**View ▶ Codes**) and selected, right-click within the left panel and click **New Code** on the pop-up menu (Figure 5-59). When creating a new code, the user can select a layer.

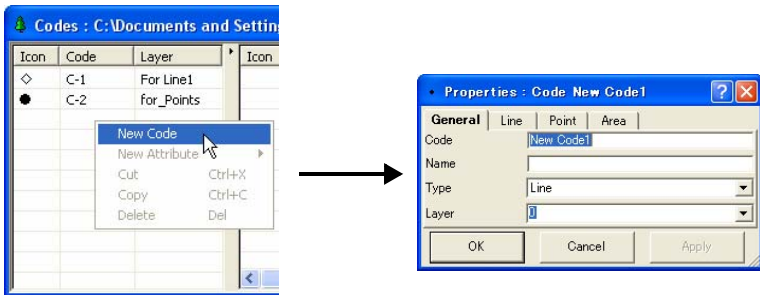


Figure 5-59. Add New Code

## Editing a Code

If used in a job, codes cannot be edited. To remove a code from being used in a job, see “Editing Codes Used for Points” on page 5-45.

1. Right-click the selected code and click **Properties** on the pop-up menu (Figure 5-60).

- On the *General* tab, edit the code's name and select the layer (Figure 5-60).

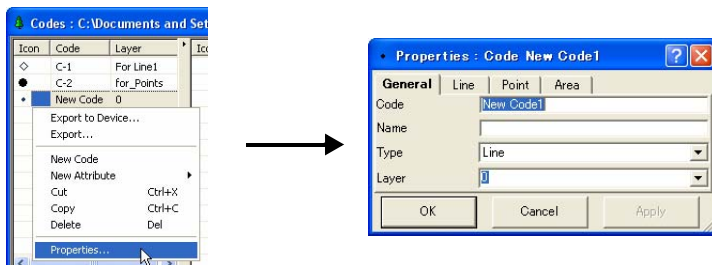


Figure 5-60. View Code Properties and Edit Name

- On the *Line* tab, select the line plotting style (color, style,width). On the *Point* tab, select the point plotting style (symbol and color). On the *Area* tab, select the area plotting style (color, fill style, fill transparency). The plotting style can be edited for any code with or without a layer (Figure 5-62).

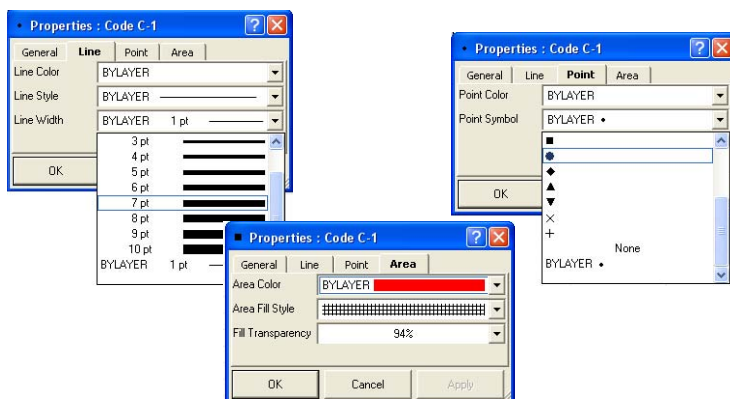


Figure 5-61. Codes's Properties

## Adding and Editing an Attribute

If used in a job, attributes cannot be added to a code. To remove a code from being used in a job, see “Editing Codes Used for Points” on page 5-45.

1. Right-click a code to add an attribute to and click **New Attribute** then select the attribute type on the pop-up menu (Figure 5-62).

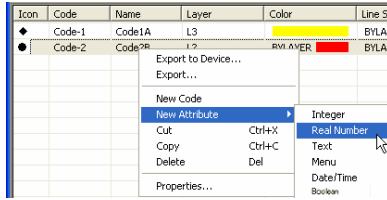


Figure 5-62. Select Attribute to Add

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

Table 5-2. Properties for Code Attributes

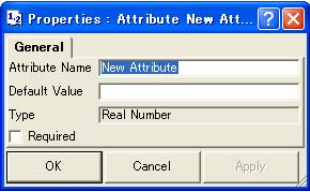

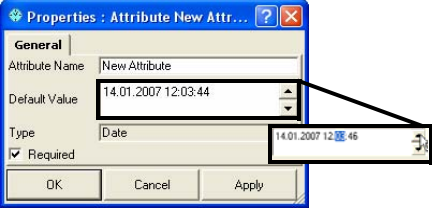

For this type of Attribute...	Edit these properties...
Integer, Real Number, Date, Time, and Text attributes (Figure 5-63)  	<ul style="list-style-type: none"> <li>• Attribute Name – type a name for the attribute</li> <li>• Default Value – type a default value for the attribute</li> <li>• Click the <b>Required</b> check box to use the attribute for the code.</li> </ul>

Figure 5-63. Attribute Properties

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

For this type of Attribute...	Edit these properties...
<p>Menu (Figure 5-64)</p>  <p>Figure 5-64. Properties for Menu Attribute</p>	<ul style="list-style-type: none"> <li>• Name – type a name for the attribute.</li> <li>• Default Value – type a default value for the attribute or select one from the drop-down list. <ul style="list-style-type: none"> <li>– Click <b>Add</b> to add the value to the list.</li> <li>– Click <b>Remove</b> to delete the selected value from the list.</li> </ul> </li> <li>• Click the <b>Required</b> check box to use the attribute for the code.</li> </ul>
<p>Menu (Figure 5-65). Date/Time</p>  <p>Figure 5-65. Properties for Date/Time Attributes</p>	<ul style="list-style-type: none"> <li>• Name – type a name for the attribute.</li> <li>• Default Value – set a default value for Date and/or Time using the up and down arrows.</li> <li>• Click the <b>Required</b> check box to use the attribute for the code.</li> </ul>
<p>Boolean (Figure 5-66)</p>  <p>Figure 5-66. Properties for Boolean Attributes</p>	<ul style="list-style-type: none"> <li>• Name – type a name for the attribute.</li> <li>• Default Value – set a default value for Boolean (<i>True</i> or <i>False</i>) using the up and down arrows.</li> <li>• Click the <b>Required</b> check box to use the attribute for the code.</li> </ul>

3. Click **Apply** to set data without closing; click **OK** to set data and close the dialog box. The right panel of the *Codes* view displays

the list of the created attributes for the code selected in the left panel (Figure 5-67).

Icon	Code	Layer	Icon	Attribute Name	Default Value	Type
◇	C-1	For Line1	[a]	test	6	Integer
●	C-2	for_Points	[a]	exam	4	Real Number
■	New Code	For Points 3	[ab]	quiz	lamp	Text
			[list]	List for ob18	pipe	Menu

Figure 5-67. Codes View

## Editing Codes Used for Points

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

1. Right-click the desired point and click **Properties** on the pop-up menu (Figure 5-68).

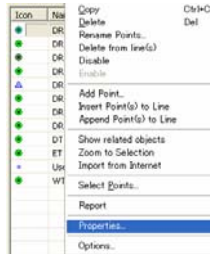
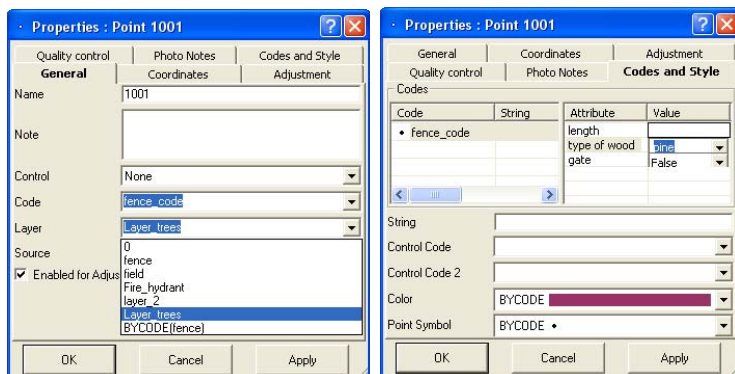


Figure 5-68. View Point Properties

2. Using the *General* tab, select a code and a layer (Figure 5-69 on page 5-46). The plotting style for this code will be taken from the layer parameters.
3. Click the *Codes and Styles* tab to view currently used codes, add a code to the point, delete a code from being used in the point, or change the point symbol and color used for the point. Any attributes associated with the codes display in the right panel.
4. To add a code to the point, right-click in the left panel and click **New Code**. Select the code from the drop-down list and click outside the cell or press **Enter** (Figure 5-69 on page 5-46). More than one code can be added to the point; codes will display in the *Points* tab.

Note: typing a new code in the text entry box will add the code the job file and point. Use the *Codes* view to apply attributes.

- To edit menu attributes associated with a code, select a new value from the *Value* column drop-down list.



Points Tab with  
Multiple Codes

Points		
Icon	Name	Code
•	User1	2,3

Figure 5-69. Add Code to Point

- To delete a code from being used in the point, right-click in the left panel and click **Delete** (Figure 5-70). Any attributes associated with the code are also deleted from the point.  
Note: deleting a code from the *Codes and Styles* tab only deletes the code from the point, not the job.
- Click **OK** to save the settings.

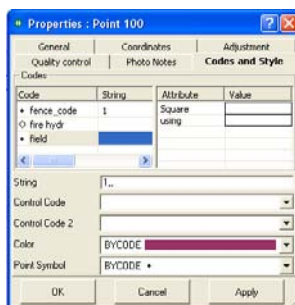


Figure 5-70. Delete Code from Point

# Editing Layers

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

## Adding a Layer

1. To create a new layer in the current job, click **Edit ▶ Add ▶ Layers**. (Or in the Layers view, click **Add Layers** on the pop-up menu. Or, on the toolbar, right-click in the Layers drop-down list.)
2. Enter the following general information for the layer (Figure 5-71 on page 5-48):
  - Name – the name of the layer.
  - Visible – select Yes to show the layer on the CAD view; select No to hide the layer.
  - Note – enter desired comments.
3. Select the following plotting information for the layer (Figure 5-71 on page 5-48):
  - Line Style – select the type of line to display for line information in the layer.
  - Line Width – select a width for lines in the layer.
  - Color – select a color for all data (point and line) in the layer.
  - Point Symbol – select a symbol to represent all points in the layer.
4. Select the following plotting information for the area (Figure 5-71 on page 5-48):
  - Select the area fill style in the corresponding field.

The Fill Transparency field displays the value of an area's transparency..

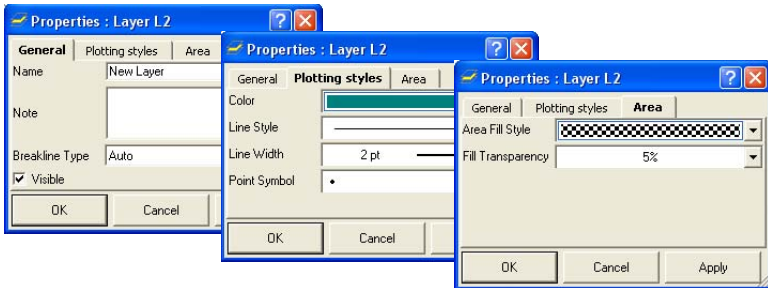


Figure 5-71. Enter and Select Layer's Attributes

## Editing a Layer in the Layers View

If used in a job, layers can be edited. Layer 0 cannot be deleted from the job or renamed, but the plotting styles of the Layer 0 can be edited.

Edit a Layer using the Layers View (Figure 5-72):


- Click **View** ► **Layers** and select the desired layer(s) in the *Layers* view.
- Highlight and click any (except *Name*) cell in the *Layers* view, select and edit the desired parameters (Figure 5-72).

Name	Visible	Line Style	Line Width	Color	Point Symbol	Breakline Type	Note	Area Fill Style	Fill Transparency
0	Yes	—	1 pt		•	Auto		None	0%
Layer-1	Yes	—	1 pt		•	Auto	For Road-1	None	0%

Figure 5-72. Editing Layer in the Layer View

Edit a Layer using the *Properties* dialog box for the layer (Figure 5-72 on page 5-48).



- Double-click in the Layer combo box in the Toolbar, select the desired layer from the drop-down list, and click .
- Click **View ▶ Layers** and right-click the desired layer. Select *Properties* from the pop-up menu.

Edit the layer's properties on the *General* and *Plotting styles* and *Area* tabs of the **Properties** dialog box for the layer.

## Setting the Layer for Codes

When creating a new code, the user can select a layer. In this case, the plotting style for this code will be taken from the layer parameters (Figure 5-73).

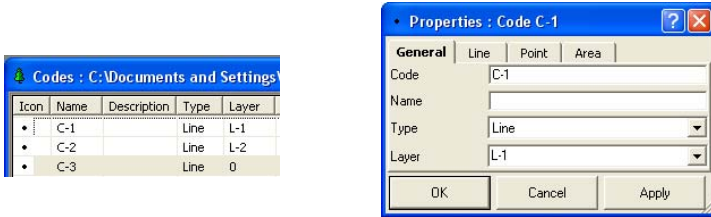


Figure 5-73. Codes and Layers

To edit the plotting style for any code with or without the layer, use the *Plotting styles* tab of the code's **Properties** dialog box (Figure 5-74).

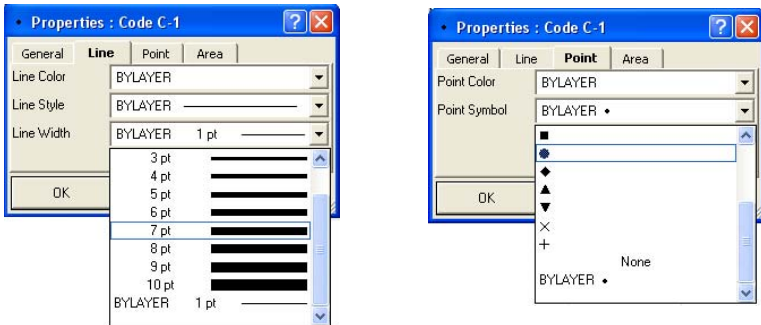


Figure 5-74. Editing Plotting Styles (Point Symbol) for Code

If no layer is selected for the code, the code will be automatically assigned to the active layer. This layer will be applied for all codes in in Spectrum Survey Office job and for imported files without layer support.

## Setting the Layer for a New/Existing Point

To set the layer for a new (or existing) point, select the layer using the *General* tab in the *Add Point* (or the *Properties*) dialog box (Figure 5-75). The attributes (color and point style) for the selected layer will be assigned to this point.

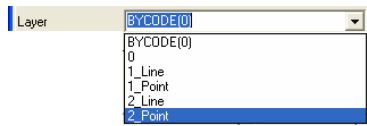


Figure 5-75. Setting Layer for Point

To apply codes (instead of layers) for a point, select the desired code in the *Code* field and set “BYCODE” in the *Layer* field. The attributes (color and point style) for the layer will be assigned to this point. Figure 5-76 on page 5-50 shows an example of a point with code “101” in the *CAD View*. For this point, the layer was set to “BYCODE (For Points)” and this code uses the layer “For Points”.

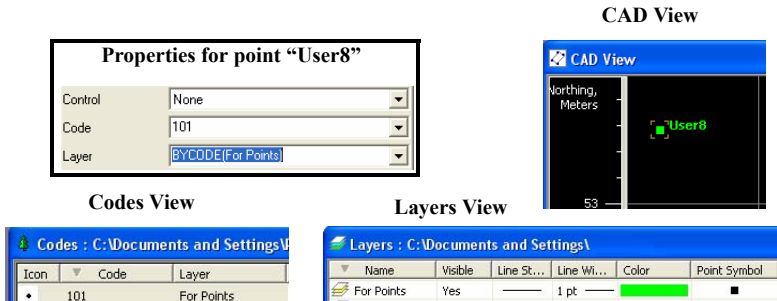


Figure 5-76. Setting Code for Point and Viewing Point

- If the point has multiple codes, setting Layer to “BYCODE” forces it to belong to multiple layers (Figure 5-77).

- If the point has no code, setting Layer to “BYCODE” forces the point to belong to layer 0 (zero) (Figure 5-77).

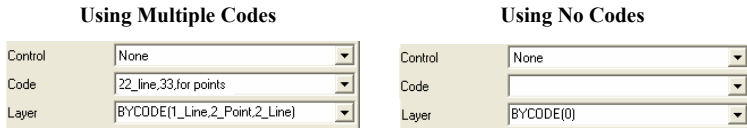


Figure 5-77. Layer Determination when Applying Codes

## Setting the Layer for New/Existing Linework

To set the layer for new linework, select any layer from the list of existing layers in the Toolbar (Layer combo box). The plotting styles of the new line will be assigned by the active layer (Figure 5-78).

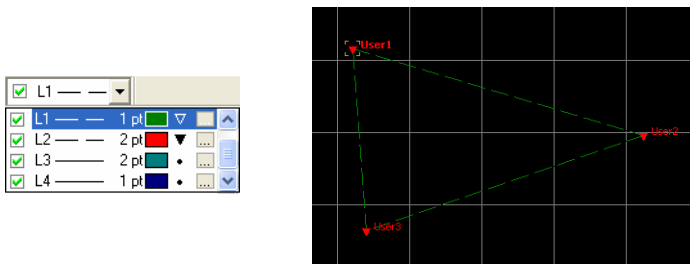
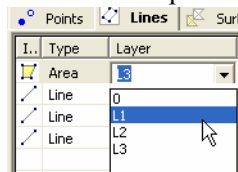


Figure 5-78. Setting the Layer for Linework

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

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



- Right-click on the line (or selected lines) in the CAD View and select the Properties from pop-up menu. Select a different layer from the drop-down list in the Properties window (Figure 5-79).

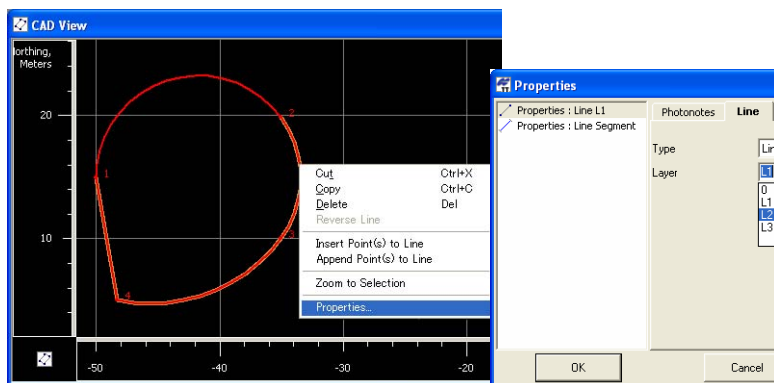


Figure 5-79. Select a Different Layer from the Drop-down List

## Editing TS Instrument Parameters

Total station instrument parameters assign height and type information for the TS instrument used for the TS data. See Table 5-1 on page 5-2 for a list of editable cells.

Instrument parameters define precisions of measurement performed by a particular TS model. By default (if no instrument is selected), Spectrum Survey Office uses some reasonable default. Precisions of TS measurements slightly influence how measurements are accounted for during an adjustment; assigning correct instruments can slightly improve adjustment results. For most cases, however, the default, applied precision are sufficient.

The *Custom TS-Instrument List* allows you to add user-defined instrument types to the instrument list.

### Option 1: Edit in the Tabular View

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

To select TS occupations with certain parameters, use the **Select TS Occupations** dialog box (see “Selecting TS Occupations” on page 4-40 for details).

2. Click a highlighted cell and edit the desired information (Figure 5-80).
  - For # (station number), select the desired order for the station
  - For *Instrument Height*, type a height for the instrument.
  - For *Instrument Type*, select the model from the list
  - For *Instrument Centering Error*, *Instrument Height Error*, *Reflector Centering Error* and *Reflector Height Error*, type in the corresponding values for the error of centering instrument/reflector and for the error of the instrument's/reflector's height measurement. All errors will be included into calculation of common error of point's positioning after performing the adjustment of the given network.

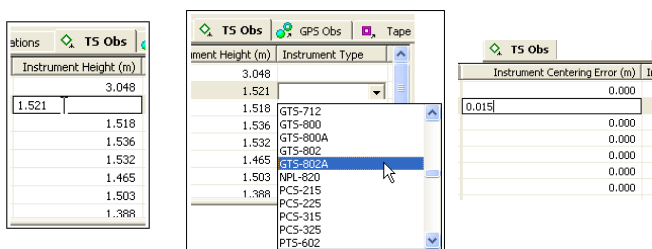


Figure 5-80. Editable Instrument Cells in Tabular View

3. After editing information in the column, click outside the cell or press **Enter** to save the new information.

## Option 2: Edit in the Properties Dialog Box

1. Select the desired occupation(s).

To select TS occupations with certain parameters, use the **Select TS Occupations** dialog box (see “Selecting TS Occupations” on page 4-40 for details).

2. Right-click the selected occupation(s) and click **Properties** on the pop-up menu, or click **Edit ► Properties** (Figure 5-81).

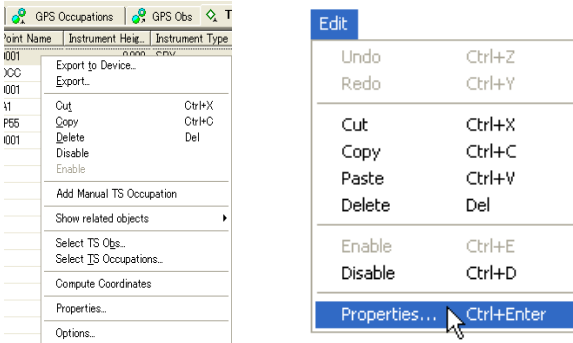


Figure 5-81. Ways to Open Properties

3. On the *General* tab, edit the height of the instrument as needed (Figure 5-82).
4. On the *Instrument Type* tab, edit the type of instrument used as needed (Figure 5-82).

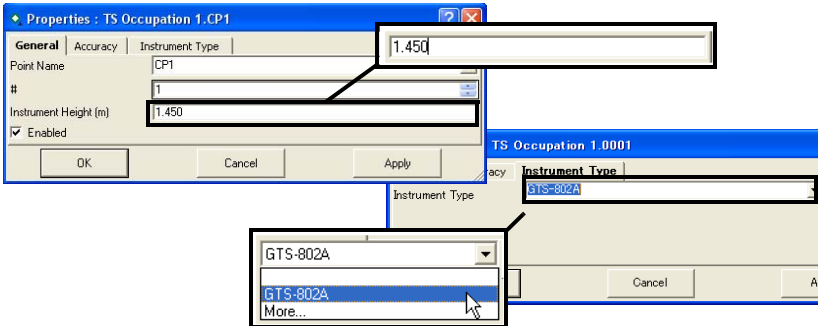


Figure 5-82. Enter New Parameters for TS Occupation

- On the *Accuracy* tab, type in the corresponding values for the error of centering instrument/reflector and for the error of the instrument's/reflector's height measurement (Figure 5-83).

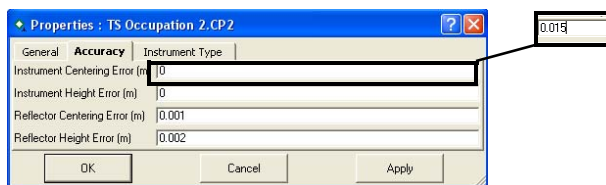


Figure 5-83. Accuracy Properties for TS Occupation

- Click **OK** to save the edited information, which can be viewed on the left panel of the *TS Obs* tab.

## Adding TS Instruments Using the Custom TS Instruments List

Each TS instrument model has known measurement precision characteristics, which should be given in the TS instrument's documentation. A list of standard TS instruments, not viewable or editable, is stored in a TSinstrument.XML file.

- To add a new instrument type to the instrument list or edit a current instrument type, right-click a TS occupation and click **Properties** on the pop-up menu (Figure 5-84).

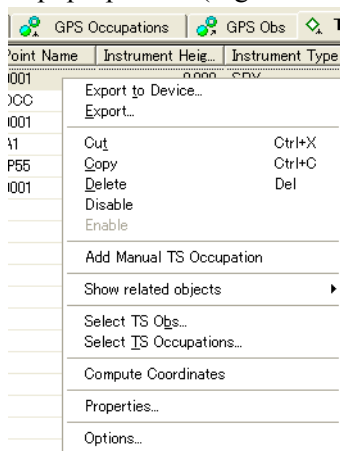


Figure 5-84. Open Properties

- Click **Custom** (Figure 5-85 on page 5-56) to display the *Custom TS Instrument List*.

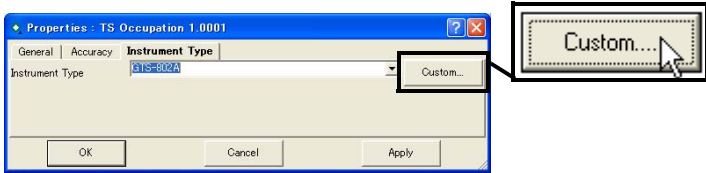


Figure 5-85. Open Custom TS Instrument List

- Click **Add** (Figure 5-86). To remove an instrument, click on the TS instrument's row and click **Remove**.
- On the *General* tab, edit the *Name*, *Manufacturer*, and *Note* fields (Figure 5-86). Then click **Apply** to save the information.

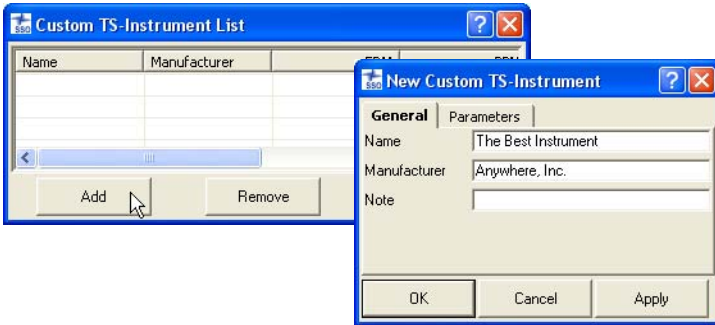


Figure 5-86. New Custom TS Instrument

- Click the **Parameters** tab and enter the *EDM*, *PPM*, vertical and horizontal accuracies, and maximum distance (Figure 5-87).

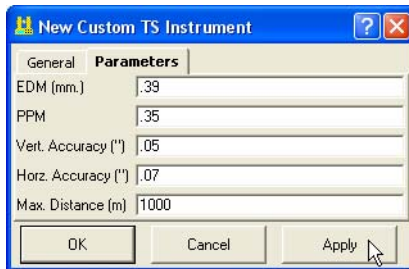


Figure 5-87. New Custom TS Instrument – Parameters

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



## Manually Adding Total Station Occupation

Spectrum Survey Office does not allow the user to edit the raw data collected in the field using Total Station. But the software allows manual adding the TS measurements to the job and editing these values.

To add the TS measurements to the job, take the following steps:

- Click **Add ▶ Manual TS Occupation** (Figure 5-88).

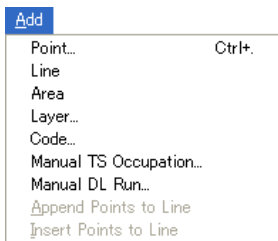


Figure 5-88. Adding a TS Occupation Manually

- In the *General* tab of the **Add Manual TS Occupation** dialog box (Figure 5-89):
  1. Select the point which used as station in TS measurement from the list of the job points.
  2. Type in the instrument height.
  3. Select the number of the measurement

In the *Accuracy* tab type in the corresponding values for the error of centering instrument/reflector and for the error of the instrument's/reflector's height measurement.

In the *Instrument Type* tab select the instrument used.

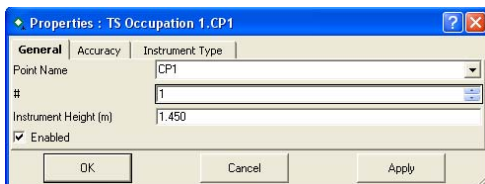


Figure 5-89. Add Manual TS Occupation Dialog Box

- After clicking OK in the **Add Manual TS Occupation** dialog box, the *TS Obs* tab and the **Add Manual TS Obs** dialog box will display (Figure 5-90).

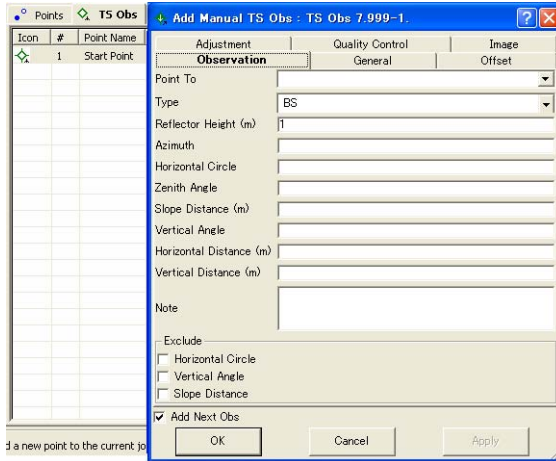
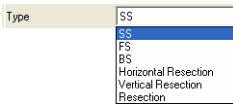


Figure 5-90. Add Manual TS Obs Dialog Box

In the **Add Manual TS Occupation** dialog box, the user can select the type of the measured point and type in all desired measurements for this point



Follow the rules below when manually typing in measurements:

- For BS, set the value for the Horizontal Circle (Figure 5-91 on page 5-59). If this unit was equal to zero, set zero in this field.
- For other points, set the value for the Horizontal Circle, Vertical Angle/Zenith Angle and Slope Distance/Horizontal Distance. If these units were equal to zero, set zero in these fields.

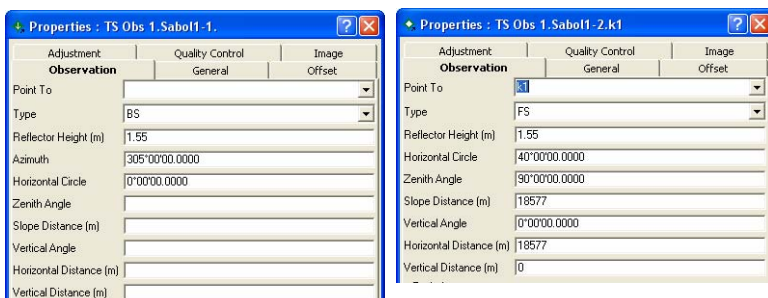


Figure 5-91. Properties for BS and FS points

- After clicking OK in the *Add Manual TS Obs* dialog box to save this observation in the tab, the next *Add Manual TS Obs* dialog box will display to add a new observation if the *Add Next Obs* box  *Add Next Obs* is checked.

The parameters entered and calculated in the left pane of the *TS*

*Obs* tab are editable

Icon	#	Point From	Point To	Reflector H...	Azimuth	Horizontal C...
📍	1	Start Point		1.550	305°00'...	0°00'00.0000
📍	2	Start Point	k1	1.550		3
📍	3	Start Point	3	1.550		120°00'00.0...
📍	4	Start Point	4	1.550		300°00'00.0...

- To obtain the coordinates for the TS observations, click **Process ▶ Compute Coordinates**.

The *Points* tab and the Map/CAD View will display the coordinates for these TS Observations (Figure 5-92 on page 5-59).

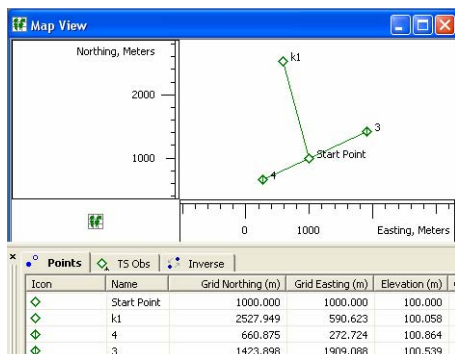


Figure 5-92. Calculating Coordinates for TS Observations

## Manually Adding Digital Run

Spectrum Survey Office does not allow the user to edit the raw data collected in the field using Digital Level. But the software allows manual adding of DL measurements to the job and editing those values

(Figure 5-93).

To add the leveling job to the Spectrum Survey Office job, take the following steps:

1. **Add ▶ Manual DL Run**

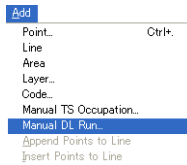


Figure 5-93. Add->Manual DL Run

2. In the *General* tab of the *Add Manual DL Run* dialog box (Figure 5-94) type in the name of the leveling job and set the number of the leveling.

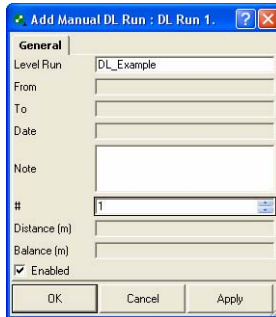


Figure 5-94. Add Manual DL Run dialog box

3. After clicking OK in the *Add Manual DL Run* dialog box, the *DL Obs* tab and the *Add Manual DL Obs* dialog box will display (Figure 5-95)

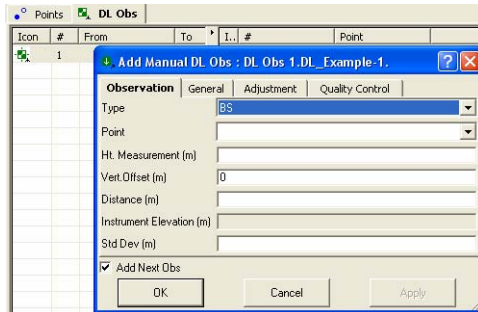



Figure 5-95. Add Manual DL Obs Dialog Box

In the *Add Manual DL Obs* dialog box, the user can select the type of the measured point  and enter all desired measurements for this point.

Spectrum Survey Office will prompt the user to make DL observations in the following order from which the station will be measured:

- the BS point
- the FS point
- the FS point (repeated measurement)
- the BS point (repeated measurement)

Therefore, the point type for the first observation is BS. After clicking OK in the *Add Manual DL Obs* dialog box to save this BS observation in the tab, the next *Add Manual DL Obs* dialog box (for FS- observation) will display to add a new observation (if the *Add Next Obs* box  *Add Next Obs* is checked).

The parameters which were entered and calculated in the left panel of the *DL Obs* tab are editable (except the ‘Instrument Elevation’)  
(Figure 5-96).

I..#	P...	B5 (m)	Instrument Elevati...	FS (m)	Elevation (m)	Distance (m)
1	1	1.620	1.620		0.000	20.000
2	2		1.630	-0.800	2.430	24.000
3	2		1.610	-0.820	2.430	24.000
4	1	1.620	1.620		0.000	20.000

Figure 5-96. The Left Panel of the DL Observation Tab

To obtain the coordinates for the DL observations, click **Process ▶ Adjustment**. The *Points* tab will display elevations for these DL Observations (Figure 5-97).

Icon	Name	Ground Northin...	Ground Easting ...	Elevation (m)
•	Start Point	500,000	500,000	10,000
□	1			0,000
□	2			2,430

Figure 5-97. Calculating Elevations for DL Observations

## Editing Data Properties

Each data type has a *Properties* dialog box associated with it that displays editable and viewable information particular to the selected data.

When selecting several items of the same data type, all items are represented on one dialog box, and any changes made to the editable fields are applied to all selected items.

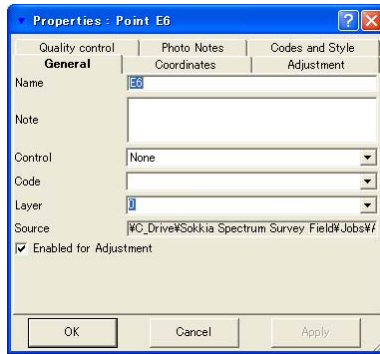
## Editing Point Properties

The *Properties* dialog box varies slightly depending on the number of points selected; the *Codes and Style* tab is not available when viewing the properties of multiple points.

- To view properties for one or several selected point(s):
  - right-click a point and click **Properties** on the pop-up menu.
  - click **Edit ▶ Properties**

The *Properties* dialog box varies slightly depending on the number of points selected.

2. View or edit *General* tab fields (Figure 5-98):
  - Editable fields – point *Name* (for single points), *Notes*, *Codes*, *Layers*, and the type of *Control* used for the point(s).
  - Selectable fields – *Enabled for Adjustment* includes the point in the adjustment process only; disable this parameter to exclude the point from adjustment.



**Figure 5-98. General Properties**

3. For single point selections, view or edit *Codes and Style* tab fields. These fields list point codes; right-click in the name field to add a code, copy/paste a code, or delete a code from the point (see “Editing Codes Used for Points” on page 5-45 for details on editing codes in this tab).
4. View or edit *Coordinates* tab fields (Figure 5-99). Available fields depend on the coordinate type selected in Job configuration.

- View *Adjustment* tab fields for standard point deviations (Figure 5-99).

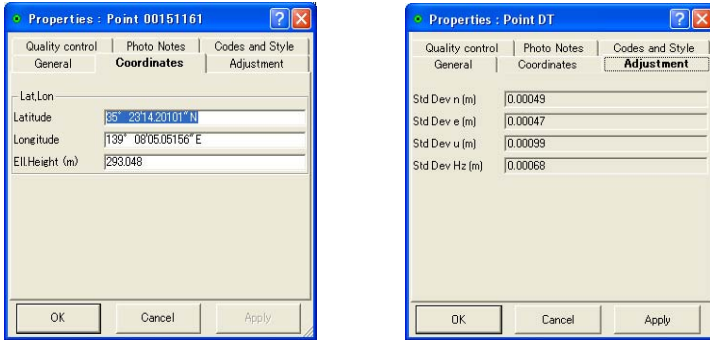


Figure 5-99. Coordinates and Adjustment Properties

- View *Quality Control* tab contains informational text on selected points (marked in red on the views) that did not pass some of the quality control checks (Figure 5-100 on page 5-64). To turn off the feature that marks a point red when it fails some quality control tests, select the *Ignore QC* check box.
- When finished, click **OK** to apply the changes and close the dialog box.
- The *Photo Notes* tab (Figure 5-100 on page 5-64) displays the image(s) per the point. It is possible to add image(s) for the point.

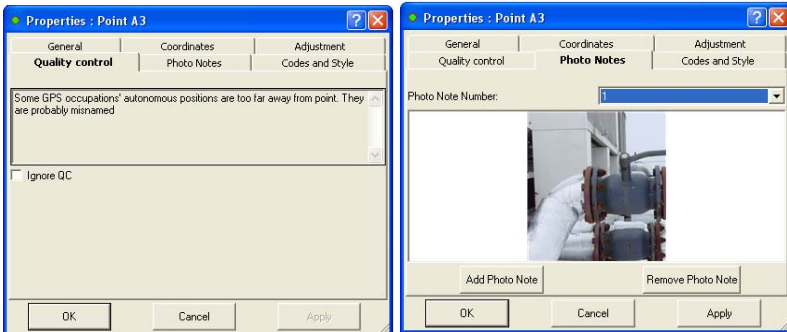


Figure 5-100. Quality Control and Photo Notes Properties



## Editing GPS Occupations Properties

The *Properties* dialog box varies slightly depending on the type of occupation selected. For some occupations, additional fields provide further information.

1. To view or edit properties for one or several selected GPS occupation(s):
  - right-click an occupation and click **Properties** on the pop-up menu
  - click **Edit ▶ Properties**
2. View or edit *General* tab fields (Figure 5-101 on page 5-66). The fields vary, depending on the type of occupation selected.
  - Editable fields – original/point names and any *Notes* associated with the point(s).
  - Selectable fields – *Enabled* includes all vectors based on this occupation in processing; disable this parameter to exclude the occupation from processing.
  - For PP occupations, the *Orbit* field displays the type of orbit data available for processing this occupation. If “None” displays, the occupation is marked with red and the QC tab

contains text describing the problem (for example: “No ephemeris”). No processing can be done without orbit data.  
for Static Occupation

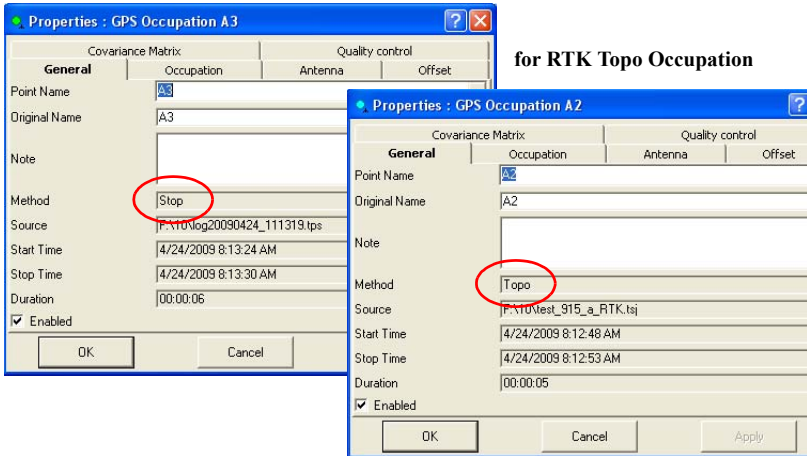


Figure 5-101. General Properties

- View the Covariance Matrix tab that displays six elements of covariance matrix for the single occupation, where
  - $\text{SigmaX}$ ,  $\text{SigmaY}$ ,  $\text{SigmaZ}$  - the square root of the corresponding diagonal element,
  - $\text{Corr}(X,Z)$ ,  $\text{Corr}(X,Y)$ ,  $\text{Corr}(Y,Z)$  - normalize cross-correlation coefficients.
 If this occupation is a Static (for post- processing) occupation, this tab will display only  $\text{SigmaX}$ ,  $\text{SigmaY}$ ,  $\text{SigmaZ}$  for standalone solution (in spite of the status (processed or not processed) presented in GPS observation for this occupation).

If this occupation is a Topo (from RTK solution) occupation, this tab will display all six elements of covariance matrix for the current RTK solution.

**for Static Occupation**

General	Occupation	Antenna	Offset
<b>Covariance Matrix</b>			
Quality control			
SigmaX	0.6543126106		
SigmaY	0.7131575942		
SigmaZ	1.0668532658		
CorX-Y	0.0000000000		
CorX-Z	0.0000000000		
CorY-Z	0.0000000000		

**for RTK Topo Occupation**

General	Occupation	Antenna	Offset
<b>Covariance Matrix</b>			
Quality control			
SigmaX	0.0032407204		
SigmaY	0.0031363398		
SigmaZ	0.0056852421		
CorX-Y	0.6000000238		
CorX-Z	0.4900000095		
CorY-Z	0.5899999738		

**Figure 5-102. Covariance Matrix for Different Occupations**

- View or edit *Antenna* tab fields. See “Option 2: Edit in the Properties Dialog Box” on page 5-5 for details on editing these fields.
- View or edit *Offset* tab fields. See “Editing Antenna Offsets” on page 5-7 for details on editing these fields.
- View *Quality Control* tab contains informational text on selected occupations (marked in red on the views) that did not pass some of the quality control checks (Figure 5-103 on page 5-68). To turn off the feature that marks a point red when it fails some quality control tests, select the *Ignore QC* check box.

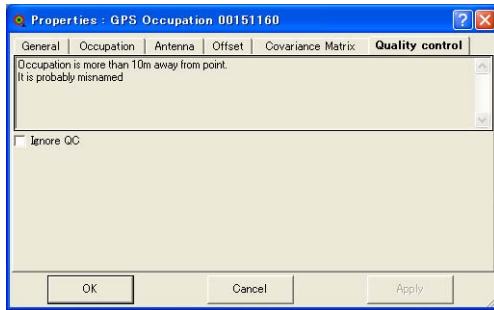


Figure 5-103. Quality Control Properties

- When finished, click **OK** to apply the changes and close the dialog box.

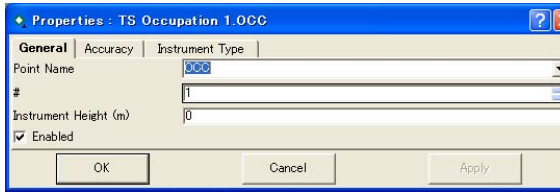
## Editing TS Obs Properties

The *Properties* dialog box varies slightly depending on the panel in which data is selected.

### Edit TS Occupations Properties

The TS occupations panel *Properties* dialog box sets point name, point number, instrument height, and instrument type information.

- To view properties for one or several selected TS occupation(s), right-click an occupation in the left panel of the *TS Obs* tab, then do one of the following:
  - click **Properties** on the pop-up menu
  - click **Edit ▶ Properties**
- View or edit *General* tab fields (Figure 5-104 on page 5-69).
  - Editable fields – *Point name*, *Instrument height*, *Station number*, and *Instrument height*.
  - Selectable fields – *Enabled* includes all vectors based on this occupation in processing; disable this parameter to exclude the occupation from adjustment.



**Figure 5-104. General Properties**

3. View or edit *Accuracy* tab fields. See “Option 2: Edit in the Properties Dialog Box” on page 5-54 for details on editing these fields.
4. View or edit *Instrument Type* tab fields. See “Option 2: Edit in the Properties Dialog Box” on page 5-54 for details on editing these fields.
5. When finished, click **OK** to apply the changes and close the dialog box.

## Edit TS Observations Properties

The TS observations panel *Properties* dialog box sets point name, point number, instrument height, and instrument type information.

1. To view properties for one or several selected TS observation(s):
  - right-click an observation in the right panel of the TS Obs tab and click **Properties** on the pop-up menu
  - click an observation in the right panel of the TS Obs tab and click **Edit ▶ Properties**
2. View or edit *General* tab fields (Figure 5-105 on page 5-70).
  - Editable fields – *Code*, *String*, *Control Code* and *Control Code2*.
  - Selectable fields – *Enabled* includes the vector during processing; disable this parameter to exclude the vector from processing.

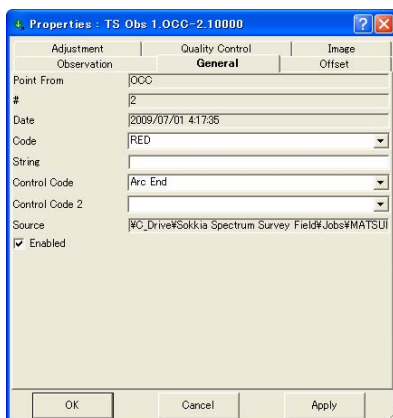


Figure 5-105. General Properties

3. View or edit *Observation* tab fields.

- Editable fields - *Point To*, *Type of observation* (except BKB points), *Azimuth* (only for BKB points measured to the point with unknown coordinates) and *Reflector Height*.
- Selectable fields (available for all types of the points except BKB points) - To exclude *Horizontal Circle* and/or *Vertical Angle* and/or *Slope Distance* from adjustment and from export to a raw file format, select the *Exclude* check box for the corresponding measurement.

4. View or edit *Offset* tab fields for editing offsets and selecting the offset Type (Figure 5-106).

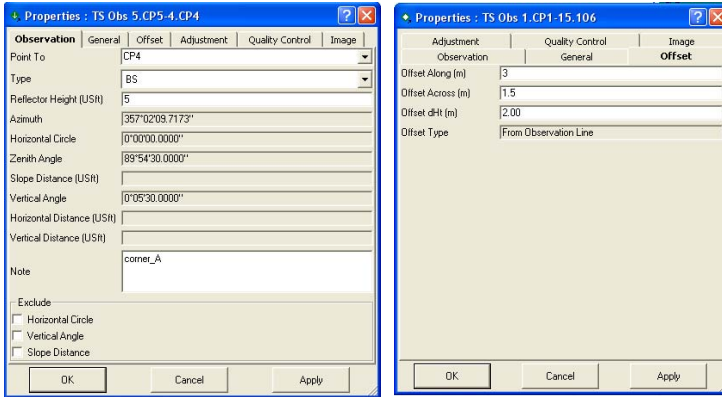


Figure 5-106. Observation and Offset Properties

5. View or edit *Adjustment* tab fields for setting the *AutoReject* option and viewing the status and residuals for the observation (Figure 5-106).
6. The *Quality Control* tab contains informational text on selected observations (marked in red on the views) that did not pass some of the quality control checks (Figure 5-106).
7. The *Image* tab displays the image(s) for the selected TS observation (Figure 5-107)

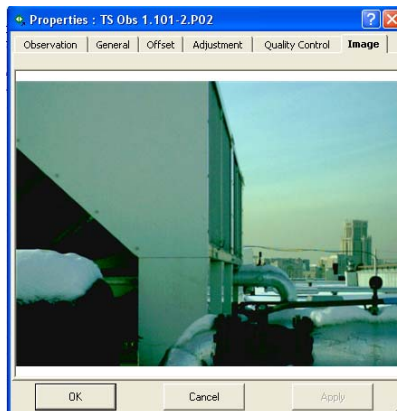


Figure 5-107. Image Properties.

8. When finished, click **OK** to apply the changes and close the dialog box.

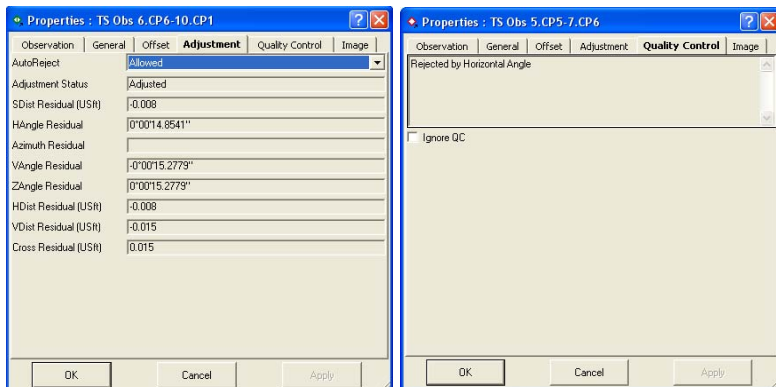


Figure 5-108. Adjustment Properties

## Editing GPS Obs Properties

The *Properties* dialog box varies slightly depending on the type of observation selected. For some observations, additional fields provide further information: for kinematic observations, “Adjustment status” and “Reject mode” are not displayed; the “Point to” field for RTK autotopo observations can be edited

- To view properties for one or several selected GPS observation(s):
  - right-click an observation in the right panel of the GPS Obs tab and click **Properties** on the pop-up menu
  - click an observation in the right panel of the GPS Obs tab and click **Edit ▶ Properties**
- View or edit *General* tab fields (Figure 5-109); available fields differ depending on the type of observation selected.
  - Editable fields – *Notes* for all observations, *Point to* for RTK autotopo observations



- Selectable fields – *Enabled* includes the vector during processing, adjustment, and export; disable this parameter to exclude the vector from processing.

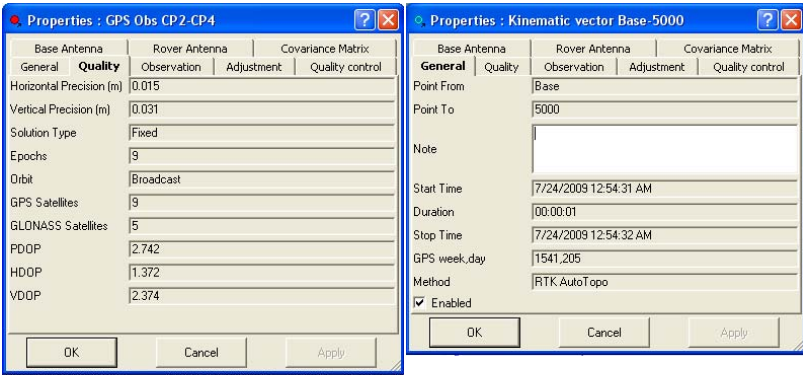


Figure 5-109. General Properties

3. View *Observation* tab fields which contain fields for viewing the vector solution type (dX,dY,dZ, Azimuth, Elevation Angle, Distance, dN,dE,dHt) (Figure 5-110 on page 5-73).

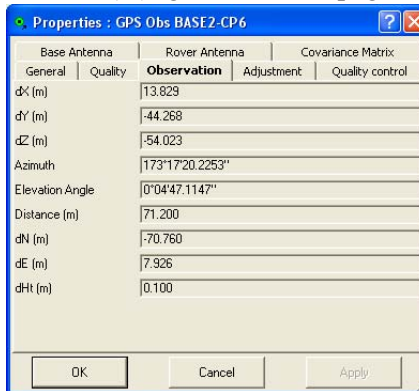


Figure 5-110. Observation Properties

4. View *Quality* tab fields which contain the fields for viewing (Figure 5-111 on page 5-74):
  - Horizontal/vertical precisions.
  - The solution type.
  - The number of epochs over the common data time interval.

- The number of GPS/GLONASS satellites (SV's). For RTK observation, the common number of SV's observed by the base and rover in the last common epoch. For PP observation, the common number of SV's observed by the base and rover during the whole observation time.
- The position dilution of precision (HDOP and VDOP) in the last common epoch for RTK observation (taken from the Spectrum Survey Field RTK job).
- The type of orbit data available for processing this observation.

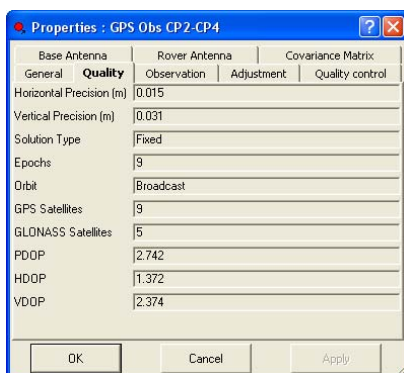


Figure 5-111. Quality Properties

5. View or edit *Adjustment* tab fields, which differ depending on the type of observation selected: for static observations, set the *AutoReject* option and view the status and residuals for the observation; for kinematic observations, only residuals information displays. Select the *AutoReject* parameter as needed (Figure 5-112).

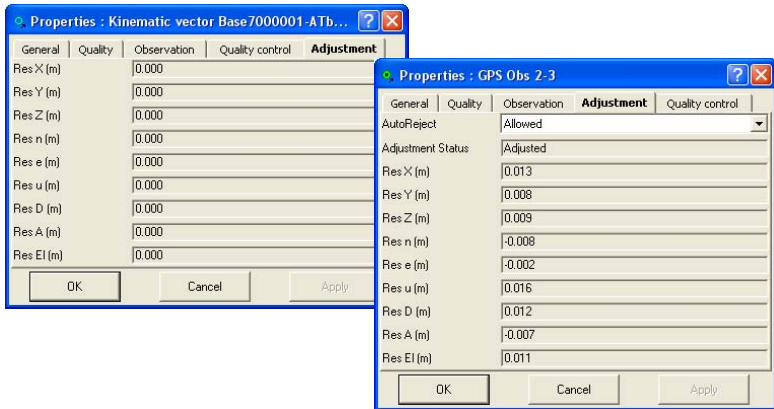


Figure 5-112. Adjustment Properties

- View *Quality Control* tab contains informational text on selected observations (marked in red on the views) that did not pass some of the quality control checks (Figure 5-113 on page 5-75).

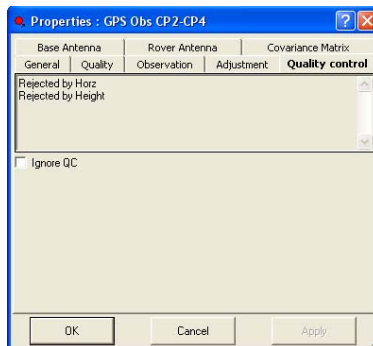
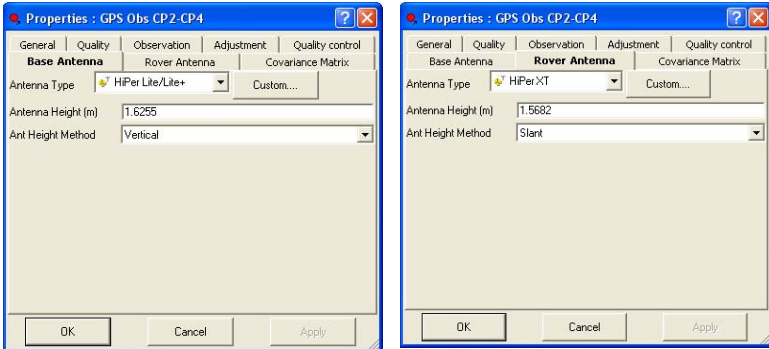
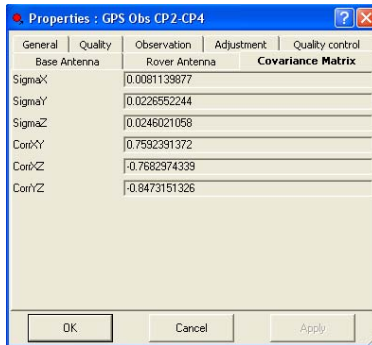


Figure 5-113. Quality Control Properties

- View or edit *Base antenna* and *Rover Antenna* tab fields, for corresponding antennas: select the desired antenna type, antenna height and antenna height method for the selected observation



- View the *Covariance Matrix* tab that displays six elements of covariance matrix for the given GPS observation, where  $\text{SigmaX}$ ,  $\text{SigmaY}$ ,  $\text{SigmaZ}$  - the square root of the corresponding diagonal element,  $\text{Corr}(X,Z)$ ,  $\text{Corr}(X,Y)$ ,  $\text{Corr}(Y,Z)$  - normalize cross-correlation coefficients.



- When finished, click **OK** to apply the changes and close the dialog box.

# Processing, Adjusting, & Localizing Points

When working with GPS+ raw data, you will need to first process the GPS observation with GPS+ PostProcessing (DGPS PostProcessing for the GIS module) to obtain observation vectors and approximate coordinates of observed points. For some applications, the quality of the approximate coordinates will be good enough, but for high-precision applications, run an adjustment on the observations to further improve point coordinates.

The adjustment function also adjusts total station networks, combined GPS and total station networks, and recomputes coordinates of RTK solutions. The adjustment process will try to compute improved positions for all points in the job (that have not been disabled or filtered out).

To transform coordinates between a GPS coordinate system (WGS84) and a local coordinate system, use the localization process to compute transformation parameters.

## Setting Process and Adjustment Properties

The properties dialog box for processing and adjusting applies adjustment, TS computation, and GPS+ PostProcess parameters.

1. To set process and adjustment parameters, do one of the following (Figure 6-1 on page 6-3):
  - Click **Process ▶ Process Properties** to display the *Process properties* dialog box.

- Click **Job ▶ Job Configuration**, then click **Process** in the left panel of the *Job Configuration* dialog box.

The Process panel in the *Job Configuration* dialog box and the *Process properties* dialog box display the same parameters.

2. On the *Adjustment* tab, select the following adjustment parameters (Figure 6-1 on page 6-3):
  - Confidence level for the adjustment process: either 68%, 95%, or 99% (Figure 6-1). The default confidence level is 95%.
  - Rejection criterion for rejecting bad observations. The default rejection criterion is By Quality Control.
  - Tests to run before adjusting the network. All tests are selected by default.
3. On the *A priori UWE* tab of *Adjustment Process* sub-menu, select a priority unit of weight error for the GPS vector in vertical, horizontal or 3D adjustment, and for slope distance, horizontal angle, vertical angle of TS measurements in adjustment of network (Figure 6-1 on page 6-3). The default confidence level is 1.
4. On the *TS-Computations* tab, select the refraction coefficient: either 0, 0.14, or 0.2 (Figure 6-1 on page 6-3). The default is 0.14.
5. On the *GPS+ PostProcess* tab, select (Figure 6-1 on page 6-3):
  - the elevation mask
  - the navigation system
  - the limit of the vector distance
 

If the distance of a job vector exceeds the specified limit, Spectrum Survey Office will not create GPS observation for it
  - the minimum duration for station mode (Auto or Fixed Time)
  - enables/disables creating GPS observation for the ‘Kinematic’ occupation

- enables/disables creating GPS observation for the ‘Go’ occupations
- enables/disables calculating the DPOP value for all type of post-processed observations (Figure 6-1 on page 6-3).
- enables/disables auto import of the corresponding occupation of the base (reference) station from the Internet into the current job.

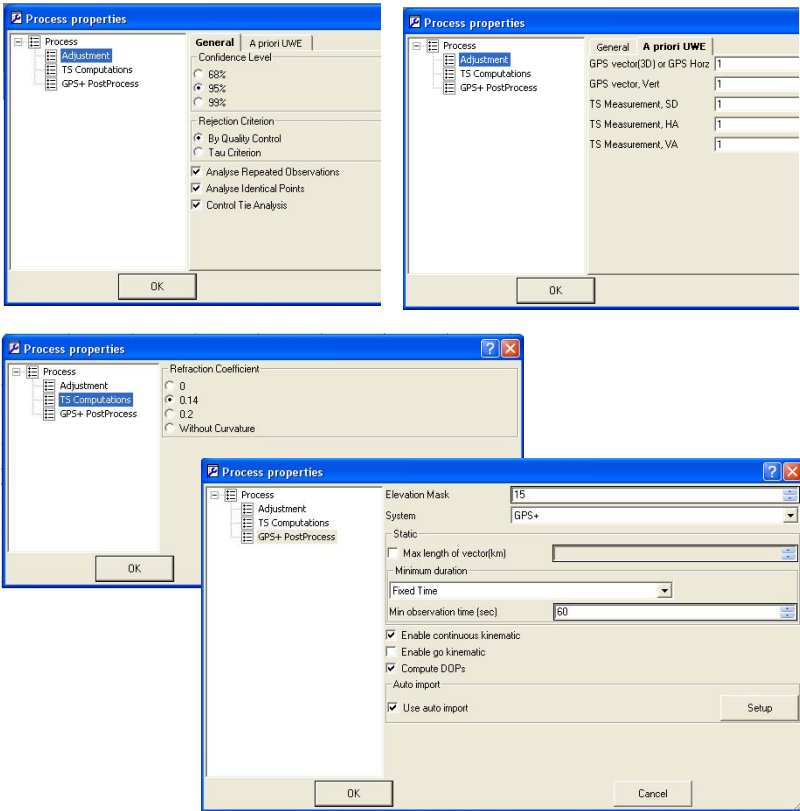
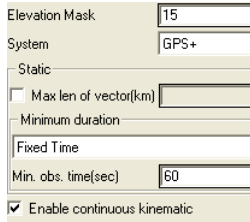


Figure 6-1. Process Properties

# Enabling GPS Observations for Kinematic Occupation

To display and process GPS kinematic data, check mark the “Enable continuous kinematic” box on the *GPS+ PostProcess* tab (Figure 6-1).



Elevation Mask	15
System	GPS+
Static	
<input type="checkbox"/> Max len of vector(km)	
Minimum duration	
Fixed Time	
Min. obs. time(sec)	60
<input checked="" type="checkbox"/> Enable continuous kinematic	

**Figure 6-2.** Select ‘Enable Continuous Kinematic’ to Display/Process GPS Observations

When enabled, the following data will display in Spectrum Survey Office if the job has kinematic data:

- kinematic points in the Points tab and Map view
- kinematic observations in the GPS tab
- kinematic trajectories in the Map view

For each epoch in a kinematic occupations that can be post-processed, Spectrum Survey Office will generate a kinematic point with a unique name based on the occupation name and epoch GPS time.



## NOTICE

*GPS Observation for kinematic occupation can be processed only from static occupations collected by a motionless receiver*

If importing TPS files collected with Spectrum Survey Field in RTK+PP mode where points were generated by time, Spectrum Survey Office will use the same time interval for generating points and the same naming rules. Therefore, RTK autotopo points and postprocessed kinematic points collected at the same time will merge.



# Enabling Kinematic Data for Go Occupations

‘Go’ occupations are included in Stop-and-Go measurements and by default, the display and processing of GPS Observations for ‘Go’ occupations is turned off. To display and process GPS observations for ‘Go’ occupations, select the “Enable go kinematic” check box on the *GPS+ PostProcess* tab (Figure 6-3)

Elevation Mask	15
System	GPS+
- Static	
<input type="checkbox"/> Max len of vector(km)	
- Minimum duration	
Fixed Time	
Min. obs. time(sec)	60
<input type="checkbox"/> Enable continuous kinematic	
<input checked="" type="checkbox"/> Enable go kinematic	
<input type="checkbox"/> Compute DOPs	

**Figure 6-3. Select to Display/Process GPS Observation for ‘Go’ Occupations**

When enabled, the following data will display in Spectrum Survey Office if the job has ‘Go’ occupations (Figure 6-4 on page 6-6):

- kinematic points in the Points tab and Map view
- kinematic observations in the GPS tab
- kinematic trajectories in the Map view

For each epoch in ‘Go’ occupations that can be post-processed, Spectrum Survey Office will generate a kinematic point with a unique name based on the occupation name and epoch GPS time.



*GPS Observation for ‘Go’ occupations can be processed only from static occupations collected by a motionless receiver.*

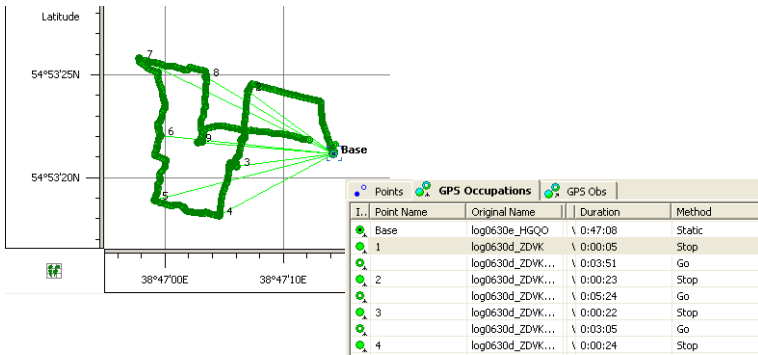


Figure 6-4. Example of creating GPS Observation for Go Occupations

## Enabling or Disabling Point Data

In the Tabular, Map, or Occupation view, use the pop-up menu or Edit menu to include/exclude data in the processing and/or adjustment processes.

- Select single or multiple data, right-click and click **Enable** or click **Disable** on the pop-up menu.
- Select single or multiple data, click **Edit ▶ Enable** or **Edit ▶ Disable**.
- Select single or multiple data, open the *Properties* dialog box, enable/disable the *Enabled* parameter on the *General* tab. The *Properties* dialog box for some data types only allows this parameter for adjustment, or for processing and adjustment.

Disabled data is grayed-out in all views.

## Enabling or Disabling Epochs

In the Occupation View (Figure 6-5), you can display the satellite vehicles for individual occupations. For advanced users, disabling or enabling epochs for use in postprocessing will help to “fine tune” the results of postprocessed data.

Click the +/- button next to the occupation or right click the occupation and click **Show SVs** on the pop-up menu. The total epoch for each satellite displays under the occupation (Figure 6-5).

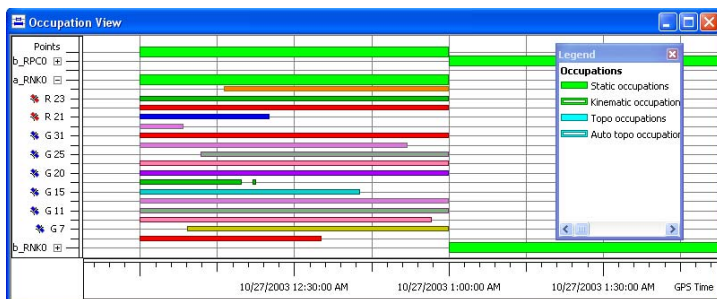


Figure 6-5. Satellite Occupation Times

1. To select individual epochs for disabling/enabling, zoom in on a selected satellite vehicle occupation.
2. Either drag a square around an epoch or click a satellite's epoch (Figure 6-6 on page 6-8) to select the desired epoch(s) and time interval(s).
  - When dragging a square to select certain epochs, any epoch with starting times within the selection square will be selected; or, the entire epoch will be selected if the selection square falls within the start and end time of the epoch.
  - When selecting epochs, hold the CTRL or Shift to select multiple epochs.
  - To deselect and invert the selection for certain epochs, hold the CTRL key and click the epochs to deselect.

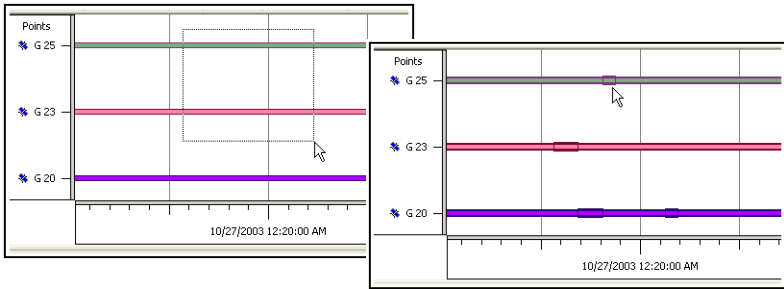


Figure 6-6. Selecting Epochs

- Once selected, right-click within the view and click **Disable** (or **Enable**) on the pop-up menu. Disabled epochs display with slanting lines (Figure 6-7).

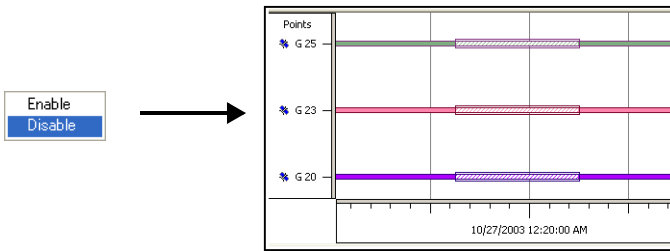


Figure 6-7. Disable Selected Epochs

## Processing

The processing function processes vectors (observations) according to the parameters entered and selected in the Quality Control and Process panels in Job configuration. See “Setting Process and Adjustment Properties” on page 6-1 for setting process properties.

## Processing All GPS Observations

To process all vectors in the job:

- Click **Process** ► **GPS+ PostProcessing**
- Press **F7** on the keyboard

- Click the **GPS+ PostProcessing**  button.

## Processing Selected GPS Observations

1. Select the desired observation(s) in the Map view or on the *GPS Obs* tab in the Tabular view.

To select GPS observations with certain parameters, use the **Select GPS Obs** dialog box (see “Selecting TS Observations” on page 4-42 for details).

2. In the *GPS Obs* tab, right-click the selected observation(s) and click **GPS+ PostProcessing** on the pop-up menu (Figure 6-8).

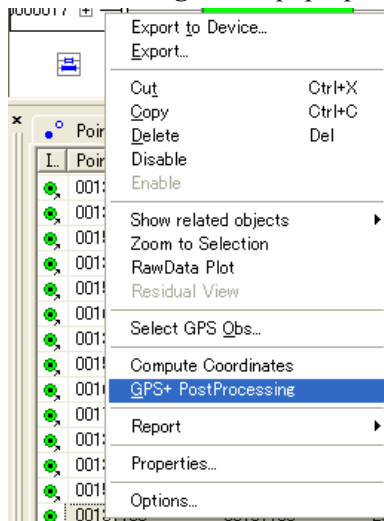


Figure 6-8. Process Selected GPS Observation(s)

## Understanding the Results

The **Legend** dialog box (Figure 6-9) shows and describes the icons and colors used for each data item.

In the Map view, post processed data display as bright green and red lines. Baselines with horizontal/vertical precisions worse than the value set in the current job will display red. Figure 6-9 on page 6-10

shows before and after example Map view screen shots of the PostProcess function for selected observations.

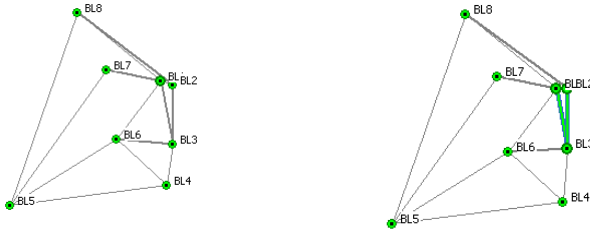


Figure 6-9. Example PostProcess in Map View

In the Tabular view, adjusted and post processed information display in the following data columns:

- horizontal and vertical precisions of the vector solution
- GPS observation values displays vector increments, in the selected display option
- type of solution used for the vectors; either Fixed (all ambiguities have been fixed to integers) or Float (all estimated ambiguities are float numbers)

Figure 6-10 shows before and after example Tabular view screen shots of the Post Process function for selected observations.

Point From	Point To	Start Time	Duration	Note	Horizontal Precision (m)	Vertical Precision (m)	dh (m)	de (m)	du (m)	Method
BL1	BL2	3/18/2003 1:07...	0:10:15		0.002	0.003	-0.039	14.865	-0.126	PP
BL1	BL3	3/18/2003 1:22...	0:10:00		0.007	0.013	-88.415	15.006	-1.011	PP
BL1	BL3	3/19/2003 1:38...	0:06:15		0.005	0.016	-88.420	15.018	-1.029	PP
BL2	BL3	3/19/2003 1:12...	0:06:45		0.007	0.013	-88.381	0.136	-0.900	PP
BL2	BL3	3/19/2003 1:12...	0:06:45		0.007	0.013	-88.394	0.144	-0.931	PP
BL2	BL3									PP
BL2	BL3									PP
BL2	BL3									PP

Figure 6-10. Example of Post Processing in the Tabular View

## About Vector Processing Modes

Spectrum Survey Office uses the following modes for processing static vectors based on the distance of the vector. These modes are automatic based on the length of the vector, and cannot be changed.

The *Solution Type* column of the *GPS Obs* tab displays the type of mode used.

- VLBL (very long baselines) – used if the vector is longer than 40km. The VLBL mode is based on a trivial triple-difference technique and can give ONLY a float solution. In this case, “Iono Free” displays in the Solution Type column.
- WideLane – used for vectors between 30km and 40km. In this case, “Fixed,Wide Lane” or “Float,Wide Lane” displays in the Solution Type column.
- L1&L2c – used for vectors between 10km and 30km. In this case, “Fixed,Iono Free” or “Float,Iono Free” displays in the Solution Type column.
- L1&L2 – used for vectors shorter than 10km. In this case, “Fixed” or “Float” displays in the *Solution Type* column.

The *Solution Type* column of the GPS Obs tab displays the type of mode used.

## Adjustment

TS observations, GPS observations, and DL observations can be adjusted, either together or separately and either constrained or free. In a constrained adjustment, network adjustment is performed from a fixed point(s). In a free adjustment, network adjustment is performed from an arbitrary point (selected by Spectrum Survey Office). Note the following information about adjustments:

- Adjustments on GPS observations will use the selected datum. Adjustments on TS observations will use the sphere of the mean Earth radius. Both of these adjustments will take into account the parameters of the geoid in the current job.

- Before adjusting a network, GPS\TS\DL point coordinates will be re-computed using corresponding observations.
- Spectrum Survey Office performs separate adjustments for plane coordinates and for heights.
- If a control point is fixed, either in the plane or by height, the adjustment will occur for either plane coordinates or heights, respectively.
- Using the Advanced module the dimension of the network adjustment can be selected (1D, 2D, 3D or Auto).



### **NOTICE**

*Before performing a network adjustment with GPS observations, perform GPS+PostProcessing.*

When performing a network adjustment, the adjustment module first analyzes the network and then adjusts the network. The following flowchart (Figure 6-11 on page 6-13) illustrates the adjustment process.

To adjust all observations in the current job, do one of the following:

- Click **Process ▶ Adjustment**
- Press **F8** on the keyboard
- Click the **Adjust Network** button



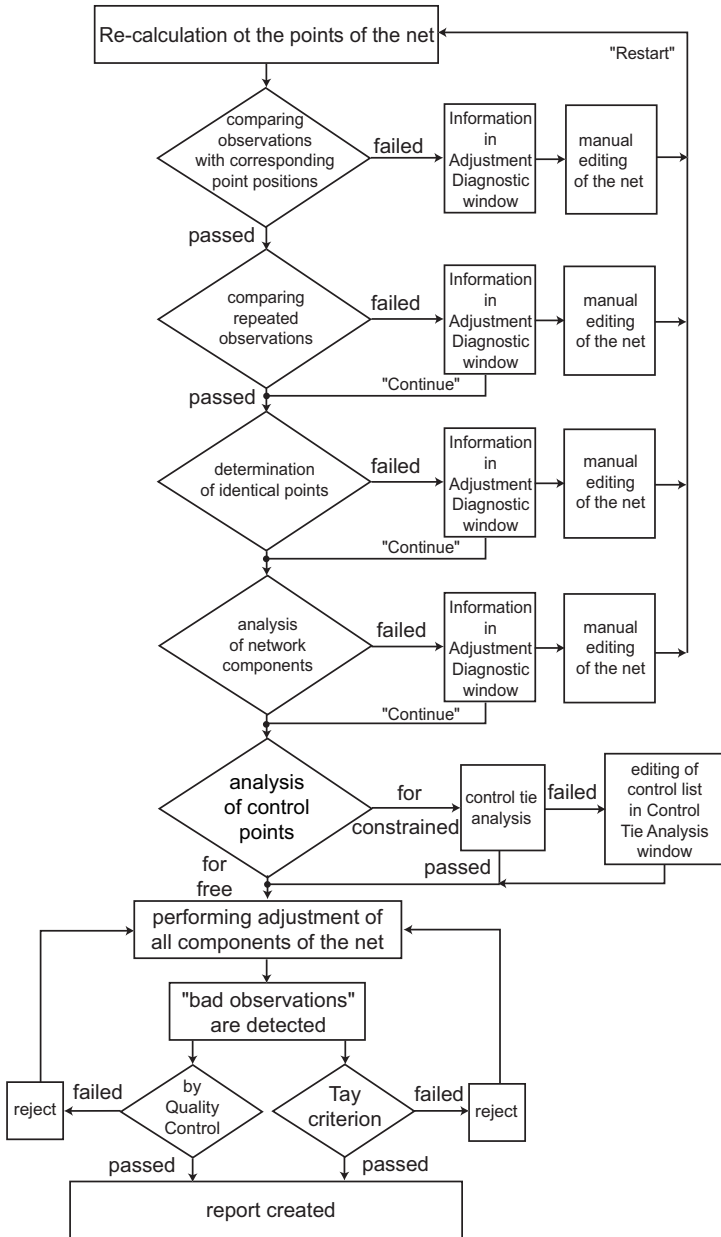


Figure 6-11. Network Adjustment Flowchart

After starting the adjustment procedure, the network is analyzed. While analyzing, network testing may be interrupted and the *Adjustment Diagnostic* dialog box will display (Figure 6-12). This dialog box displays some information about the test(s) being executed and possible issues with the data that could prevent accurate network adjustment. To analyze information from testing and to solve possible issues, do the following:

- Click **Continue** to continue the adjustment without any changes to the data.
- Click **Cancel** to stop the adjustment.
- Click the hyperlink to edit the indicated data of the job.
- Click **Restart** when done to continue the adjustment.
- Click **Save Preliminary Coordinates** to view the preliminary computed coordinates.



**Figure 6-12. Adjustment Diagnostic**

When viewing preliminary coordinates (by clicking Save Preliminary Coordinates on the *Adjustment Diagnostic* dialog box), the Map view will display the point positions that have been computed; some points will not have positions. The following example (Figure 6-13 on page 6-15) shows the before and after Map views for a TS observation adjustment from a point with WGS-84 coordinates. The TS points did not have coordinates in WGS-84 system, only in the ground system used for the job can be viewed. After running the adjustment function, Save Preliminary Coordinates was clicked and a localization was performed on the points using one common point from the job. This localization process only calculated WGS-84 coordinates of the points without adjusting them.



## Adjustment Test: Checking Vector Coordinates

The check vector coordinates test compares the difference between the coordinates of the baseline end points and the baseline coordinates.

- For TS observations, if the difference in distances is more than 40 meters or in angles (horizontal or vertical) is more than 25 degrees, then the network adjustment is interrupted and the *Adjustment Diagnostic* dialog box displays (Figure 6-15).
- For GPS observations, if the difference in distances (computed as square root of sum of squared differences in all three coordinates) is more than 1000 meters, then the network adjustment is interrupted and the *Adjustment Diagnostic* dialog box displays (Figure 6-15).

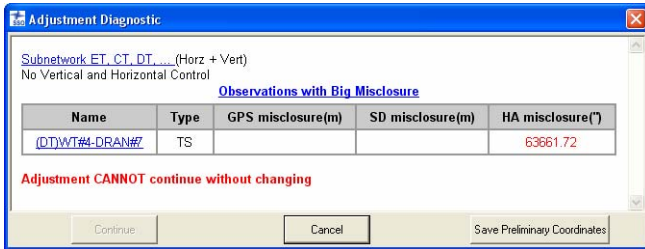


Figure 6-15. Messages After Comparing Observations with Corresponding Points

The presence of such observation(s) in the network is a fatal error and the adjustment cannot continue.

1. Click the hyperlink to access the data that caused the error. The Tab/Map view will display for the observation.
2. Edit the data in the current job.
3. Click **Restart** to continue the adjustment process.

## Adjustment Test: Analysis of Repeated Observations

The repeated observations analysis averages the coordinates of the vector for two or more observations with common start/end names (for example, observations N1-N2 and N2-N1 are assumed as repeated). The averaged observation then replaces the repeated observations. The test will pass or fail based on the values set in the *TS observations/GPS Observations* tab of the **Job Configuration** dialog box (**Job ▶ Job Configuration ▶ Quality Control**).

- A successful test is where the difference between the computed observation and any one of the repeated observations is less than the values set in the **Job Configuration** dialog box.
- A failed test is where the difference is more than the values set in the **Job Configuration** dialog box. The network adjustment process will be interrupted and the **Adjustment Diagnostic** dialog box will display (Figure 6-16).



Figure 6-16. Messages After Analysis of the Repeated GPS Observation

The adjustment process can be continued or can be restarted after making changes to the data.

- Click **Continue** to continue the network adjustment.
- Click the hyperlink to access the data that caused the error. Edit the data and click **Restart** to continue the network adjustment (Figure 6-17 on page 6-18).

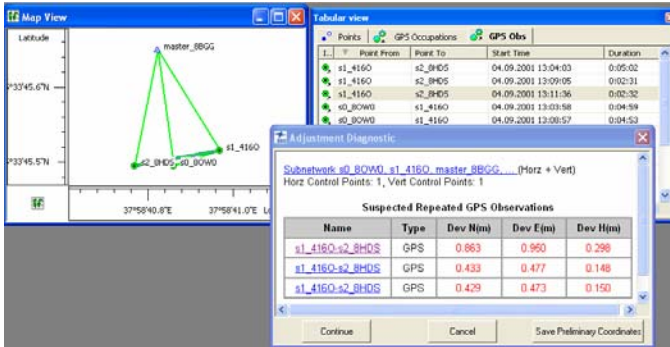


Figure 6-17. Selection of Repeated Observation in Map and Tabular View

## Adjustment Test: Detecting Identical Points

The detect identical points test computes coordinate differences between all points of the current job. The test will pass or fail, based on the values set in the *Point Precisions* tab of the *Job Configuration* dialog box (**Job** ► **Job Configuration** ► **Quality Control**).

- A successful test is where the coordinate difference for a pair of points is more than horizontal/vertical precision set in the *Job Configuration* dialog box.
- A failed test is where the difference is less than the values set in the *Job Configuration* dialog box. The network adjustment process will be interrupted and the *Adjustment Diagnostic* dialog box will display (Figure 6-18).

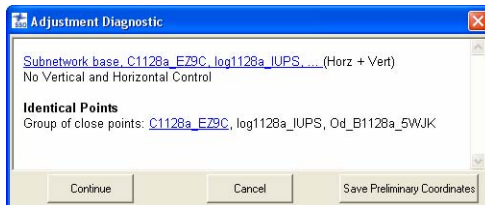


Figure 6-18. Messages After Searching of the Identical Point

The adjustment process can be continued or restarted after making changes to the data.

- Click **Continue** to continue the network adjustment.
- Click the hyperlink to access the data that caused the error. Edit the data and click **Restart** to continue the network adjustment.

## Adjustment Test: Analysis of the Network

The network analysis test identifies the network components that either have no common connections or have weak connections with other components. This test only works on TS observations that have incomplete angle or distance measurements.

- In the absence of a severe error, the isolated components will be adjusted separately.
- If a severe error exists, the network adjustment will stop for ALL components of the network and the *Adjustment Diagnostic* dialog box will display (Figure 6-19). For every component, the dialog box shows the existence/absence of horizontal and vertical control point(s).

If no control points are set for the network, a free adjustment will be performed.

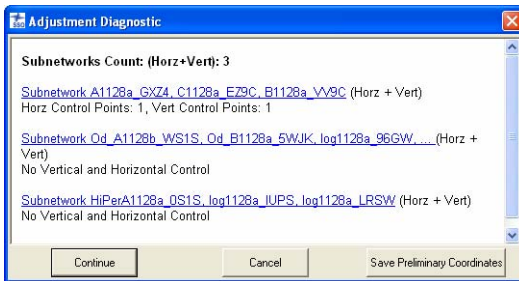


Figure 6-19. Messages After Analysis of the Net Components

The adjustment process can be continued or can be restarted after making changes to the data.

- Click **Continue** to continue the network adjustment.

- Click the hyperlink to access the data that caused the error. Edit the data and click **Restart** to continue the network adjustment.

## Adjustment Test: Analysis of Vertical and Horizontal Control Point(s)

When the current job contains control points, an analysis will determine if the control point has vertical and horizontal coordinates.

- If only vertical control point(s) are found, the adjustment process stops and the *Adjustment Diagnostic* dialog box will display (Figure 6-20). Click **Continue** to perform ONLY a vertical adjustment of the network.

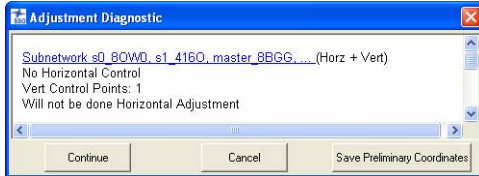


Figure 6-20. Only Vertical Control Point(s)

- If only horizontal control point(s) are found, the adjustment process stops and the *Adjustment Diagnostic* dialog box will display (Figure 6-21). Click **Continue** to perform ONLY a horizontal adjustment of the network.

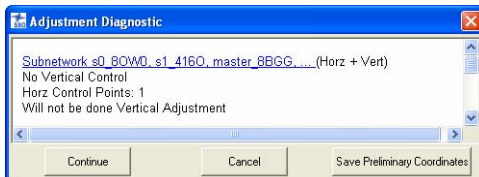


Figure 6-21. Only Horizontal Control Point(s)



## Adjustment Test: Analysis of Consistency of Control

If more than one control point is used for the horizontal/vertical adjustment, the adjustment process also checks the accuracy of the control coordinates. The control tie analysis test compares control coordinates with the appropriate coordinates computed using GPS/TS/DL observations. The resulting residuals are used to estimate the accuracy of the local geodetic reference net being used and to find possible error with the control coordinates.

The *Process properties* dialog box and *Adjustment* tab enable/disable the “Control Tie Analysis” test to the adjustment process (Figure 6-22). The test will pass or fail based on the values set in the *Point Precisions* tab of the *Job Configuration* dialog box (**Job ▶ Job Configuration ▶ Quality Control**).

- A successful test is where the difference is less than horizontal/vertical precision set in the *Job Configuration* dialog box.
- A failed test is where the difference is more than the value of horizontal/vertical precision set in the *Job Configuration* dialog box. The network adjustment process will be interrupted and the *Control Tie Analysis* dialog box will display (Figure 6-22).

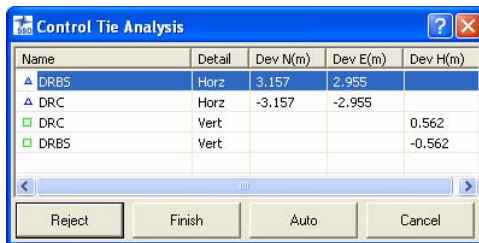


Figure 6-22. Control Tie Analysis

The adjustment process can be stopped, continued, altered, or restarted after making changes to the data.

- Click **Cancel** to stop the Control Tie analysis.
- Click **Finish** to continue the Control Tie analysis without making changes.

- Select a control point and click **Reject** to stop using it as a control point and restart the Control Tie analysis.
- Click **Auto** to automatically stop using the points with a maximum value of residual as control points and restart the Control Tie analysis.

## Evaluating the Quality of the Adjusted Network

The quality of the adjusted network can be evaluated using either the quality control test or the tau criterion test.

1. Click **Process ► Process Properties**.
2. On the Adjustment tab, select the desired rejection criterion (Figure 6-23).

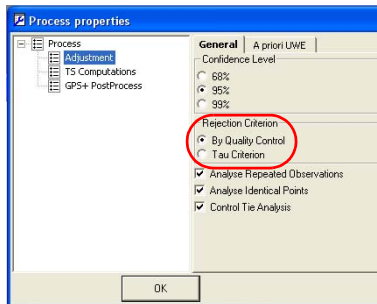


Figure 6-23. Select Rejection Criterion Test

3. To enable/disable using a bad observation for network adjustment, double-click the *Autoreject* column for the desired GPS/TS observation(s) and select the desired usage.
  - Allowed – a bad observation will be automatically rejected from the network adjustment.
  - Not Allowed – a bad observation will be included in the network adjustment. Observations with any residual values will be used in the network adjustment.



Figure 6-24. Allowing/Not Allowing Bad Observations in Network Adjustments

Network components will be retained for adjustment based on the values set in the *GPS Obs Precision / TS Obs Precision* tabs of the **Job Configuration** dialog box (**Job ▶ Job Configuration ▶ Quality Control**).

- A “By Quality Control” test will reject the following network components from the adjustment with residuals worse than the values set for the current job. These residuals are calculated in the adjustment process for the closed figures and/or for repeated observations in the network.
  - all plane components of the GPS observations and distances and/or horizontal angles of the TS observations for plane adjustment
  - all height components of the GPS observations and vertical angles of the TS observation for vertical adjustment
- A “Tau Criterion” test will reject the following network components from the adjustment with a Tau value more than  $Tau_{critical}$ . These residuals are calculated in the adjustment process for the closed figures and/or for repeated observations in the network.
  - all plane components of the GPS observations and distances and/or horizontal angles of the TS observations for plane adjustment
  - all height components of the GPS observations and vertical angles of the TS observation for vertical adjustment

The formula for calculating Tau is:  $Tau = (RES) / \delta_{Res}$

where “(RES)” designates the residual calculated for the corresponding component of the observation and “ $\delta_{Res}$ ” is the RMS residual error.

Note that  $Tau_{critical}$  depends on the number of degrees of freedom and the selected level of confidence (Figure 6-23 on page 6-22).

When the network adjustment completes, the **Adjustment Result** dialog box will display (Figure 6-25 on page 6-24).

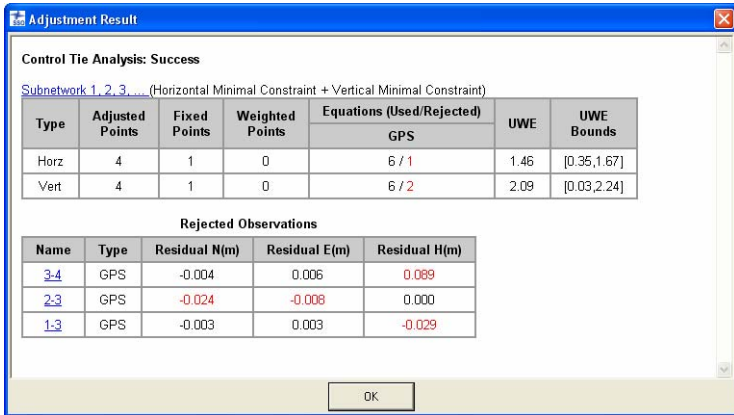


Figure 6-25. Adjustment Results

The results of every test performed on the network will be listed, and displays the following information:

- The results of the Control Tie analysis, either successful or not successful. If not successful, a list of control points that will not be used as fixed control for horizontal/vertical network adjustment will be included (Figure 6-26).



Figure 6-26. Control Tie Results – Successful and Not Successful Examples

- The type of the network adjustment, either free (inner) adjustment, horizontal only adjustment, vertical only adjustment, adjustment with one point in horizontal and vertical control, or adjustment with several points in horizontal and vertical control (Figure 6-27 on page 6-25).

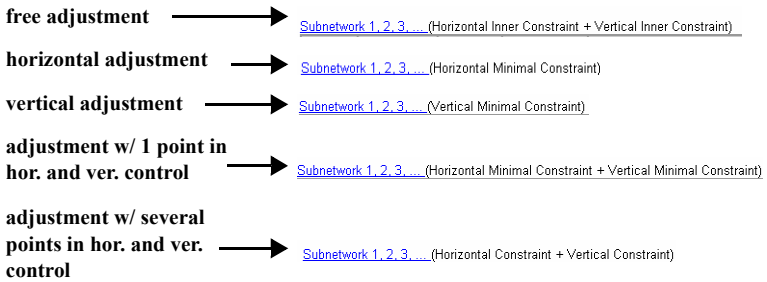


Figure 6-27. Types of Network Adjustments

- The horizontal and vertical adjustments, separately, for the adjusted network, including: the quantity of adjusted points, fixed points and weighted points, the quantity of used observations and rejected observations, errors of unit weight (UWE) and UWE bounds.
- The rejected observations (or the components of observations), if applicable. This table displays the components of observations in red if they are rejected from the network and are not used in the final adjustment.
- The points with precisions worse than the values set for the current job.



The screenshot shows a dialog box titled 'Adjustment Result' with a sub-header 'QC fail Points'. It contains a table with four columns: Name, StdDev N(m), StdDev E(m), and StdDev H(m). The 'StdDev H(m)' column contains values in red text, indicating failed points. An 'OK' button is at the bottom.

Name	StdDev N(m)	StdDev E(m)	StdDev H(m)
WT_stat	0.000	0.000	0.165
ET	0.000	0.000	0.164
DRES	0.000	0.000	0.161
DRBN	0.000	0.000	0.161
DREN	0.000	0.000	0.160
DT	0.000	0.000	0.159
DRAS	0.000	0.000	0.159
DRD	0.000	0.000	0.159

Figure 6-28. Adjustment Results for Point Precisions

- The observations with residuals worse than the values set for the current job (Figure 6-29 on page 6-26).

QC fail Observations				
Name	Type	Residual N(m)	Residual E(m)	Residual H(m)
master_BGGG-s2_8HDS	GPS	-0.458	0.734	-0.818

OK

Figure 6-29. Adjustment Results for Observation Residuals

After the adjustment the Map and Tabular views update with the adjusted data.

- In the Map view, adjusted points are displayed as a circle icon with equatorial lines, and observations are displayed as red lines if a component(s) of this observation was rejected from the network adjustment (Figure 6-30).

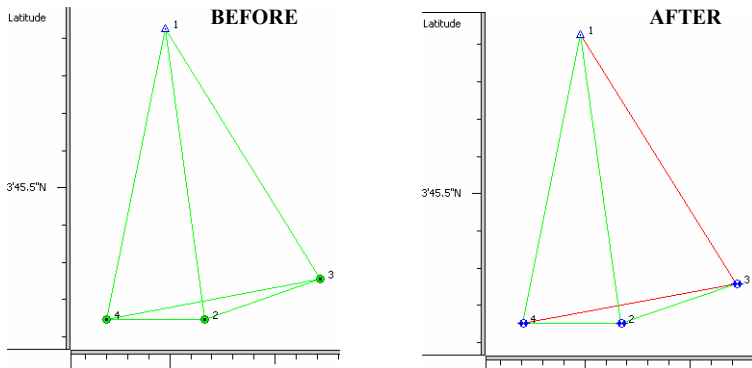


Figure 6-30. Map View – Example of Adjustment

- In the Tabular view, information on the adjustment displays in the following data columns:
  - The *Points* tab displays the point's standard deviation.
  - The *TS Obs / GPS Obs* tabs display observation residuals.

Std Dev n (m)	Std Dev e (m)	Std Dev Hz (m)	Std Dev u (m)
0.000	0.000	0.000	0.000
0.002	0.002	0.003	0.007
0.003	0.002	0.004	0.007
0.005	0.004	0.007	0.012

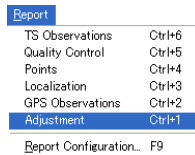
Adjustment Sta...	Res n (m)	Res e (m)	Res u (m)
Adjusted	-0.007	0.013	-0.009
Adjusted	0.007	0.003	-0.006
Adjusted	-0.002	-0.002	-0.002
Adjusted	0.002	0.000	-0.001
Adjusted	-0.002	-0.000	0.001
Adjusted	0.002	-0.002	0.002

Figure 6-31. Points and Obs Tabs – Examples of Adjustment

## Viewing the Adjustment Report

After adjusting data in Spectrum Survey Office, the adjustment report provides a summary of adjustments made to measured vectors.

Click **Report ▶ Adjustment** (Figure 6-32) to view the adjustment report,



**Figure 6-32. View Adjustment Report**

The **Adjustment Report** opens in a separate window and displays information about the adjustment. See “Adjustment Report” on page 7-7 for details.

- To save the report as a file, click the **Save As** button. Enter the location and name information, then click **Save**.
- To copy the report to a text editor such as Microsoft® Word or Outlook Express, click the **Select All** then **Copy** buttons. Open the desired application and **cut and paste** the information.
- To print the report, click the **Print** button.

## Processing Loop Closures and Viewing the Report

Loop closures use GPS observations (vectors) that form a closed loop to sum all vectors in the loop to get a resulting residual vector close to zero. This residual is compared against a threshold value (*Horz Tolerance* and *Vert Tolerance*). The threshold values calculated as

$$\text{Horiz Tolerance} = \text{Horiz Tolerance abs} + \text{Horiz Tolerance rel} \cdot \text{Length} \cdot 10^{-6}$$

$$\text{Vert Tolerance} = \text{Vert Tolerance abs} + \text{Vert Tolerance rel} \cdot \text{Length} \cdot 10^{-6}$$

where the values of the *HorzTolerance abs* / *Vert Tolerance abs* and *Horz Tolerance rel* / *Vert Tolerance rel* are configured in **Job Configuration ▶ Quality Control ▶ Loop Closure Precisions** tab.

The residual shows as red in the report, if the value of the residual is greater than this threshold.

1. To generate a loop closure report, click **Process ▶ Loop closures**. The *Loop closures* dialog box will display (Figure 6-33).

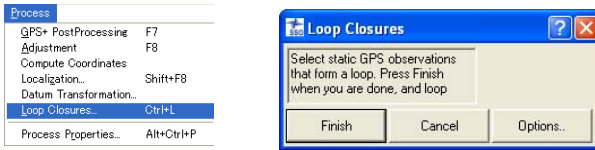


Figure 6-33. Process Loop Closure

2. On the main screen (Map View or *GPS Observations* tab) select static GPS observations that form a loop(s) (Figure 6-34).

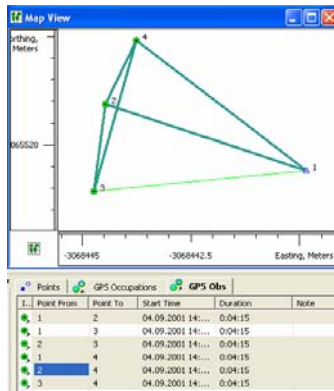


Figure 6-34. Select Vectors the Form a Loop

3. Perform one of the following to view or edit the loop closure report (Figure 6-35 on page 6-29):
  - Click **Finish** on the *Loop closures* dialog box to display the standard Loop Closure Report. The standard Loop Closures Report opens in a separate window.
  - Click **Cancel** on the *Loop closures* dialog box to stop creating of the Loop Closure Report.
  - Click **Options** on the *Loop closures* dialog box to edit the configuration of the standard Loop Closure Report. See



“Editing Loop Closure Report Options” on page 6-29 for more information.

Loop Closures							
Loop	dHz (m)	dU (m)	Horz Tolerance (m)	Vert Tolerance (m)	dHz (ppm)	dU (ppm)	Length (m)
1-2(04.09.2001 14:07:43)							
1-4(04.09.2001 14:07:43)	0.0024	0.0007	0.0301	0.0401	201.67	58.32	12.097
2-4(04.09.2001 14:07:43)							
2-3(04.09.2001 14:07:43)							
2-4(04.09.2001 14:07:43)	0.0179	0.0535	0.03	0.04	2259.98	6749.0	7.9293
3-4(04.09.2001 14:07:43)							

Figure 6-35. View Loop Closure Report

The standard Loop Closure Report displays the following information about selected static GPS observations:

- Loop – the observations that form a closed loop.
- dHz and dU – displays the absolute horizontal and vertical misclosures for the given loop.
- Horz Tolerance / Vert Tolerance (m) – the threshold values used during the process.
- dHz (ppm), dU (ppm) – the accuracy of the loop in parts per million.
- Length (m) – the length of the loop.

## Editing Loop Closure Report Options

To edit the type of information that displays on the Loop Closure Report, click **Options** on the *Loop closures* dialog box

The *Loop Closure Report Options* dialog box displays after clicking **Options** on the *Loop closures* dialog box (Figure 6-36).

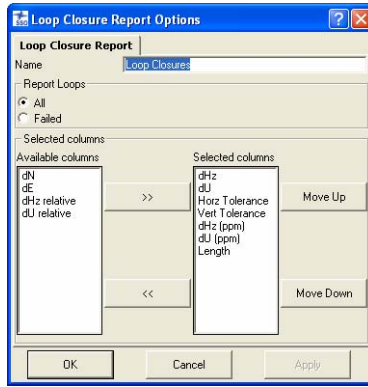


Figure 6-36. Loop Closure Report Options

On the *Loop Closure Report Options* dialog box, select and/or arrange the informational columns that will display on the report. Click **Ok** when done, then run the report as described above.

- To rename the report (create customized loop closure reports), enter a name for the report.
- If adding items to the report, select the items to include in the left column and click the move right (>>) button.
- If removing items from the report, select the items to remove and click the move left (<<) button.
- Use the **Move Up** and **Move Down** buttons to order included/existed items.

## Localization

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

A GPS+ system is capable of precise positioning, but the positions it computes are relative to a global reference system defined in terms of a geographic latitude, longitude, and height above the earth's surface. To be useful for local site work, global GPS coordinates need to be

converted into local site coordinates, defined in terms of a distance north and east of some origin point and some distance above an elevation datum. These north, east, and elevation coordinates (often abbreviated to NEZ coordinates) can be regional coordinates system—for example, a state plane system in the United States—or the project’s survey crew may arbitrarily define these coordinates for the specific site. NEZ coordinates must be defined in terms of the construction design data. In either case, a mathematical conversion is necessary to turn global GPS coordinates into NEZ coordinates relative to the locally defined coordinate system.

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

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

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

Use the following guidelines to ensure high-quality localization:

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

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

If the job has already been localized, it will automatically be re-localized when any data changes.

## Horizontal and Vertical Localization Determinations

In Spectrum Survey Office (and Spectrum Link and Spectrum Survey Field), 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 ( $\alpha$ ), 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.

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

Spectrum Survey Office (and Spectrum Link and Spectrum Survey Field) 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, Spectrum Survey Office will use the geoid to during the localization. The geoid model is used to correct local heights for the geoid before computer localization parameters; consequently, localization parameters will be different with or without a geoid in the job. The presence of a geoid will not significantly affect localization results when using three or more vertical controls, but will improve localization quality if using less than three vertical controls.

- When using ONE control point, the following assumptions have already been determined (Table 6-1):

Table 6-1. Localization with One Control Point

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

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

## Accuracy Estimation for Localization Parameters

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

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

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

The **Localization** dialog box will display the residuals for all control points (Figure 6-37).

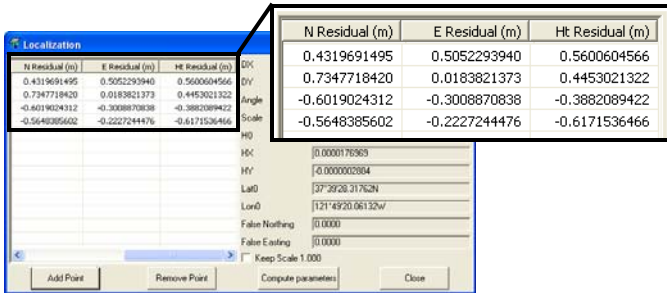


Figure 6-37. Localization Residuals

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

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

## Creating Localization in the job

To perform localization in a Spectrum Survey Office job, two sets of coordinates in the different systems are needed for the same points:

- in the WGS-84 coordinate system (any datum or any grid coordinates can be converted to WGS-84 using pre-defined parameters)
- in a Local coordinate system.

The following example shows how to perform localization for a GPS network (Figure 6-38 on page 6-35).

1. All vectors of the network are processed. The network is adjusted with the fixed coordinates 'BASE' point in the NAD-83. So, the first set of the coordinates for localization is available.

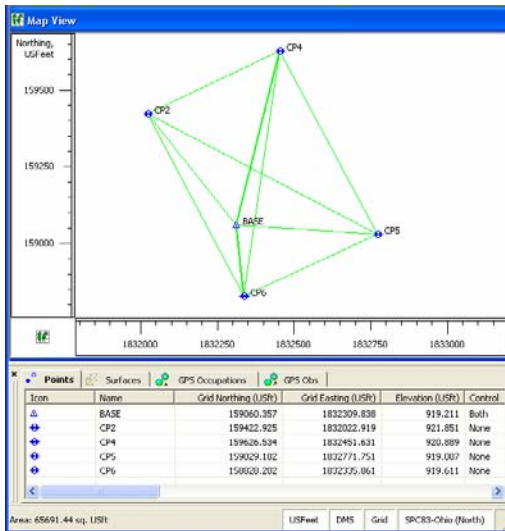


Figure 6-38. Adjusted Network

2. Import a local coordinate file into the job file. Before importing this file, be sure that the Ground coordinate system is specified for the job. To do this, click **Job ► Job Configuration** (Figure 6-39), select *Coordinate Systems* and select *Localization* in the *Projection* field:

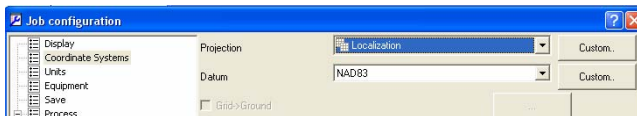


Figure 6-39. Selecting Localization Projection

To import a local coordinate file, click **Job ► Import**. Navigate to and select the desired Ground coordinate file, then click **Open** (Figure 6-40).



Figure 6-40. Import Coordinate File

To see the coordinates of the imported points, select the *Ground* coordinate system in the Status Bar USFeet | DMS | Ground | Localization.

The Tabular and Map Views display the coordinate file's information. The second set of the coordinates for localization becomes available (Figure 6-41).

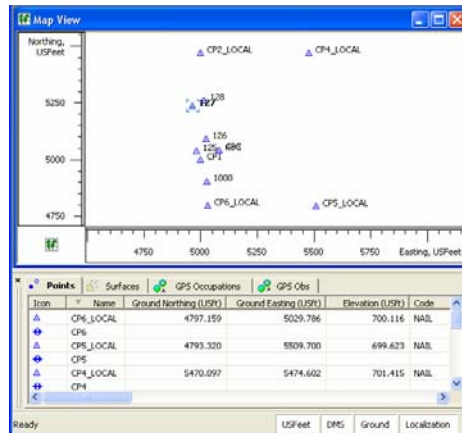


Figure 6-41. Imported Points in Ground Coordinate System



- To perform localization using these two sets of coordinates, click **Process** ► **Localization** or press **Shift+F8** to open the **Localization** dialog box. Click **Add Point** (Figure 6-42).

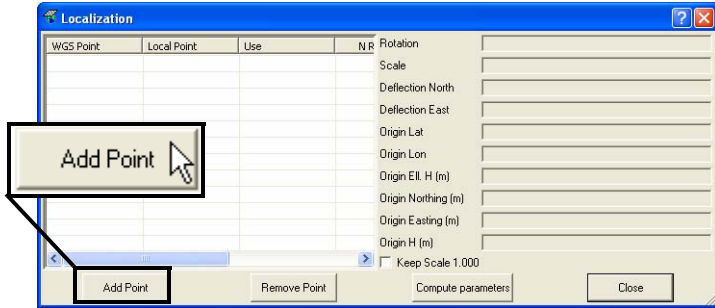


Figure 6-42. Add Point to Localize

- Select the following information (Figure 6-43):
  - The point to include in the localization from the *WGS Point* drop-down list (the point in the *WGS-84* coordinate system).
  - A corresponding point in the *Local Point* column (the point in the *Ground* coordinate system)).
  - The control point type in the *Use* column.

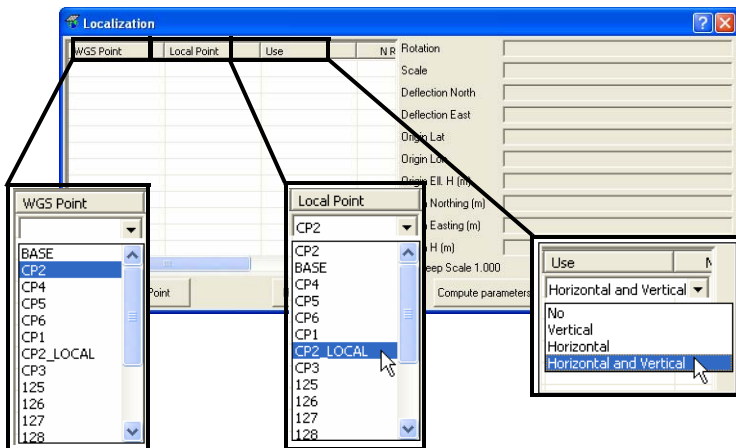


Figure 6-43. Select WGS, Local Point, and Use Data

5. After selecting the first pair of points on the localization window, Spectrum Survey Office will automatically calculate localization parameters using one control point. Then the Points tab and Map View display the coordinates of the points in both coordinate systems (Datum/Grid and Ground) (Figure 6-44)
6. To add the other points to localization, click **Add Point** and repeat step 4 until all desired points are added to the localization table. Spectrum Survey Office will automatically recalculate localization parameters after any changes in the *Localization* window and *Points* Tab are made.
  - The *North*, *East*, and *Height* residual columns in the left panel display the residual calculated for the corresponding axes after computing localization.
  - The right panel displays the localization parameters for the entered WGS and Local points.

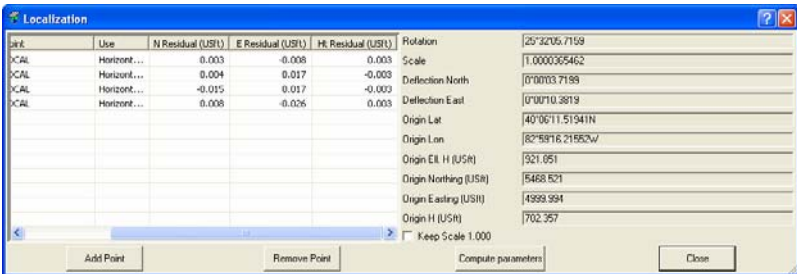
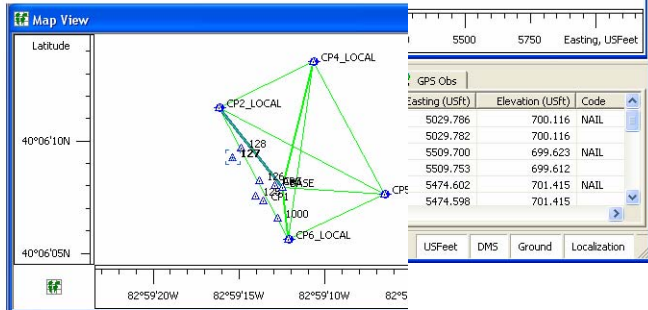
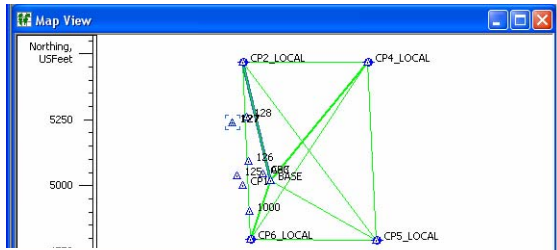


Figure 6-44. Localized Coordinate Points

After computing the localization, these parameters will be used to convert WGS coordinates into local coordinates, and vice versa.

*Ground  
Coordinate System*



Icon	Name	Latitude	Longitude	Ell. Hei
▲	CP6_LOCAL	40°06'05.63216N	82°59'12.13077W	
▲	CP6	40°06'05.63212N	82°59'12.13079W	
▲	CP5_LOCAL	40°06'07.64197N	82°59'06.53705W	
▲	CP5	40°06'07.64205N	82°59'06.53635W	
▲	CP4_LOCAL	40°06'13.52697N	82°59'10.69831W	
▲	CP4	40°06'13.52700N	82°59'10.69839W	

*Datum  
Coordinate System*

**Figure 6-45. Map and Tabular Views After Localization in Both Coordinate Systems**

# Reporting

Spectrum Survey Office processes reports based on desired information and report parameters for viewing data summaries.

Besides reports, Spectrum Survey Office supports many different file formats for exporting data to be used in other software or devices.

## Standard Reports

Reports provide a way to view data off line, or to track data through changes when report versions are saved to the computer. Reports also provide a quick summary of information in a relatively compact form.

The following sections describe default reports and their initial report items. See “Customized Reports” on page 7-9 for changing the report’s information.

- To save a report as a file, click the **Save As** button. Enter the location and name information, then click **Save**.
- To copy a report to a text editor such as Microsoft® Word or Outlook Express, click the **Select All** then **Copy** buttons. Open the desired application and **paste** the information.
- To print a report, click the **Print** button.

# TS Observations Report

To view the TS Observation report, click **Report ▶ TS Observations**.

Report	
TS Observations	Ctrl+6
Quality Control	Ctrl+5
Points	Ctrl+4
Localization	Ctrl+3
GPS Observations	Ctrl+2
Adjustment	Ctrl+1
Report Configuration... F9	

Figure 7-1. View the Adjustments Summary Report

The default Adjustment report has the following fields that include applicable information (Figure 7-11 on page 7-8):

- Project Summary
- TS Observations

The screenshot shows a software window titled "TS Observations - Sokkia Spectrum Survey Office Report Viewer". The window contains a menu bar (File, Edit, Help) and a toolbar with icons for Save As, Select All, Copy, and Print. Below the toolbar is the Sokkia logo. The main content area is divided into two sections: "Project Summary" and "TS Observations".

**Project Summary**

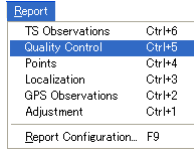
Project name: **Atsugi 2.tp**  
 Surveyor:  
 Comment:  
 Linear unit: **Meters**  
 Angular unit: **DMS**  
 Projection:

**TS Observations**

#	Point From	Point To	Instrument Height (m)	Reflector Height (m)	Horizontal Circle
1-1	0001	9999	0.000		0° 00'00.0000"
1-2	0001	9999	0.000	0.000	0° 00'00.0000"
1-3	0001	0002	0.000	0.000	326° 12'04.0000"

# Quality Control Report

To view the Quality Control report, click **Report ▶ Quality Control** (Figure 7-2).



A screenshot of a software menu titled "Report". The menu is open, showing several options. The "Quality Control" option is highlighted in blue. The options and their corresponding keyboard shortcuts are:

Report	
TS Observations	Ctrl+6
Quality Control	Ctrl+5
Points	Ctrl+4
Localization	Ctrl+3
GPS Observations	Ctrl+2
Adjustment	Ctrl+1
Report Configuration...	F9

**Figure 7-2. View Quality Control Report**

The default Quality Control report has the following fields that include applicable information:

- Project Summary
- GPS Obs Quality
- RTK Obs Quality
- Repeated Observations
- Failed Loop Closures
- Identical Points
- Misnamed GPS Occupations
- AutoRejected GPS Obs
- Adjusted Point Quality

File Edit Help

Save As... Select All Copy Print

**SOKKIA**

Project Summary

Project name: 20090706\_03.ttp  
 Created by:  
 Comment:  
 Linear unit: Meters

GPS Obs Quality					
Name	dN (m)	dE (m)	dHt (m)	Horizontal Precision (m)	Vertical Precision (m)
00131161-00151161	-201.766	357.888	-34.481	0.002	0.003
00131161-00181161	402.396	426.976	-28.582	0.002	0.003
00131161-00171161	-296.048	-109.398	-44.823	0.002	0.003
00131161-00181161	-362.978	42.416	-50.197	0.002	0.003
00151161-00181161	604.161	69.112	5.884	0.002	0.003
00151161-00171161	-94.261	-467.290	-10.365	0.004	0.006
00151161-00181161	-161.198	-315.478	-15.727	0.003	0.005
00161161-00171161	-698.405	-536.402	-16.333	0.004	0.005
00161161-00181161	-765.354	-384.595	-21.689	0.002	0.004
00171161-00181161	-66.927	151.815	-5.369	0.003	0.004

RTK Obs Quality				
Name	dN (m)	dE (m)	dHt (m)	Vertical Precision (m)
no data met				

Repeated Observations				
Name	Type	Dev N(m)	Dev E(m)	Dev U(m)
no data met				

Failed Loop Closures							
Loop	dHz (m)	dU (m)	Horz Tolerance (m)	Vert Tolerance (m)	dHz (ppm)	dU (ppm)	Length (m)
no data met							

AutoRejected GPS Obs				
Name	dN (m)	dE (m)	dHt (m)	Vertical Precision (m)
no data met				

Figure 7-3. Printable Quality Control Report

## Points Report

To view the Points report, click **Report ▶ Points** (Figure 7-4).

Report	
TS Observations	Ctrl+6
Quality Control	Ctrl+5
<b>Points</b>	<b>Ctrl+4</b>
Localization	Ctrl+3
GPS Observations	Ctrl+2
Adjustment	Ctrl+1
Report Configuration... F9	

Figure 7-4. View Points Report

The default Points report has the following fields that include applicable information (Figure 7-5):

- Project Summary
- Points

Points						
Name	Latitude	Longitude	Ell.Height (m)	Code	dE (m)	
00131161	35° 23'20.74781"N	139° 07'50.87157"E	327.516			
00151161	35° 23'14.20102"N	139° 08'05.05156"E	293.048			
00161161	35° 23'33.80372"N	139° 08'07.79006"E	298.961			
00171161	35° 23'11.14255"N	139° 07'46.53728"E	282.689			
00181161	35° 23'08.97097"N	139° 07'52.55228"E	277.322			

Figure 7-5. Printable Points Report

## Localization Report

To view the Localization report, click **Report ▶ Localization** (Figure 7-6).

Report		
TS Observations		Ctrl+6
Quality Control		Ctrl+5
Points		Ctrl+4
Localization		Ctrl+3
GPS Observations		Ctrl+2
Adjustment		Ctrl+1
Report Configuration...		F9

Figure 7-6. View Localization Report

The default Localization report has the following fields that include applicable information (Figure 7-7 on page 7-6):

- Localization Report
- Localization Points report



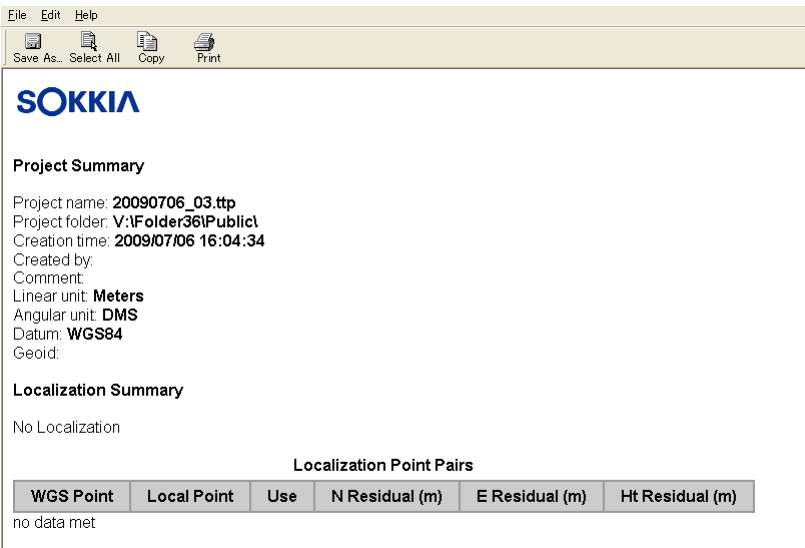


Figure 7-7. Printable Localization Report

## GPS Observations Report

To view the GPS Observations report, click **Report ▶ GPS Observation** (Figure 7-8).

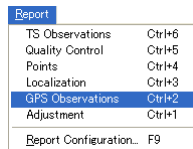


Figure 7-8. View GPS Observations Report

The default GPS Observations report has the following fields that include applicable information:

- Project Summary
- GPS Observations

Project Summary

Project name: 20090706\_03.ttp  
 Surveyor:  
 Comment:  
 Linear unit: Meters

GPS Observations					
Name	dN (m)	dE (m)	dHt (m)	Horizontal Precision (m)	Vertical Precision (m)
00131161-00151161	-201.766	357.888	-34.481	0.002	0.003
00131161-00161161	402.396	426.976	-28.582	0.002	0.003
00131161-00171161	-296.048	-109.398	-44.823	0.002	0.003
00131161-00181161	-362.978	42.416	-50.197	0.002	0.003
00151161-00161161	804.161	69.112	5.884	0.002	0.003
00151161-00171161	-94.261	-467.290	-10.365	0.004	0.006
00151161-00181161	-161.198	-315.478	-15.727	0.003	0.005
00161161-00171161	-898.405	-536.402	-16.333	0.004	0.005
00161161-00181161	-785.354	-384.595	-21.689	0.002	0.004
00171161-00181161	-66.927	151.815	-5.369	0.003	0.004

Figure 7-9. Printable GPS Obs Report

## Adjustment Report

To view the adjustments summary report, click **Report ▶ Adjustment**.

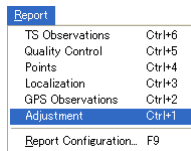


Figure 7-10. View the Adjustments Summary Report

The default Adjustment report has the following fields that include applicable information (Figure 7-11 on page 7-8):

- Project Summary
- Adjustment Summary
- Used GPS Observations

- GPS Observations Residuals
- Control Points
- Adjusted Points

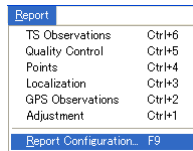
Used GPS Observations					
Name	dN (m)	dE (m)	dHt (m)	Horizontal Precision (m)	Vertical Precision (m)
no data met					
GPS Observation Residuals					
Name	dN (m)	dE (m)	dHt (m)	Horizontal Precision (m)	Vertical Precision (m)
no data met					
Control Points					
Name	Latitude	Longitude	Ell.Height (m)	Code	dE (m)
no data met					
Adjusted Points					
Name	Latitude	Longitude	Ell.Height (m)	Code	
no data met					

Figure 7-11. Printable Adjustment Summary Report

# Customized Reports

Report customization allows you to include or exclude certain information from generated reports.

To configure a customized report, click **Report ▶ Report Configuration** (Figure 7-12).



Report	
TS Observations	Ctrl+6
Quality Control	Ctrl+5
Points	Ctrl+4
Localization	Ctrl+3
GPS Observations	Ctrl+2
Adjustment	Ctrl+1

Report Configuration... F9

Figure 7-12. View Report Configuration

The **Report Configuration** dialog box provides a set of tools for displaying printed report information (Figure 7-13 on page 7-10).

- The *Reports* field displays current reports. Click a report to display its items.
- The **New report** button creates a new report. See “Creating a New Report Configuration” on page 7-18 for details.
- The **Delete report** button deletes the selected report.
- The **Copy report as** button copies the selected report. Use this button to copy a report to make modifications to the copied report without deleting the original report.
- The **Execute** button runs the selected report on the open job file, displaying the report screen.
- The *Available report templates* field displays items that can be included in the report.
- The *Included report items* field displays the items included in the report.
- The move right (>>), **Move Up**, **Move Down**, and **Remove** buttons include/exclude and order report items.
- The **Options** button configures options for selected items.
- The *Report format* items selects the format for export.

The same item (for example, with different options) can be included in the same report to display information for data in customized groups. Using the **Options** button (see “Edit Item Options” on page 7-13 for details), the name of almost any report item can be changed. When changing an item’s name in the right-hand *Included report items* list, only the name changes, a new item is not added; the item still corresponds to the previous name of the item in the left-hand *Available report items* list.

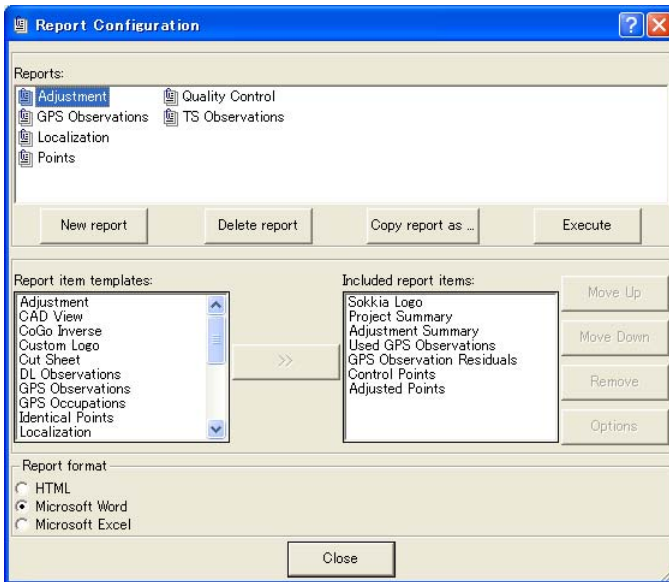


Figure 7-13. Report Configuration Dialog Box

To generate a report, select the report on the *Report Configuration* dialog box and click **Execute**. Customized reports also appear on the Reports menu.



Customize a toolbar report button to quickly run a frequently used report. See “Customizing the Toolbar” on page 1-30 for details.

## Editing a Report Configuration

Reports and report items can be edited to provide only the desired information in the report output.

### Copy a Report

1. Select the desired report in the *Reports* panel and click **Copy report as**. A configuration with the same items as the original report is added to the *Reports* window (Figure 7-14).

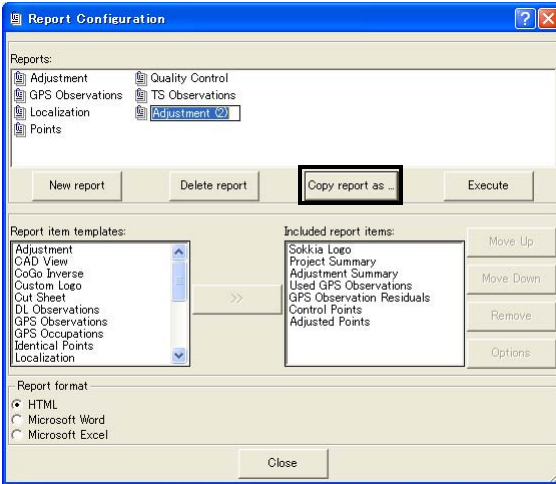


Figure 7-14. Copy Selected Report

2. Rename the configuration. If needed, click-pause-click the configuration name to activate the naming editor.
3. If adding items, select the items to include in the left column and click the move right (>>) button (Figure 7-15 on page 7-12).
4. If removing items, select the items to remove and click **Remove** (Figure 7-15 on page 7-12).
5. Use the **Move Up** and **Move Down** buttons to order included items (Figure 7-15 on page 7-12).

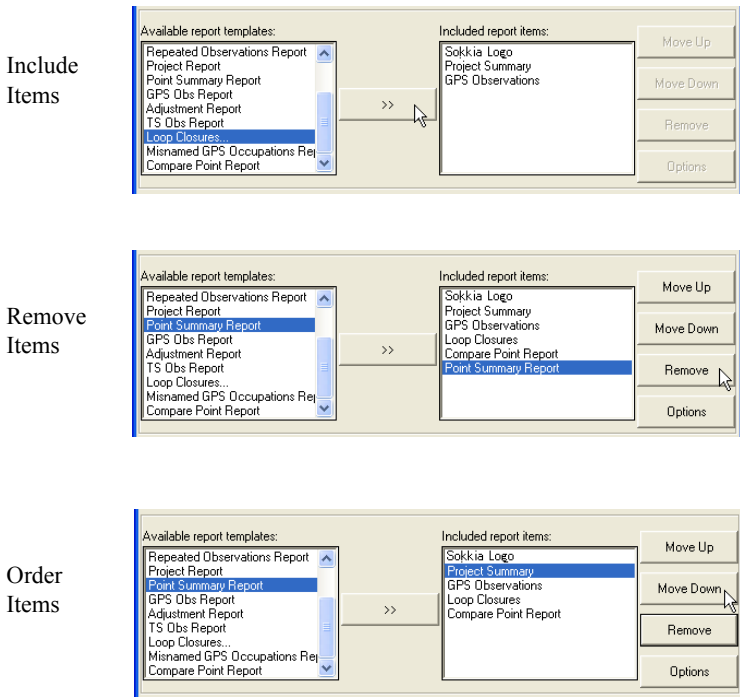


Figure 7-15. Edit Item Columns

6. Click **Execute** to view the report or click **Done** to save the report configuration.

## Edit Items in the Selected Report

1. Select the desired report in the *Reports* panel.
2. If adding items, select the items to include in the left column and click the move right (>>) button (Figure 7-15).
3. If removing items, select the items to remove and click **Remove** (Figure 7-15).
4. Use the **Move Up** and **Move Down** buttons to order included items (Figure 7-15).
5. Click **Execute** to view the report or click **Done** to save the report configuration.

## Edit Item Options

Changing item options will apply those changes to the currently selected report only.

Select a configuration in the *Reports* panel, click the desired item in *Included report items* column, and click **Options**.

Depending on the selected item, the **Options** dialog box displays different item parameters.

- Identical Points Report – edit the name and click **OK** (Figure 7-16).

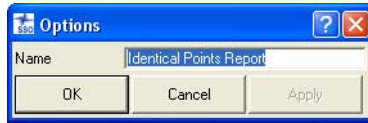


Figure 7-16. Item Options – Identical Points Report

- Cut Sheet Report – edit the name select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, and click **OK** (Figure 7-17).

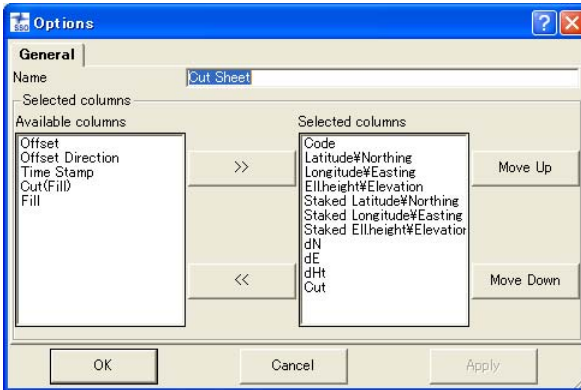


Figure 7-17. Item Options – Staked Points Report



- Misnamed Auto topo Rovers Report – edit the name and click **OK** (Figure 7-17).



Figure 7-18. Item Options – Misnamed Autotopo Rovers Report

- Repeated Observations – edit the name and select the report type for vectors, then click **OK** (Figure 7-19).

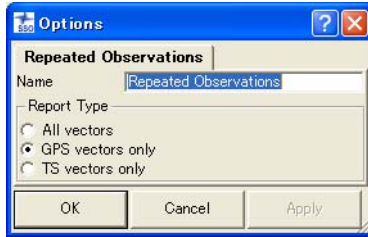


Figure 7-19. Item Options – Repeated Observations

- Project Report – edit the name, type template items in the same manner as displayed on screen or delete template items, then click **OK** (Figure 7-20).

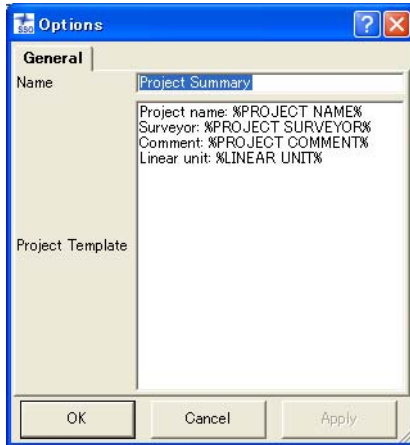


Figure 7-20. Item Options – Project Report

- Point Summary Report – edit the name, select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, enable the type of points to apply the parameters to, and click **OK** (Figure 7-21).

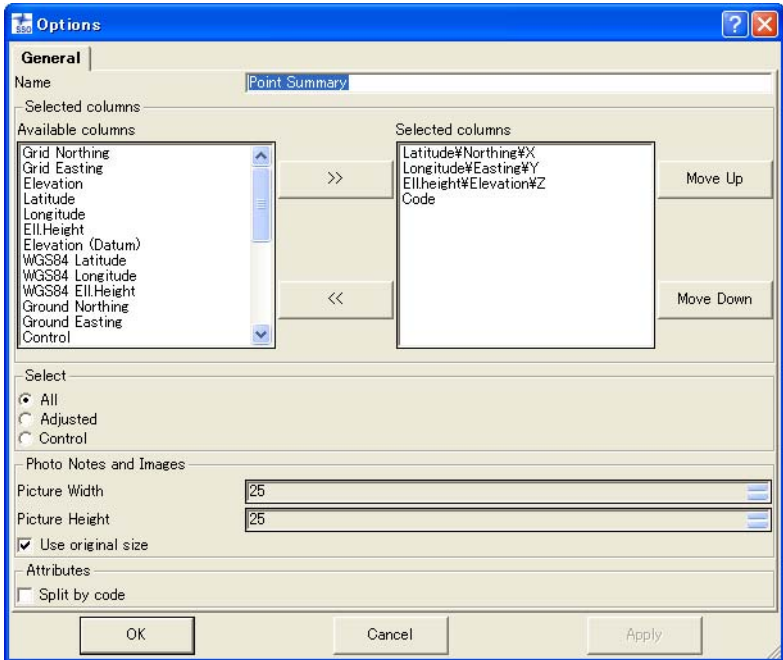


Figure 7-21. Item Options – Point Summary Report

- GPS Obs Report – edit the name, select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, select the type of points to apply the parameters to, select the method used for points to apply parameters to, and click **OK** (Figure 7-22 on page 7-16).

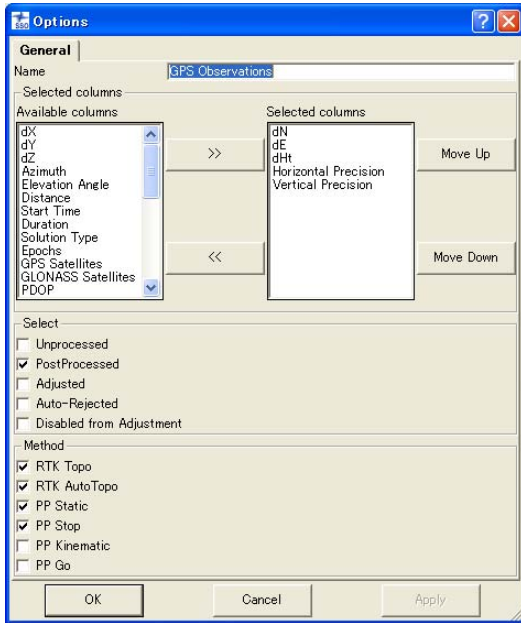


Figure 7-22. Item Options – GPS Obs Report

- Adjustment Report – edit the name, type template items in the same manner as displayed on screen or delete template items, then click **OK** (Figure 7-23).

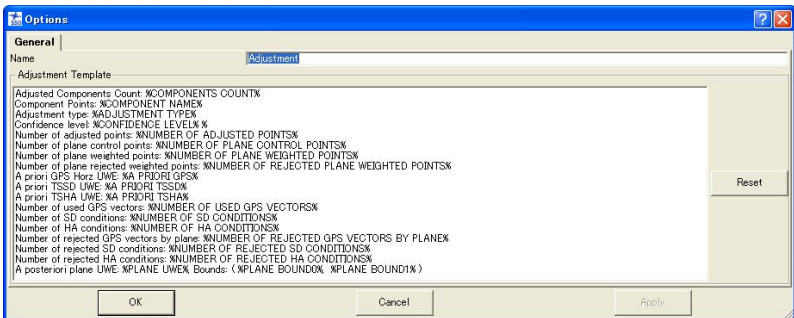


Figure 7-23. Item Options – Adjustment Report

- TS Obs Report – edit the name, select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, and click **OK** (Figure 7-24).

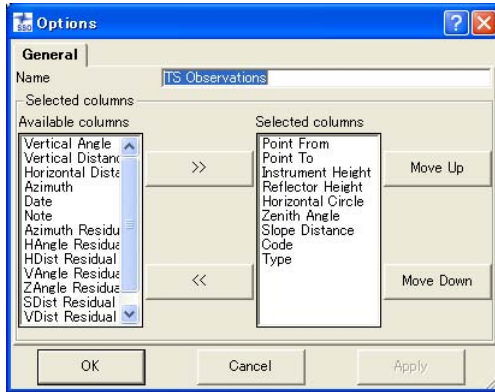


Figure 7-24. Item Options – TS Obs Report

- Loop Closures – edit the name, select the loops to report, select parameters to include or exclude using the move right/move left buttons, order the display of parameters using the Move Up/Move Down buttons, and click **OK** (Figure 7-25).

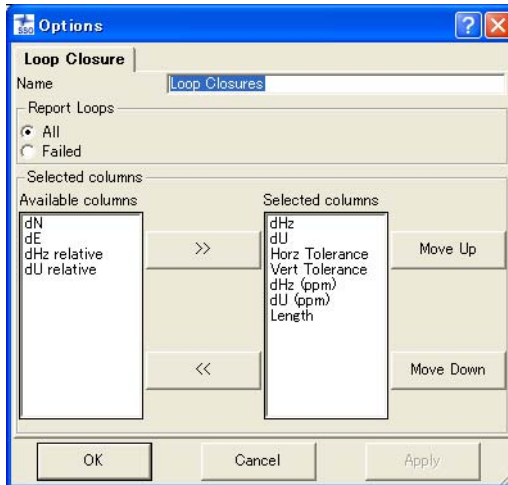


Figure 7-25. Item Options – Loop Closures

- Misnamed GPS Occupations Report – edit the name and click **OK** (Figure 7-26).



Figure 7-26. Item Options – Misnamed GPS Occupations Report

## Creating a New Report Configuration

1. On the *Report Configuration* dialog box, click **New report**. A report called “User report” appears in the *Reports* window (Figure 7-27).

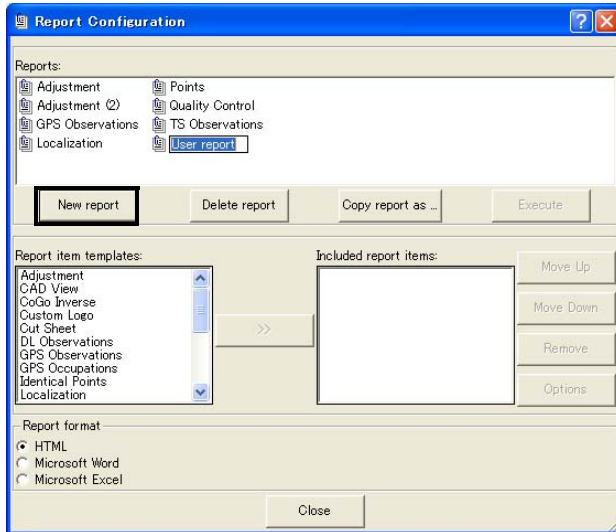
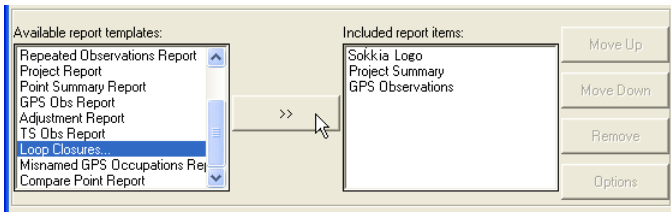


Figure 7-27. Create New Report

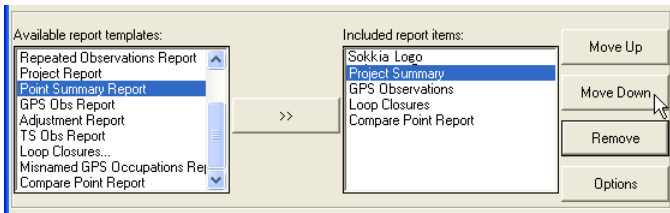
2. Select the desired item in the *Available report templates* list and click the move right button (>>) to move the item to the

*Included report items* list. Continue selecting and moving items until all desired items are included (Figure 7-28).



**Figure 7-28. Include Items in Report**

3. Select items and click the **Move Up** and **Move Down** buttons to set the order of items in the included list (Figure 7-29 on page 7-19).



**Figure 7-29. Order Included Items**

4. To edit item options, select the desired item and click **Options**. For details on the various *Options* dialog boxes for the selected item, see “Editing a Report Configuration” on page 7-11.
5. Click **Execute** to view the report or click **Done** to save the report configuration.

# Exporting

The export process allows data to be saved to other files and formats for opening in other Spectrum Survey Office jobs, for opening in other file-compatible software, or for downloading to a device.

Spectrum Survey Office exports the following file formats:

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Autodesk Layer States (*.las)</li> <li>• Coordinate files             <ul style="list-style-type: none"> <li>Custom Text Format files (*.*)</li> <li>LandXML (*.xml)</li> <li>MX GENIO (*.mgn)</li> <li>Name,E,N,Z,Code (*.csv)</li> <li>Name,Lat,Lon,Ht,Code (*.csv)</li> <li>Name,N,E,Z,Code (*.csv)</li> <li>TDS Files (*.CR5)</li> <li>Topcon 3D (*.pt3)</li> <li>Topcon FC-4 Points (*.xyz; *.fc4; *.pnt)</li> <li>Topcon FC-5 Points (*.xyz; *.fc5; *.pnt)</li> <li>Topcon GTS-210/310-10 Points (*.xyz; *.pnt)</li> <li>Topcon GTS-210/310-12 Points (*.xyz; *.pnt)</li> <li>Topcon GTS-7 Points (*.xyz; *.pnt)</li> <li>Topcon XML Points (*.xml)</li> <li>TopSurv (*.txt)</li> </ul> </li> <li>• Design Files             <ul style="list-style-type: none"> <li>AutoCAD Drawing (*.kml, *.kmz, *.kml, *.xml, *.dwg, *.dxf*.*)</li> <li>AutoCAD Drawing (*.dwg)</li> <li>AutoCAD DXF (*.dxf)</li> <li>Google KML (*.kml)</li> <li>Google KML with MAP data (*.kml)</li> <li>Google KMZ (*.kmz)</li> <li>Google KMZ with MAP data (*.kmz)</li> <li>Land XML (*.xml)</li> <li>To Civil 3D Job (*.*)</li> </ul> </li> <li>• GIS Files             <ul style="list-style-type: none"> <li>ESRI Shape (*.shp)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• GPS Obs files             <ul style="list-style-type: none"> <li>BlueBook Sheet (*.gfl, *.bfl)</li> <li>Custom Text Format (*.*)</li> <li>Field Book (*.fbk)</li> <li>LandXML (*.xml)</li> <li>O files (O*.*)</li> <li>Topcon Vectors (*.tvf)</li> <li>Topcon XML (*.xml)</li> </ul> </li> <li>• GPS+ Raw Data Files             <ul style="list-style-type: none"> <li>Compact RINEX (*.??D, *.??G, *.??N)</li> <li>RINEX (*.??O, *.??G, *.??N)</li> <li>RINEX3 (*.??O, *.??N)</li> </ul> </li> <li>• TPD (*.tpd)</li> <li>• Topcon Tools Jobs (*.tjp)</li> <li>• Topcon XML Files             <ul style="list-style-type: none"> <li>Topcon XML (*.xml)</li> <li>XML Dump (*.xml)</li> </ul> </li> <li>• TopSurv Job Files             <ul style="list-style-type: none"> <li>TopSURV 7 Job Files (*.tsj)</li> <li>TopSURV PC Job Files (*.tlsv)</li> </ul> </li> </ul> |
|---|--|



NOTICE

### NOTICE

*If exporting ground coordinates, change the display option to “ground” and then export to a file that stores coordinates in NEZ format.*

For further details on the file formats, see the corresponding section in Chapter 3. Spectrum Survey Office exports some formats not imported:

- DWG, DXF, and Shape files are popular formats used to transfer CAD and GIS data. DWG and DXF are native formats of AutoCAD and Shape are native formats of ArcInfo™. Most GIS and CAD software packages accept these formats and can be used to transfer survey results (point coordinates and codes. For DWG and DXF, some linework are auto-created from codes.
- O files are a native Ashtech format for transferring observations (vectors) between software packages.
- Topcon vectors is a simple comma delimited format for transferring vector solutions between software packages.

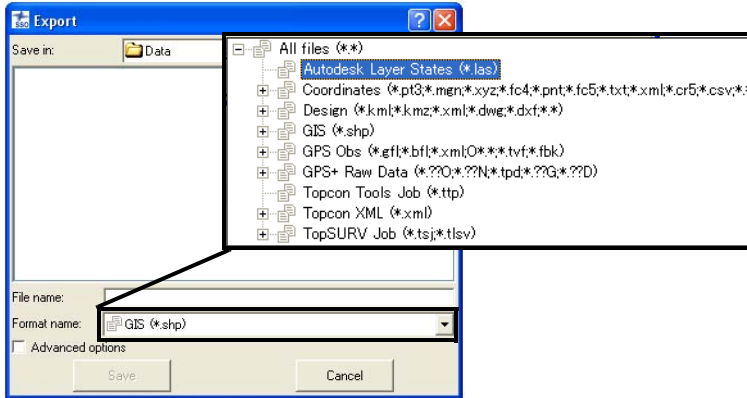
## Exporting to a File

Spectrum Survey Office exports either desired data or all data of the current job file to a corresponding file format.

1. To export information to the select file format:
  - All data – click **Job ▶ Export**, press **F4**, or click the **Export to File** Toolbar button.
  - Selected data – click **Job ▶ Export**, press **F4**, click the **Export to File** Toolbar button, or right-click and click **Export**.
2. Navigate to the location in which to save the file.
3. Select the *Format name* (Figure 8-1).

**NOTICE** *NOTICE*

*Define the export format before continuing.*



**Figure 8-1. Select Export Format**

4. If desired, select detailed export options in the *Advanced options* panel (Figure 8-2).

The advanced options differ depending on the format selected.

**NOTICE** *NOTICE*

*Unless selected, heights will be orthometric (for grid->ground) or ellipsoidal (for longitude/latitude).*

- Depending on the exported file format, define the projection type, datum, coordinate type, grid->ground transformation parameters, units, and geoid model.

**Advanced options available for exported coordinate, GIS, GPS+ raw data, localization, Spectrum Survey Office jobs, Topcon XML, TopSURV database, and TS raw data files.**

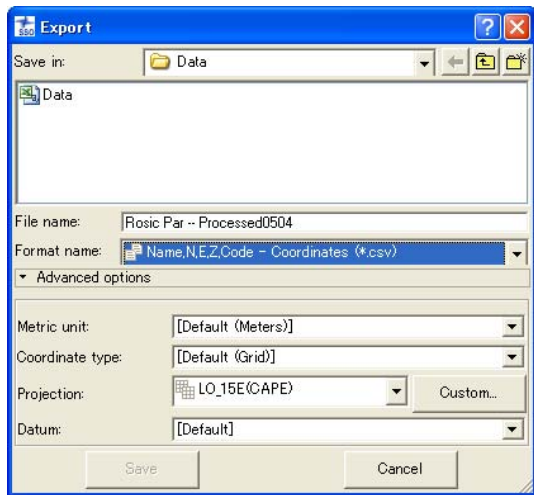


Figure 8-2. Export – Advanced Options Example



### NOTICE

*Unless selected or changed in Advanced Options, Spectrum Survey Office will use the projection, datum, and geoid settings of the active job.*

5. Type a name for the file and click **Save**.

## Exporting Files to a Device

The following sections describe exporting from a computer:

- coordinate data files to a Conventional/Robotic Total Station
- any files to a TPS Controller.

Spectrum Survey Office allows export of data to Topcon devices in two ways (Figure 8-3):

- using Windows Explorer
- using the Spectrum Survey Office buttons in the Toolbar or commands in the main menu

Installation of Spectrum Survey Office to the computer creates three additional folders in the computer.

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



Figure 8-3. Topcon's Devices Folders

## Export to a TPS Controller

1. Follow the manufacturer's directions for connecting the computer and the TPS Controller.
2. Microsoft ActiveSync needs to be installed on the computer with Windows XP. If the user's computer operates under Windows Vista, ActiveSync is not needed. A communication between the computer and an external device with Windows CE will be automatically established after connecting the device to PC.

## Using Windows Explorer

1. Open Windows Explorer and click the *Mobile Device* folder. The right panel of the window displays the contents of the Topcon Controller (Figure 8-4). Select the folder in the TPS Controller

where the exported file will be saved and select the desired file in the computer.

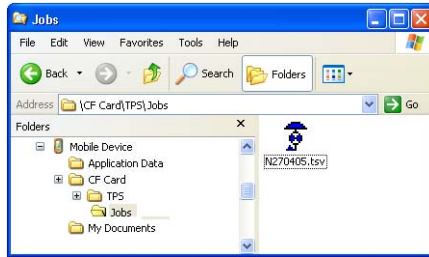


Figure 8-4. Selecting a Folder in the TPS Controller

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 the process of sending and converting the file(s) from the computer to the TPS Controller begins, the *Copy & Convert Progress* window displays the export and conversion in progress (Figure 8-5 on page 8-7).



Figure 8-5. Export and Conversion in Progress

## Using Spectrum Survey Office

1. Start Spectrum Survey Office and open a job. To export information to a device:
  - Click **Job ▶ Export to Device**, press **Shift+F4**, or click the **Export to Device** button on the Toolbar to export all data to the selected file format and send the created file to a Topcon Device.

- Select the desired data and click **Job ▶ Export to Device**, or press **Shift+F4**, or click the **Export to Device** button on the Toolbar, or right-click and click **Export to Device** on the pop-up menu to export desired data to the selected file format and send a created file to a Topcon Device as shown in Figure 8-6.

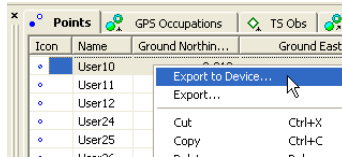


Figure 8-6. Export Data to Device

2. Double-click the **Mobile Device** in the *Export to Device* dialog box (Figure 8-7 on page 8-8), select the folder in the TPS Controller where the exported file will be saved. Select the desired file format and enter the name of the newly created file. Click **Save** in the *Export to Device* dialog box.

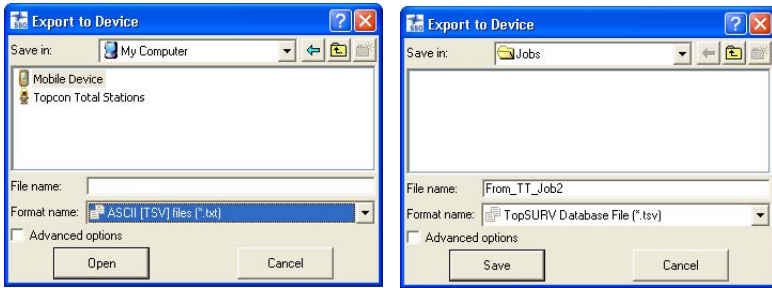


Figure 8-7. Export to Device Dialog Box

3. When the process of writing with conversion to the selected file format and sending of the created file from the current job to the TPS Controller begins, the *Copy & Convert Progress* dialog box displays the export and conversion in progress.

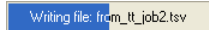


Figure 8-8. Export and Sending in Progress (Status Bar)

## Export to a TPS Total Station

Refer to the Topcon total station's manual for connecting the computer and a total station.

### Using Windows Explorer

1. Open Windows Explorer and click the folder Topcon Total Stations. The *Topcon Total Stations* dialog box displays. The right side of the window displays the 'Add New Station' icon. To add a new device right click this icon and select *Create Station* on the pop-up menu (Figure 8-9).

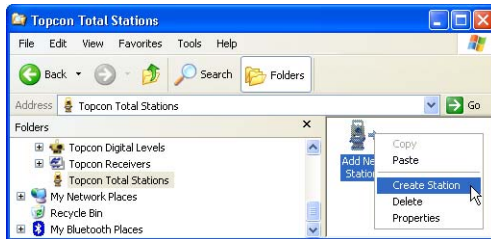


Figure 8-9. Creating a New Station in Windows Explorer

2. In the *General* tab of the *Create Station* dialog box, enter the following information and click **OK** (Figure 8-10).
  - Name – type a unique name for the device
  - Notes – type in any necessary notes
  - Port – select the COM Port that the device connects to
  - Model and Software – the type of the total station model

- 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 8-10).

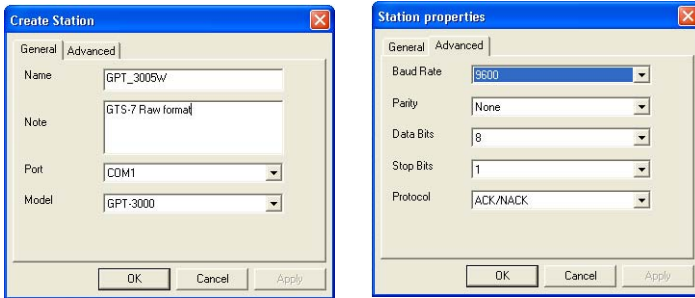


Figure 8-10. Total Station Properties

- A new icon for the Total Station will display in the right panel and a new sub-folder will be created in the *Topcon Total Stations* folder of the Windows Explorer. To change the properties (communication parameters, name, model) for this Total Station, right-click on the icon and select *Properties* on the pop-up menu. The **Station Properties** dialog box for the Total Station is identical to the **Create Station** dialog box for a new Total Station (Figure 8-11 on page 8-10).

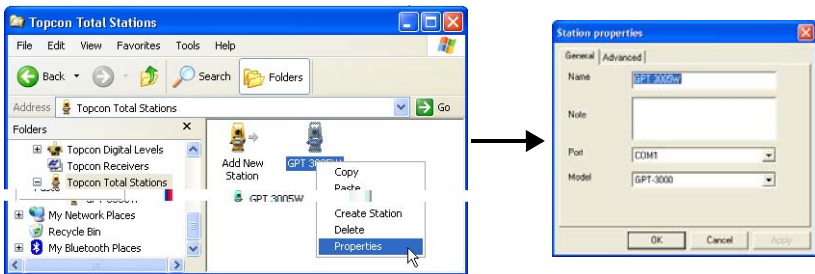


Figure 8-11. Changing the Total Station Properties

- To export a coordinate file from the computer to the Total Station, copy the selected file to the Total Station.
- Follow all the steps given in the **Upload File(s) to Total Station** dialog box to prepare the Total Station for exporting file (Figure 8-12).



7. When ready to send the file, press **F3** for “yes” at the Total Station. Click **Start** in the *Upload File(s) to Total Station* dialog box (Figure 8-12). The upload process begins.

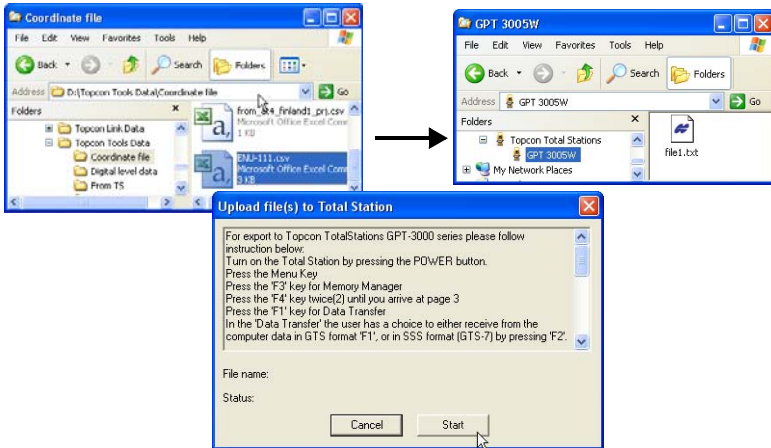


Figure 8-12. Start of Export a Coordinate File to the Total Station

8. When the process of the sending data from the computer to the Total Station begins, the status is changed from “Waiting to start...” to “Performing the transfer...” in the *Upload File(s) to Total Station* dialog box.
9. The exported file is then saved in the Total Station.

## Using Spectrum Survey Office

- Start Spectrum Survey Office and open a job. To export a coordinate file to a Total Station:
  - Click **Job ▶ Export to Device**, or press **Shift+F4**, or click the **Export to Device** button on the Toolbar to export all data to the selected coordinate file format and to send a created file to a Total Station.
  - Select the desired data and click **Job ▶ Export to Device**, or press **Shift+F4**, or click the **Export to Device** Toolbar button, or right-click and click **Export to Device** on the pop-up menu (Figure 8-13) to export data to the coordinate file

format and send the created file to the Total Station (Figure 8-13).

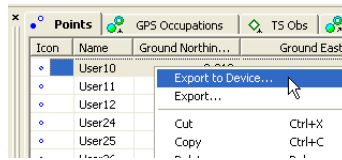


Figure 8-13. Export Data to a Device

2. Double-click the *Topcon Total Stations* in the *Export to Device* dialog box (Figure 8-14).

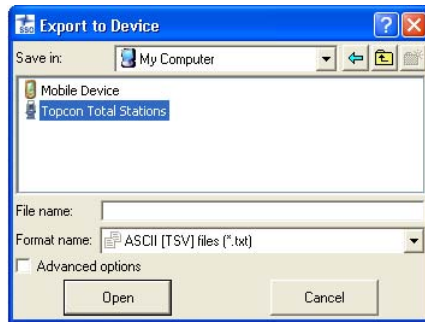


Figure 8-14. Export From Device Window

3. To add a device, right-click or double-click the icon 'Add New Station' and select *Create Station* from the pop-up menu (Figure 8-15).

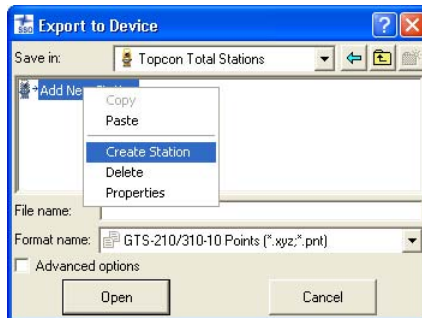
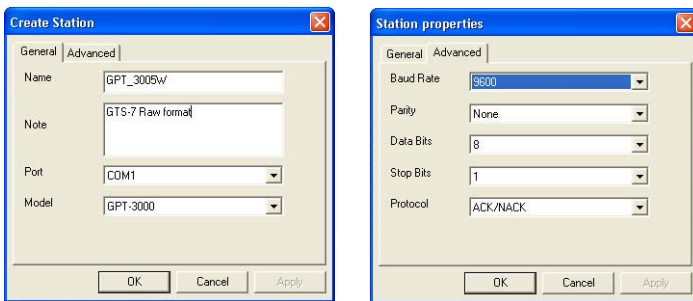


Figure 8-15. Creating a New Station

4. In the *General* tab of the **Create Station** dialog box, enter the following information and click **OK** (Figure 8-16).
  - Name – type a unique name for the device
  - Notes – type in any necessary notes
  - Port – select the COM Port that the device connects to
  - Model and Software – the type of total station model
5. In the *Advanced* tab of the **Create Station** dialog box, enter the baud rate, parity, data bits, stop bits, and protocol used for communication with the TS (Figure 8-16).



**Figure 8-16. Total Station Properties**

6. A new icon for the Total Station displays in the **Export to Device** dialog box. To change the properties (communication parameters, name, model) for this Total Station, right-click on the icon and select *Properties* on the pop-up menu. The **Station Properties**

dialog box for the Total Station is identical to the *Create Station* dialog box for a new Total Station (Figure 8-17).

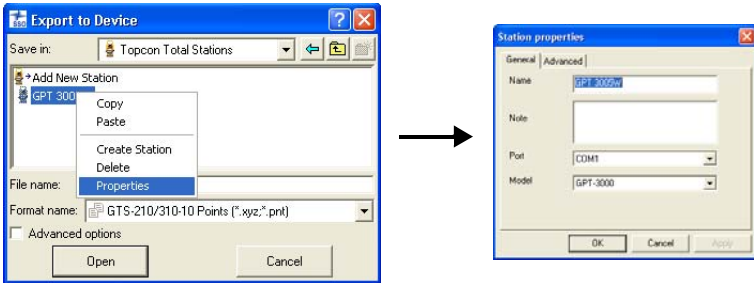


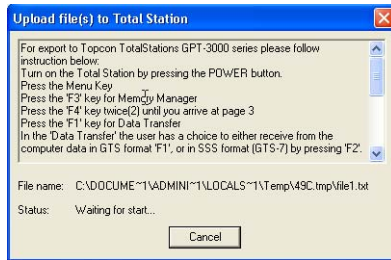
Figure 8-17. Changing the Total Station Properties

- To export a coordinate file from the current job to the Total Station, select a coordinate file format and enter the file name of the creating file. Click **Save** in the *Export to Device* dialog box (Figure 8-18).



Figure 8-18. Setting the name and type the exported file

- Follow all the steps given in the *Upload File(s) to Total Station* dialog box to prepare the Total Station for exporting file (Figure 8-19 on page 8-15).



**Figure 8-19. Start of Export a Coordinate File to the Total Station**

9. When the process of sending data from the computer to the Total Station begins, the status is changed from “Waiting to start...” to “Performing the transfer...” in the *Upload File(s) to Total Station* window.
10. Then the exported file is saved in the Total Station.

# Advanced Module

In The Advanced Module additional procedures can be performed and additional settings can be made in post-processing and adjustment.

Be sure that the Advanced Module is active in Spectrum Survey Office. When active, the Advanced Module displays in the list of active modules (**Help ▶ Licenses**) (Figure 9-1).

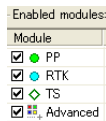


Figure 9-1. Enabled Modules

## Advanced Module for Processing

If the Advanced module is activated, the **Process Properties** dialog box for *GPS+ PostProcessing* displays three tabs: *General*, *Engine* and *Troposphere*.

Process Properties for GPS-PostProcessing.

### General Tab

The *General* tab allows you to select the following (Figure 9-2 on page 9-3):

- the elevation mask
- the navigation system (either GPS and GLONASS or only GPS satellites for calculating the GPS observations of the current job)
- the “*Save residuals*“ check box; enable to save the double difference residual for each static GPS observation of the job.

- the "Max length of vector (km)" check box; enable to limit of the vector distance. If the distance of a job vector exceeds the specified limit, Spectrum Survey Office will not create GPS observation for it.
- two options in the Minimum Duration panel:
  1. If selecting the *Auto* option, Spectrum Survey Office will create a GPS observation for a pair occupations that have a common observation time needed for starting the post-processing. The time depends on the distances between two points, the number of common satellites observed at these point, the type of the receiver (L1/L2 or L1 only and GPS and GLONASS or GPS only), and so on.
  2. If selecting Fixed Time, Spectrum Survey Office will create a GPS observation for a pair occupations that have common a observation time more than that set in the *Min. observation time (sec)* field.
- the "*Enable continuous kinematic*" check box to display and process GPS kinematic data.
- the "*Enable go kinematic*" check box to display and process GPS observations for 'Go' occupations of Stop-and-Go measurements.
- the "Compute DOPs" check box to computer HDOP, VDOP, and PDOP values for GPS observations during post-processing.

- the “*Use auto import*” check box to enable/disable auto import of the corresponding occupation of the base (reference) station from the Internet into the current job.

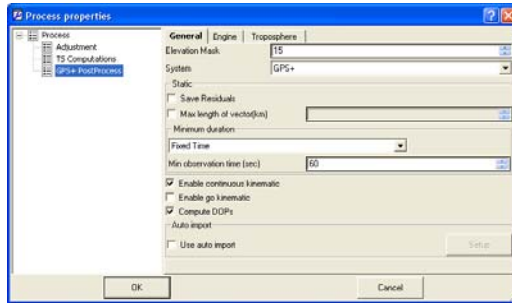


Figure 9-2. The General Tab – Advanced Module Processing

This tab is similar to the *GPS+ PostProcessing* dialog box in Spectrum Survey Office without the *Advanced Module*.

## Engine Tab

The *Engine* tab (Figure 9-3) allows you to select the engine type for static, stop-and-go or kinematic processing.



Figure 9-3. The Engine Tab – Advanced Module Processing

For any solution (Static, StopGo, and Kinematic), there is the same

set of engine type modes:

BaseLine
Auto
BaseLine
MultiSite
Extended RTK



*Baseline* type - the type of classic processing GPS occupations from the base station. This type is used without the *Advanced Module* and when the user selects *Auto* type.

*MultiSite* type - the type of simultaneous processing GPS occupations from several base stations. This type allows the user to improve position accuracy by using more satellite raw measurements for processing.

*Extended RTK* type - the RTK (Real Time Kinematic) type of processing GPS occupations from the base station.

For each engine type, if it is not set in *Auto* mode, the user can select the original set of process modes (specific technique used by the given engine):

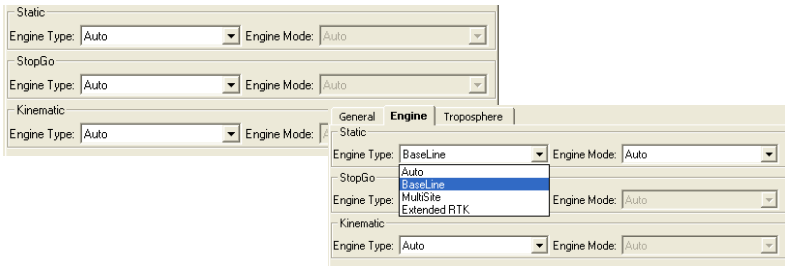


Figure 9-4. Selecting Engine Type and Engine Mode

For *Baseline* type, the user can select the following modes:

- Code Diff – Based on using pseudo-ranges only.
- L1 Only – Processing single frequency measurements (this is ‘standard’ when using single frequency receivers).
- L2 Only – Processing L2 measurements only.
- L1&L2 – Processing dual frequency measurements (recommended for shorter baselines). L1 and L2 observables will be treated by the engine as independent data sets (that is, the engine will formulate no mixed combinations from L1 and L2 observables).
- L1c – Processing dual frequency measurements collected on longer baselines (> 30 km). An ionosphere-free combination is formulated and processed but integer biases are not fixed.

- L1&L2c – The most powerful processing including both integer ambiguity resolution and the formulation of an ionosphere-free combination. This is often considered the principal technique for processing dual frequency measurements. Generally, this is used on baselines less than 30 km, but in conditions of low ionosphere activity it may be extended to about 75 km.
- VLBL – Processing very long baselines. This is based on triple differences with ionosphere and troposphere corrections.
- Wide Lane – This can be considered to be a modified L1-L2 mode. There are scenarios where the residual ionosphere is too large for either L1&L2 or L1&L2c to provide fixed solutions, yet the raw data are considered good enough to allow correct estimates of (L1-L2) ambiguities.
- L1-L2 – Processing a wide-lane combination (this is mainly used on longer baselines and for research purposes).
- L1+L2 – Processing a narrow-lane combination (this is mainly used for research purposes).

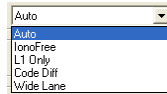
The user can select AUTO for each solution of the *Baseline* type used in Spectrum Survey Office. This option will use the following modes for Static:

- If only single frequency measurements available, AUTO is equivalent to L1 Only.
- If a vector processed is shorter than 10 km, AUTO is equivalent to L1&L2.
- For vectors falling into the 10 km to 30 km bracket, AUTO is equivalent to L1&L2c.
- For the 30 km to 400 km bracket, AUTO coincides with Wide Lane.
- Finally, if a vector is longer than 400 km, AUTO is equivalent to VLBL.

For Stop&Go and Kinematic solutions of the *Baseline* type, AUTO is equivalent to L1&L2c.

For *MultiSite* type, the user can select the same modes as for *Baseline* type. Only AUTO for each solutions of the *MultiSite* type is equivalent to Wide Lane for dual frequency data and L1 Only for single frequency data.

For *Extended RTK*, the user can select the following modes:



AUTO for each solutions of the *Extended RTK* is equivalent to IonoFree for dual frequency data and L1 Only for single frequency data.

## Troposphere Tab

Spectrum Survey Office allows the user to select among three tropospheric models available (Figure 9-5):

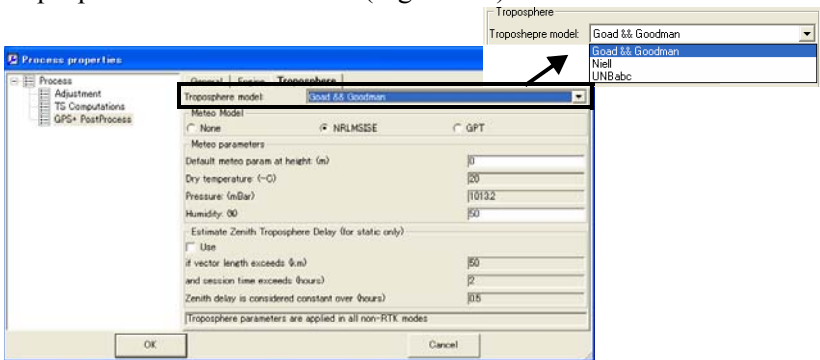


Figure 9-5. The Troposphere Tab – Advanced Module Processing

For any selected model you can either specify measured meteo parameters (*Dry temperature, Pressure, Humidity*) in the corresponding fields of the *Troposphere* tab (Figure on page 9-1) or use the *Meteo model* option.

If the user has meteo measurements such as temperature and pressure, check 'None' and type in the measured values in the corresponding fields:

Meteo Model	
<input checked="" type="radio"/> None	<input type="radio"/> NRLMSISE
<input type="radio"/> GPT	
Meteo parameters	
Default meteo param at height: (m)	<input type="text" value="0"/>
Dry temperature: (-C)	<input type="text" value="20"/>
Pressure: (mBar)	<input type="text" value="1013.2"/>
Humidity: (%)	<input type="text" value="50"/>

If the user does not have these meteo measurements, he can apply one of two empirical meteo models to compute these parameters.

- GPT - Global Pressure and Temperature model. This model is based on spherical harmonics up to degree and order nine provides pressure and temperature at any site in the vicinity of the Earth's surface. Input parameters of GPT are the station coordinates and the day of the year, thus also allowing one to model the annual variations of the parameters.
- NRLMSISE - 'NRL' stands for the US Naval Research Laboratory, 'MSIS' stands for Mass Spectrometer and Incoherent Scatter Radar respectively, 'E' indicates that the model extends from the ground through exosphere. This model describes the neutral temperature and densities in Earth's atmosphere from ground to thermospheric heights as functions of solar activity, geomagnetic activity, latitude, longitude and altitude, day of year and time of day.

When any meteo model is enabled, the *Dry temperature* and *Pressure* fields are disabled.

Meteo Model	
<input type="radio"/> None	<input checked="" type="radio"/> NRLMSISE
<input type="radio"/> GPT	
Meteo parameters	
Default meteo param at height: (m)	<input type="text" value="0"/>
Dry temperature: (-C)	<input type="text" value="20"/>
Pressure: (mBar)	<input type="text" value="1013.2"/>
Humidity: (%)	<input type="text" value="50"/>

Note that the troposphere parameters (for any setting) will correspond to a point that has the height set in the *Default meteo param at height* field (by default is 0 meters). The user may enter the factual value of the height for the point where the meteo parameters were measured. Then, using the meteo parameters entered for the known (or default)

height, the engine will calculate the troposphere model for each occupation of the job with the given height for the occupation.

## Splitting a GPS Occupation

In the Advanced module you can split any occupation and merge two occupations of the job.

1. To split an occupation, right-click the desired occupation in the *Occupation* tab and select *Split* in pop-up menu.

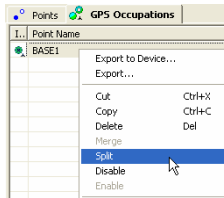


Figure 9-6. Split Occupation

2. You can divide a occupation by the two options in the *Split GPS Occupation* dialog box (Figure 9-7).

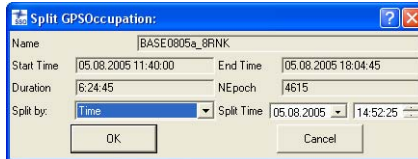


Figure 9-7. Split Occupation Dialog Box

- by Time – specify the moment of dividing of the selected occupation in the *Split Time* field. By default, this time is equal to half of the time of the occupation. Two occupations will be created after clicking **OK**. The *Occupation* tab displays the two occupations instead of the original occupation. The splits will be named “<original occupation name>(Head)” and “<original occupation name>(Tail)” (Figure 9-8 on page 9-9).

Icon	Point Name	Original Name	Start Time	Stop Time	Duration
	BASE1	BASE1	05.08.2005 11:40:00	05.08.2005 18:04:45	6:24:45

**Before Splitting**

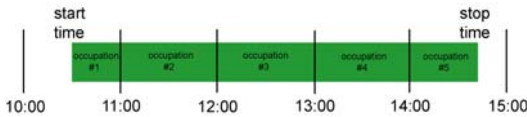
  

Icon	Point Name	Original Name	Start Time	Stop Time	Duration
	BASE1	BASE1_Head	05.08.2005 11:40:00	05.08.2005 14:52:25	3:12:25
	BASE1	BASE1_Tail	05.08.2005 14:52:25	05.08.2005 18:04:45	3:12:20

**After Splitting**

**Figure 9-8. Example of Dividing of Occupation by Time**

- by Hour – divide any occupation by the hour, where each created occupation from the original occupation will have a duration equal to 1 hour. The start / stop time of these occupations (except the first and finish occupations) will be equal to the full hour. The first occupation will stop in the full hour, the last occupation will start in the full hour.



**Figure 9-9. Rule of Dividing the Occupation by the Hour**

Several occupations will be created after clicking **OK** (Figure 9-10 on page 9-10). The *Occupation* tab displays these occupations instead of the original occupation. The first occupation will be named “<original occupation name>(Head)” and the next occupations will be named as “<original occupation name>(Tail\_n)”, where *n* equals the number of the tail occupations.

Points		GPS Occupations			
I...	Point Name	Original Name	Start Time	Stop Time	Duration
	BASE1	BASE1	05.08.2005 11:...	05.08.2005 18:...	6:24:45

**Before Splitting**

Points		GPS Occupations			
I...	Point Name	Original ...	Start Time	Stop Time	Duration
	BASE1	BASE1_Head	05.08.2005 11:40:00	05.08.2005 12:00:00	0:20:00
	BASE1	BASE1_Tail_1	05.08.2005 12:00:00	05.08.2005 13:00:00	1:00:00
	BASE1	BASE1_Tail_2	05.08.2005 13:00:00	05.08.2005 14:00:00	1:00:00
	BASE1	BASE1_Tail_3	05.08.2005 14:00:00	05.08.2005 15:00:00	1:00:00
	BASE1	BASE1_Tail_4	05.08.2005 15:00:00	05.08.2005 16:00:00	1:00:00
	BASE1	BASE1_Tail_5	05.08.2005 16:00:00	05.08.2005 17:00:00	1:00:00
	BASE1	BASE1_Tail_6	05.08.2005 17:00:00	05.08.2005 18:00:00	1:00:00
	BASE1	BASE1_Tail_7	05.08.2005 18:00:00	05.08.2005 18:04:45	0:04:45

**After Splitting**

**Figure 9-10. Example of Dividing Occupation by the Hour**

The ‘Merge’ operation uses the following rules:

1. Only two occupations can be merged at a time.
2. Two static occupations can be merged if they correspond to the same points.
3. Two kinematic occupations can be merged only if they belong to the same Stop and Go file.
4. Occupations with different recording intervals (also known as “epoch intervals”) cannot be merged.
5. Occupations with different antenna parameters and/or serial numbers cannot be merged.
6. Occupations where different antenna types were used cannot be merged.
7. Occupations where different receiver models were used cannot be merged.
8. Occupations cannot be merged if one of them contains single-frequency data and the other dual-frequency data.

## Viewing/Saving GPS Residuals

If the ‘*Save residuals*’ box is checked for static solution, Spectrum Survey Office will create residuals for all enabled GPS observations in the job after processing GPS observations. To view the residuals diagram for a static GPS observation, double-click and select ‘*Residual View*’ from the pop-up menu (Figure 9-11).

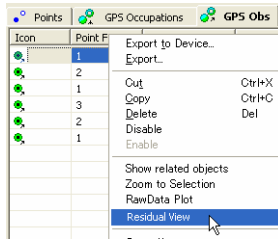


Figure 9-11. View Residuals

Then the ***Residual View*** dialog box displays diagrams of the residuals resulting from GPS-observation computation for every double difference satellite pair used in processing (Figure 9-12 on page 9-12).

- The X-axis represents the duration of GPS-observation.
- The Y-axis represents the residuals in carrier cycles for all measurement types which were collected in the two occupations.

Diagrams are represented in different colors. Each plot has its own color. The legend shows the list of all satellite pairs with corresponding colors. Use the selection boxes to hide/display pairs.



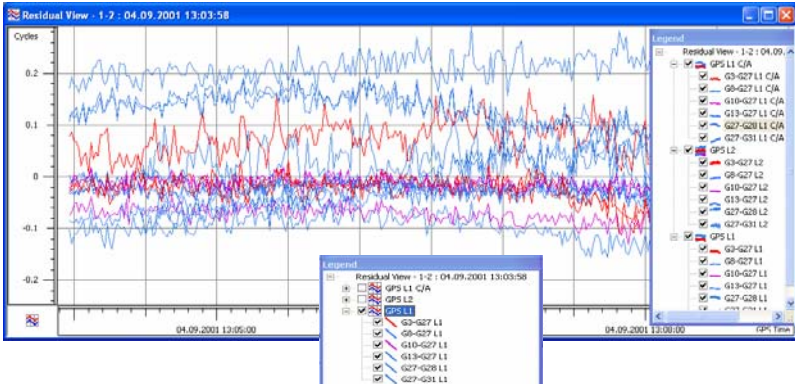


Figure 9-12. Residual View for Selected GPS-Observation

To view individual or all plots, right-click on the plot.

- To display double difference residuals, select **Show Only** <name of pair> (Figure 9-13).
- To display all, select Show All.
- To disable all measurement of a satellite, select Disable <satellite number>.

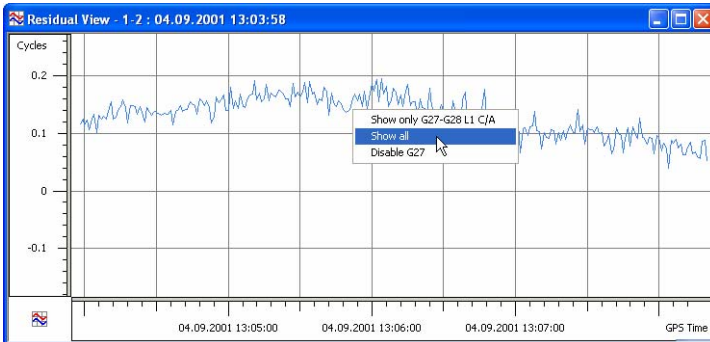


Figure 9-13. Viewing Only One Plot

Measurements from a satellite for a selected time interval can be disabled from/enabled for processing (Figure 9-14).

- To disable some measurements of a satellite, drag a square around a plot to select the desired interval of the measurements of the corresponding satellite. Right-click and select Disable.
- To enable disabled data, right-click and select Enable.

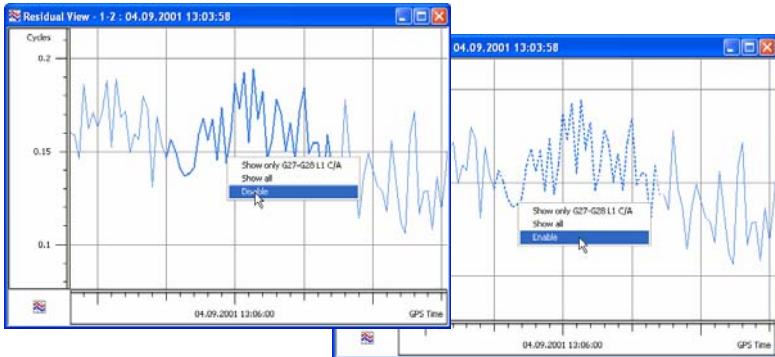


Figure 9-14. Disable/Enable Satellite Measurements

Raw measurements of the first satellite in the name of the residuals plot can be disabled/enabled. To disable data for the second satellite in the pair, change the relative satellite and redraw the residual plot (Figure 9-15 on page 9-14).

1. Right-click in the Residuals View and select Set GPS Relative.
2. Set the first satellite that will be used as “relative” for plotting residuals.
3. Disable the desired satellite.

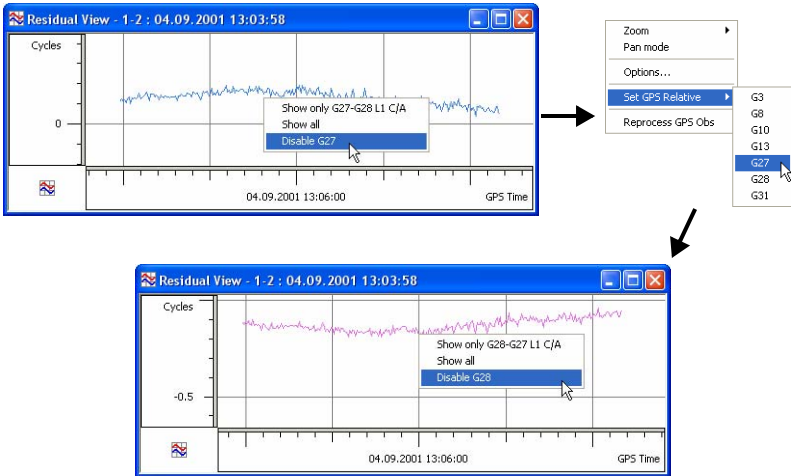


Figure 9-15. Changing Relative Satellite

## Epoch View

The *Epoch View* option allows the user to view all raw data available for the given occupation. To activate the option, right-click the desired occupation in the *GPS Occupations* tab/*Occupation View* and select *Epoch View* from the pop-up menu (Figure 9-16 on page 9-14).

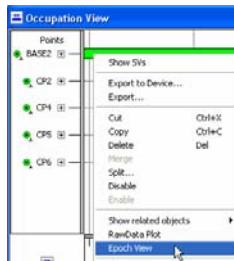


Figure 9-16. Selecting Epoch View from Pop-up Menu

The *Epoch View* dialog box displays on the screen (Figure 9-17).

The *Epoch View* dialog box displays two panels. The left panel displays all collected epochs for the occupation. Data for each epoch

contains such values as date and time, coordinates in the cartesian system (WGS84), the receiver clock offsets (in seconds), the components of velocity for each axis (in m/sec), the position dilution of precision, the common number of the obtained satellites (GPS and GLONASS), and solution type. Solution type for an occupations of a \*.tps file can be:

- *Hardware, Standalone*
- *Hardware, Code Differential*
- *Hardware, Phase differential float*
- *Hardware, Phase differential fixed*

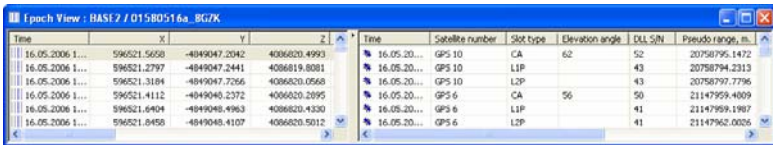


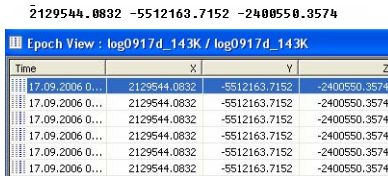
Figure 9-17. Epoch View Dialog Box

Select “*Not filtered*” only as the solution type for an occupation of a RINEX file or \*.pdc file.

**NOTICE** NOTICE

*Note: The coordinate values recorded in the header of the RINEX file will display for every epoch in the occupation.*

Coordinates given in the Header of the RINEX file



For the selected epoch in the left panel, the right panel displays satellite number, type of slot (for L1 receiver displays only CA, for L1&L2 receiver – CA, L1P, L2P), elevation angle, the channel signal to noise ratios relating to the delay lock loops (in dB\*Hz’s), the pseudorange (in meter) and carrier phase for each slot, the doppler shifts for L1 and L2, the smoothing correction (in meters) to the pseudo range measured.

To customize viewing data in the *Epoch View* dialog box, use the *Options* dialog box. To open the *Options* dialog box, right-click in any place on the *Epoch View* dialog box, then select *Options* from the pop-up menu that displays (Figure 9-18).

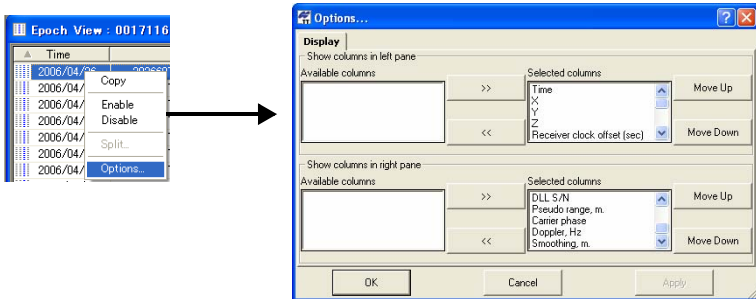


Figure 9-18. Epoch View Options

Using the *Epoch View* dialog box the user can edit an occupation: disable the selected epoch(s) (in the left panel) or/and disable any satellite(s) of the highlighted epoch (in the right panel) from the future post-processing (Figure 9-19 on page 9-16). Select the needed line(s) in the corresponding panel and right-click on any place of the highlighted area and select *Disable* from the pop-up menu.

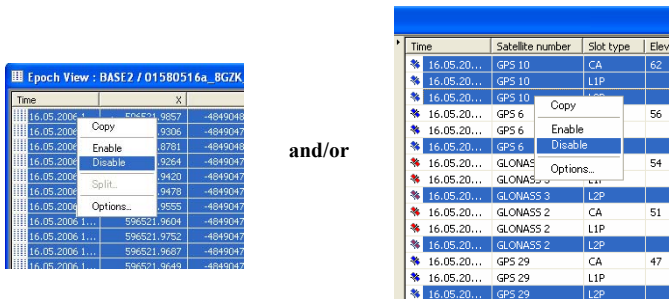


Figure 9-19. Selecting Disable from the Pop-up Menu



### NOTICE

*When any slot is disabled in the right panel, all measurement of the satellites will be disabled for this epoch.*

To view the information disabled from the occupation measurements, click **View ► Occupation View** and click the point node to view the individual satellite epochs (Figure 9-20).

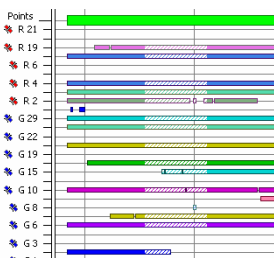


Figure 9-20. Viewing Disabled Information

Using the *Epoch View* dialog box, you can split the occupation into two occupations. Right-click on the epoch, which will be the first epoch in the second occupation, and select *Split* in the pop-up menu (Figure 9-21 on page 9-17).

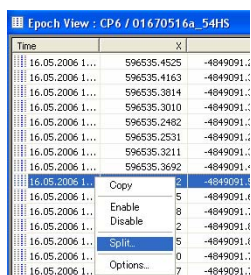


Figure 9-21. Epoch View – Split One Occupation into Two Occupations

Spectrum Survey Office will then split the occupation into two occupations. The names of the first and second occupations will be generated by adding the suffixes 'Head' and 'Tail' to the original occupations name, respectively:

Icon	Point Name	Original Name
	CP6	01670516a_54HS_Head
	CP6	01670516a_54HS_Tail

# Raw Data Plot

The *Raw Data Plot* option allows you to view in graphical form not only the plots of any ‘regular’ GPS/GLONASS receiver observables, but also the plots of various algebraic combinations of these observables. To activate this option, right-click the desired occupation(s) in the *GPS Occupations* tab/ *Occupation View* and select *Raw Data Plot* from the pop-up menu (Figure 9-22 on page 9-18).

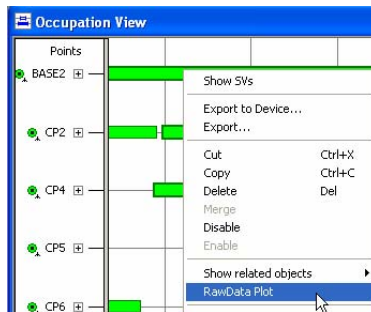


Figure 9-22. Raw Data Plot Option

The *Select Plot* dialog box displays on the screen (Figure 9-23).

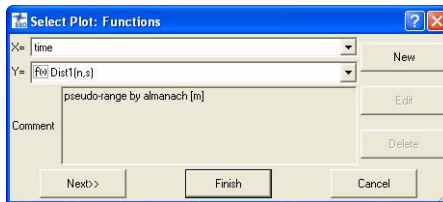


Figure 9-23. Select Plot Dialog Box

In this box, you can select a parameter for the X-axis and a desired function or existing macro for the Y-axis of the created plot.

For the X-axis the user can select any parameter from such as recording time, satellite’s elevation, a coordinate component (X, Y, Z,

Lat, Lon, H, N, E, Elevation) and velocity component ( $V_x$ ,  $V_y$ ,  $V_z$ ,  $V_n$ ,  $V_e$ ,  $V_u$ ) (Figure 9-24).

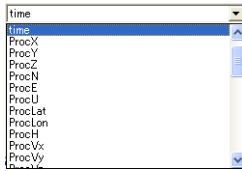


Figure 9-24. Enter Parameters on the X Axis

A pull-down list for Y-axis allows you to select a function/macro from the following groups.

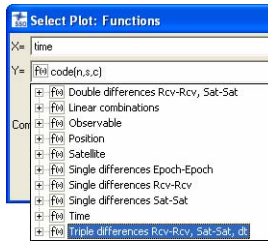
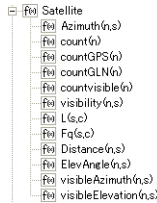


Figure 9-25. Enter Parameters on the Y Axis

- *Satellite* – this group contains satellite information for the given occupation(s).



- common/only GPS/only GLONASS number
- visibility interval for each satellite
- azimuth for each satellite from almanac
- azimuth and elevation for each satellite from the collected raw file



- pseudo range for each channel and the carrier-phase measured in whole cycles at both L1 and L2
- length of wave (L1/L2) in meters,
- distance from the receiver’s antenna phase center to the satellite’s antenna phase center. This value is retrieved from almanac messages
- *Position* – this group contains information about coordinates (cartesian (WGS84), geodetic (WGS-84), local (easting-northing-up)) and velocity of the receiver’s antenna phase center.

```

f(i) Position
f(i) ProcX(n)
f(i) ProcY(n)
f(i) ProcZ(n)
f(i) ProcN(n)
f(i) ProcE(n)
f(i) ProcU(n)
f(i) ProcLat(n)
f(i) ProcLon(n)
f(i) ProcH(n)
f(i) ProcVx(n)
f(i) ProcVy(n)
f(i) ProcVz(n)
f(i) ProcVn(n)
f(i) ProcVe(n)
f(i) ProcVu(n)
f(i) X(n)
f(i) Y(n)
f(i) Z(n)
f(i) N(n)
f(i) E(n)
f(i) U(n)
f(i) Lat(n)
f(i) Lon(n)
f(i) H(n)
f(i) Vx(n)
f(i) Vy(n)
f(i) Vz(n)
f(i) Vn(n)
f(i) Ve(n)
f(i) Vu(n)
    
```

- *Observations* – this group contains code, phase and doppler measurements, components of the position dilution of precision, receiver’s clock offsets, and signal-to-noise ratios.

Note that for TPS files the Y axis stands for SNR in dBHz. But for RINEX files this function varies from 1 to 8 conditional units:

```

f(i) Observable
f(i) SNR(n,s,c)
f(i) code(n,s,c)
f(i) phase(n,s,c)
f(i) doppler(n,s,c)
f(i) smoothing(n,s,c)
f(i) ReceiverClockOffset(n)
f(i) HDOP(n)
f(i) VDOP(n)
f(i) PDOP(n)
    
```

- *Linear combinations* – this group contains the default macros for calculating various combinations of the code and phase measurements for a single occupation.

```

(f) Linear combinations
(f) CodeSubPhase(n,s,c)
(f) Ionosphere(n,s,c)
(f) IonosphereFreeCodePlusPhase(n,s,c)
(f) CodeIonosphere2ch(n,s,c,c1)
(f) PhaseIonosphere2ch(n,s,c,c1)
(f) m_PhaseIonosphere2ch(n,s,c,c1)
(f) CodeIonosphereFree2ch(n,s,c,c1)
(f) CodeIonosphere1Free2ch(n,s,c,c1)
(f) PhaseIonosphereFree2ch(n,s,c,c1)
(f) m_PhaseIonosphereFree2ch(n,s,c,c1)
(f) Melbourne_Wubenna(n,s,c,c1)
(f) MP1(n,s,c,c1)
(f) MP2(n,s,c,c1)
(f) CodeWideLane(n,s,c,c1)
(f) PhaseWideLane(n,s,c,c1)
(f) m_PhaseWideLane(n,s,c,c1)
(f) PhaseNarrowLane(n,s,c,c1)
(f) m_PhaseNarrowLane(n,s,c,c1)
(f) CodeGeometryFree(n,s,c,c1)
(f) m_PhaseGeometryFree(n,s,c,c1)
(f) CorrectedPhase(n,s,c)
(f) dCodeSubdPhase(n,s,c)
    
```

- *Single differences Epoch-Epoch* – this group contains the default macros for calculating single differences between epochs for a single occupation: by code, by phase, by phase corrected for the receiver clock's offset, by ionosphere free combination.

```

(f) Single differences Epoch-Epoch
(f) DiffEpochByCode(n,s,c,dt)
(f) DiffEpochByPhase(n,s,c,dt)
(f) DiffEpochByCorrPhase(n,s,c,dt)
(f) DiffEpochByIonofreeCodePlusPhase(n,s,c,dt)
(f) DiffEpochByCodeIonofree2ch(n,s,c,c1,dt)
(f) DiffEpochByCodeIonofree2ch(n,s,c,c1,dt)
(f) DiffEpochByPhaseIonofree2ch(n,s,c,c1,dt)
(f) m_DiffEpochByPhaseIonofree2ch(n,s,c,c1,dt)
    
```

- *Single differences Receiver-Receiver* – this group contains the default macros for calculating single differences between two occupations overlapped in time: by code, by phase, by phase corrected for the receiver clock's offset, ionosphere free combination.

```

(f) Single differences Rcv-Rcv
(f) DiffRcvByCode(n,n1,s,c)
(f) DiffRcvByPhase(n,n1,s,c)
(f) DiffRcvByCorrPhase(n,n1,s,c)
(f) DiffRcvByIonofreeCodePlusPhase(n,n1,s,c)
(f) DiffRcvByCodeIonofree2ch(n,n1,s,c,c1)
(f) DiffRcvByCodeIonofree2ch(n,n1,s,c,c1)
(f) DiffRcvByPhaseIonofree2ch(n,n1,s,c,c1)
(f) m_DiffRcvByPhaseIonofree2ch(n,n1,s,c,c1)
    
```

- *Single differences Satellite - Satellite* – this group contains the default macros for calculating single differences for a pair of satellites in a single occupation: by code, by phase, by phase

corrected for the receiver clock's offset, by ionosphere free combination.

```

[-] Single differences Sat-Sat
  [-] DiffSatByCode(n,s,s1,c)
  [-] DiffSatByPhase(n,s,s1,c)
  [-] DiffSatByCorrPhase(n,s,s1,c)
  [-] DiffSatByIonofreeCodePlusPhase(n,s,s1,c)
  [-] DiffSatByCodeIonofree2ch(n,s,s1,c,c1)
  [-] DiffSatByCodeIonofree2ch(n,s,s1,c,c1)
  [-] DiffSatByPhaseIonofree2ch(n,s,s1,c,c1)
  [-] m_DiffSatByPhaseIonofree2ch(n,s,s1,c,c1)

```

- *Double differences Receiver-Receiver, Satellite – Satellite*: this group contains the default macros for calculating double differences between two occupations overlapped in time: by code, by phase, by phase corrected for the receiver clock's offset, by ionosphere free combination.

```

[-] Double differences Rcv-Rcv, Sat-Sat
  [-] Diff2RcvSatByCode(n,n1,s,s1,c)
  [-] Diff2RcvSatByPhase(n,n1,s,s1,c)
  [-] Diff2RcvSatByCorrPhase(n,n1,s,s1,c)
  [-] Diff2RcvSatByIonofreeCodePlusPhase(n,n1,s,s1,c)
  [-] Diff2RcvSatByCodeIonofree2ch(n,n1,s,s1,c,c1)
  [-] Diff2RcvSatByCodeIonofree2ch(n,n1,s,s1,c,c1)
  [-] Diff2RcvSatByPhaseIonofree2ch(n,n1,s,s1,c,c1)
  [-] m_Diff2RcvSatByPhaseIonofree2ch(n,n1,s,s1,c,c1)

```

- *Triple differences Receiver-Receiver, Satellite – Satellite*: this group contains the default macros for calculating triple differences between two occupations overlapped in time: by code, by phase, by phase corrected for the receiver clock's offset, by ionosphere free combination.

```

[-] Triple differences Rcv-Rcv, Sat-Sat, dt
  [-] Diff3RcvSatDtByCode(n,n1,s,s1,c,dt)
  [-] Diff3RcvSatDtByPhase(n,n1,s,s1,c,dt)
  [-] Diff3RcvSatDtByCorrPhase(n,n1,s,s1,c,dt)
  [-] Diff3RcvSatDtByIonofreeCodePlusPhase(n,n1,s,s1,c,dt)
  [-] Diff3RcvSatDtByCodeIonofree2ch(n,n1,s,s1,c,c1,dt)
  [-] Diff3RcvSatDtByCodeIonofree2ch(n,n1,s,s1,c,c1,dt)
  [-] Diff3RcvSatDtByPhaseIonofree2ch(n,n1,s,s1,c,c1,dt)
  [-] m_Diff3RcvSatDtByPhaseIonofree2ch(n,n1,s,s1,c,c1,dt)

```

- *Time* – this group allows the user to set time for Y-axis.

All functions can have one or several parameters depending on the type of the function. The following four parameters are used in Raw Data Plot:

- n – number of the epoch
- s – number of the satellite
- c – number of the channel
- dt – interval between epochs

If a function that contains one parameter is selected, the plot for this function will be displayed automatically after pressing either the **Next** or **Finish** button in the *Select Plot: Function* dialog box (Figure 9-26 on page 9-23).

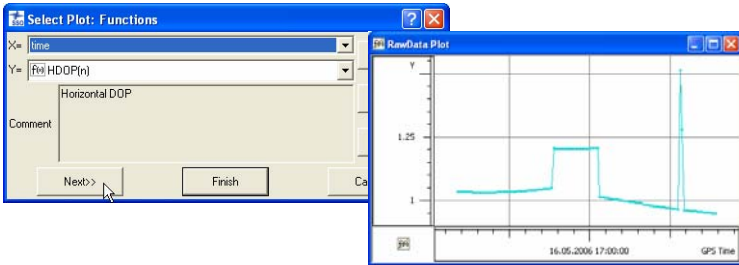


Figure 9-26. Activating the function with one parameters

If the user selects a function that contains two or more parameters, the plot for this function will be displayed automatically after pressing the **Finish** button in the *Select Plot* dialog box.

Clicking the **Next** button allows the user to select desired satellites/channels and set any values from 1 to 10 for the interval between epochs (dt).

For example, when the user creates the plot of signal-to-noise ratios for an occupation, it is possible to select satellite(s) and channel(s) for which the plot will be drawn.

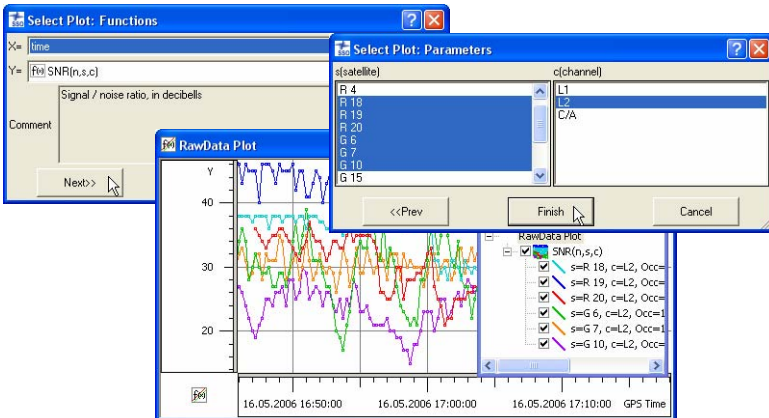


Figure 9-27. Selecting Satellites and Channel for One Occupation

For example, when the plot of double difference is created between two occupations overlapped in time by phase corrected for the receiver clock's offset, it is possible to select satellites and desired channels for these occupations (Figure 9-28).

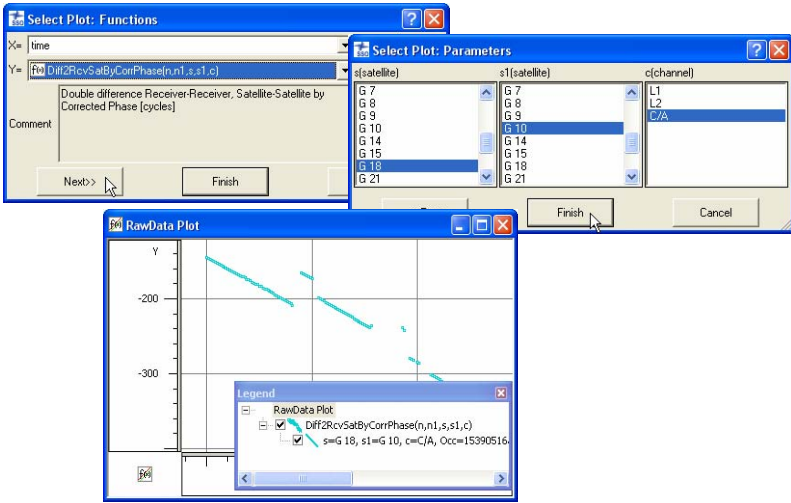


Figure 9-28. Selecting Satellites and Channel for Two Occupations

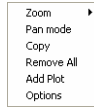
Click **Finish** button in the *Select Plot: Functions* dialog box to draw the plot:

- for all visible satellites, all channels and the interval between epochs ( $dt$ ) equal to 1 if the user did not select any parameters for the previous plot
- for the selected satellites, channels and  $dt$  if the user set these parameters for the previous plot

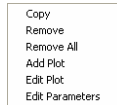
## Editing Plots in Raw Data Plot Window

Working in the *Raw Data Plot* dialog box, the user can edit both the whole window and a separate plot displayed in the window. To open a

menu for editing the properties of the dialog box, right-click in any empty place of the dialog box.



Right-click on the plot, to open a menu for editing the properties of the given plot.



For the whole window, you can:

- apply zoom and pan options
- copy all plots to the clipboard to paste this information in the table view of Excel
- remove all information from the window
- activate the **Select Plot: Functions** dialog box and add any plot to this dialog box (this command is identical to the *RawData Plot* in the pop-up menu of the *GPS Occupations* tab/ *Occupation View* (see Figure 9-23 on page 9-18). For example: adding the Elevation (of satellites) plot to the plot of the SNR for C/A slot (Figure 9-29).

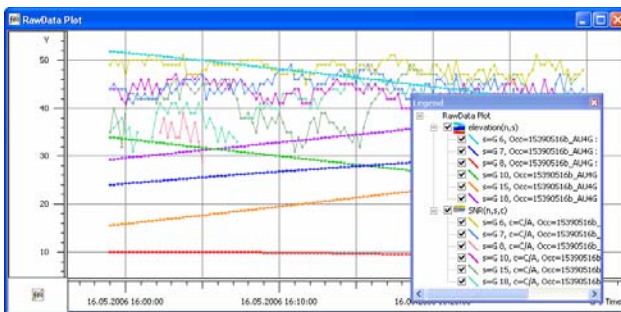


Figure 9-29. Adding Different Plots

Note: If a plot is added to any other plot, the 'Y' axis will display only absolute units.

- activate the **RawData Plot Options** dialog box (Figure 9-30) and show/hide *Grid* and *Legend*.



Figure 9-30. Raw Data Plot Options

For the plot, you can:

- copy the plots to the clipboard, to paste this information in the table view of Excel
- remove only the selected plot from the window
- remove all information from the window
- activate the **Select Plot** dialog box and add any plot to this window (this command is identical to the *RawData Plot* in the pop-up menu of the *GPS Occupations* tab/ *Occupation View* (see Figure 9-23 on page 9-18)
- activate the **Select Plot** dialog box and select any available plot instead of the selected plot

Activate the **Select Plot** dialog box and edit the parameters for the plot (Figure 9-31).

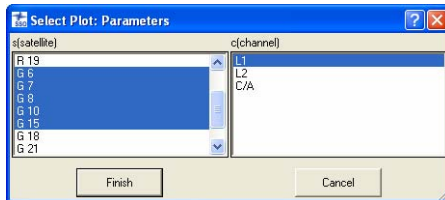


Figure 9-31. Edit Plot Parameters – Select Plot

## Editing and Creating Macros

Any existing algebraic combinations of the receiver observables can be edited. Click the **Edit** button in the *Select Plot* dialog box and update any function in the *Edit Function* dialog box (Figure 9-32).

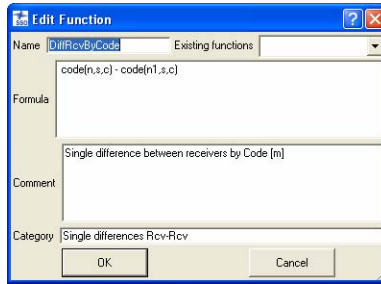


Figure 9-32. Editing Algebraic Combinations of Receiver Observables

The *Formula* field of this window allows editing a math expression using common math actions: addition, subtraction, division, multiplication. For editing the math expression, the user can select any available functions from the list of the drop-down list of the *Existing function* field (Figure 9-33)

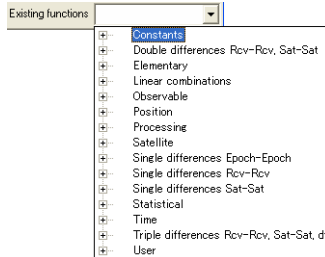


Figure 9-33. Formula Field

Besides the ‘regular’ GPS/GLONASS receiver observables and various algebraic combinations of these observables, the list contains two additional categories: “Elementary” and “Statistical” (Figure 9-34 on page 9-28).



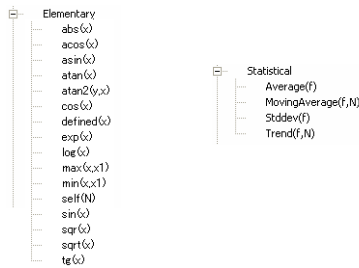


Figure 9-34. Elementary and Statistical Observables

The user can select any item from all categories for editing the math expression in the Formula field.

Note: If the name of the existing function is edited, the previous name will be changed for the new name.

To create a new algebraic combination of receiver observables, click the **New** button in the **Select Plot: Function** dialog box and create a new function in the **Edit Function** dialog box (Figure 9-35).

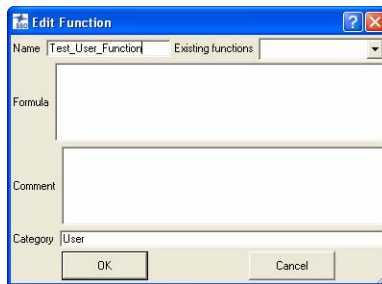
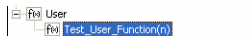


Figure 9-35. Creating a New Function

The user can select any item from all categories (from the list of the *Existing function* field) to create a math expression in the *Formula* field. After saving this function, the new name will be added to the *User* tree in the list of the available functions on the **Select Plot: Functions** dialog box:



# Datum Transformations

With the Datum Transformation option you can:

- determine an unknown datum parameters with respect to the WGS84 datum or,
- redefine the parameters of the existing datum with respect to the WGS84 for a local area.

The calculating of seven (7) parameters of transformation,

- DX,DY,DZ - Translation parameters defining the position of the reference ellipsoid's center relative to WGS84's origin. (These three scalars are specified in meters).
- RX/RY/RZ - Rotation angles defining the orientation of the reference ellipsoid relative to WGS84's axes. (These three scalars are specified in arc seconds).
- Scale factor (in ppm);

is enabled only if the following three conditions are met:

- Not less than three Control points are available for datum transformation
- One of the two systems is WGS84
- For a new local datum, whose parameters are calculated, a reference ellipsoid should be defined.

Before importing or typing the points, which have coordinates in the local datum the user needs to set this datum in the **Job Configuration** dialog box. The user can either select an existing datum (to redefine the transformation parameters) (Figure 9-36 on page 9-30),

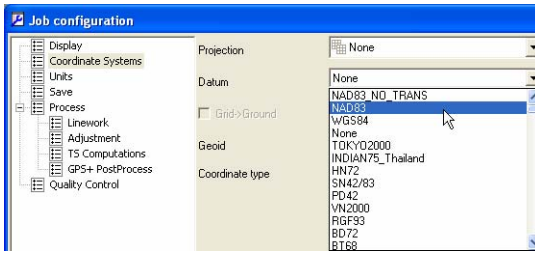


Figure 9-36. Select Existing Datum to Redefine Transformation Parameters

or create a new datum (to determine the transformation parameters) (Figure 9-37).

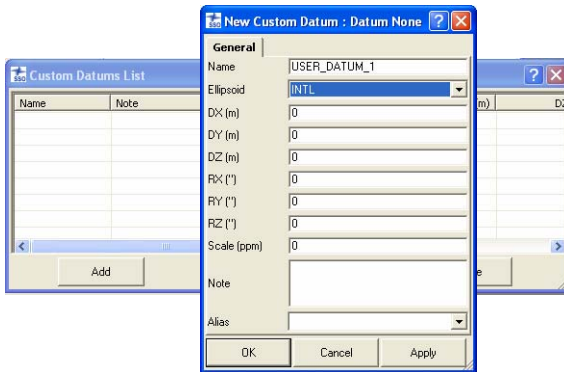


Figure 9-37. Create a New Datum to Determine the Transformation Parameters

The Control points (pairs of points) need to have the coordinates in both datums. The names of the Control Points for the same physical point in the different coordinate systems should be different:

Icon	Name
•	Control_Point1_WGS
•	Control_Point2_WGS
•	Control_Point3_WGS
•	Control_Point1_Other Datum
•	Control_Point2_Other Datum
•	Control_Point3_Other Datum

To type in or import from a file coordinates in the corresponding coordinate system, the user has to select this coordinate system in the Status Bar (Figure 9-38 on page 9-31).

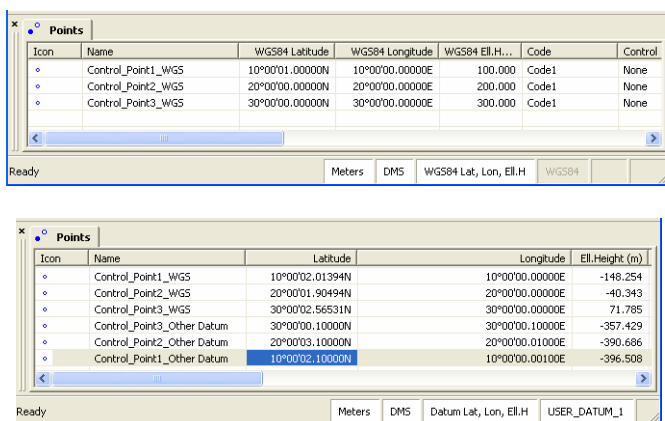


Figure 9-38. Datum Transformation

**NOTICE**

When the user selects the local datum, Spectrum Survey Office will display coordinates for all points of the job in the selected coordinate system.

To calculate the 7 parameters of transformation using the control points, take the following steps:

1. Click **Process ► Datum Transformation** to open the *Datum Transformation* dialog box (Figure 9-39). Click **Add Point**.

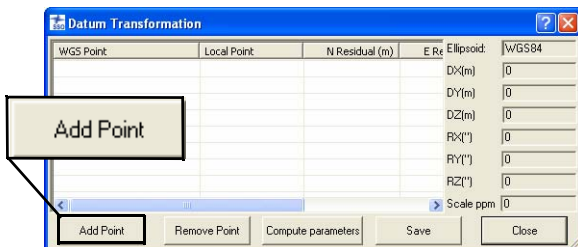
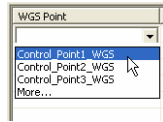


Figure 9-39. Add Point to Datum Transformation

2. Select the point to include in the datum transformation from the *WGS Point* drop-down list. The software sets the coordinates of

the selected points in the WGS-84 coordinate system in this column.



To specify the corresponding point in the Local Datum, either highlight the *Local Point* column, left-click on the column and select the corresponding point in the *Local Point* column from the drop-down list, or right-click on the *Local Point* column and select the corresponding point from the drop-down list of the *Local Point* field in the **Properties** dialog box (Figure 9-40).

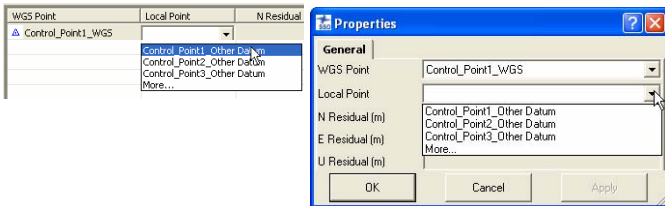


Figure 9-40. Specify Local Points

The software sets the coordinates of the selected points in the local datum coordinate system in this column.

3. Click **Add Point** and repeat steps 1 and 2 until all desired points are added to the transformation table.
4. Click **Compute parameters** to obtain the transformation parameters of the Local Datum relative to the WGS84 datum (Figure 9-41 on page 9-33)
  - The North/East/Height Residual and Total RMS columns in the left panel display transformation residuals for the corresponding axes and total the values of the residuals.
  - The right panel displays the datum transformation parameters for the entered Control points (Figure 9-41 on page 9-33).

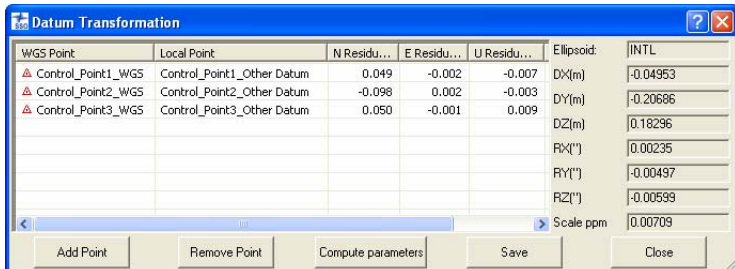
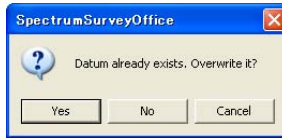


Figure 9-41. Calculating Results

After computing the transformation, these parameters will be used to transfer WGS coordinates into the local datum, and vice-versa. To save the calculated parameters, click the **Save** button. If the Local datum exists in the Spectrum Survey Office datum list, the following window will appear:



If “Yes“ is selected, the new parameters will be set for this datum name.

If “No“ is selected, the software will offer to save these parameters under the name entered in the Name field of the **Save datum as** dialog box (Figure 9-42).

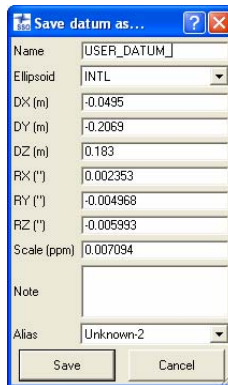
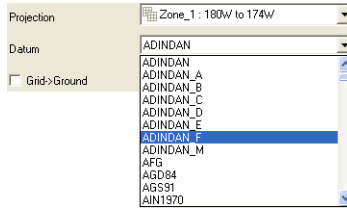


Figure 9-42. The Save Datum As Dialog Box

As described in Figure 2-15 on page 2-11, the *Datum* drop-down list sets the datum (such as, WGS84) to be used to display and adjust data. This list is available only if a local coordinate system is selected or if the current grid projection allows different datums to be used (such as UTMNorth, UTMSouth, and UPS grids):



In all other cases, the grid defines the datum(s), which is a reference datum for a selected projection (Figure 9-43).

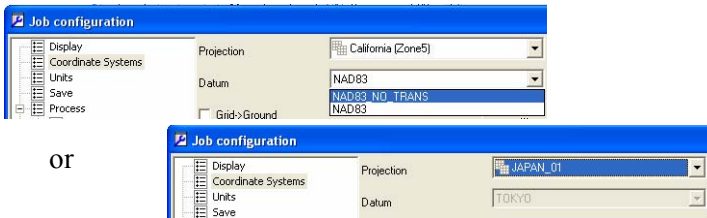


Figure 9-43. The Grid Defines the Datum(s)

If the user selects the corresponding datum (as prototype) for the desired projection in the drop-down list of the *Alias* field in the *Save datum as* dialog box (Figure 9-44), this created local datum can be used for the projection.

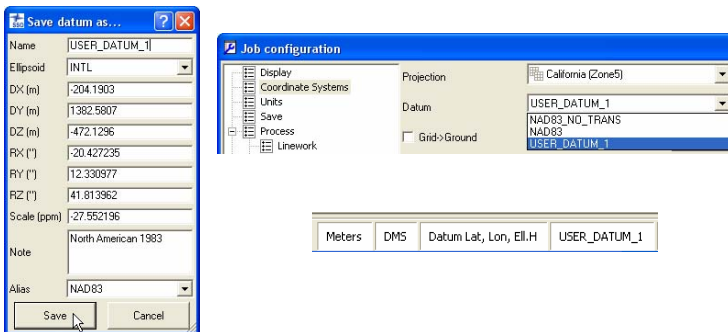


Figure 9-44. Selecting Alias Datum

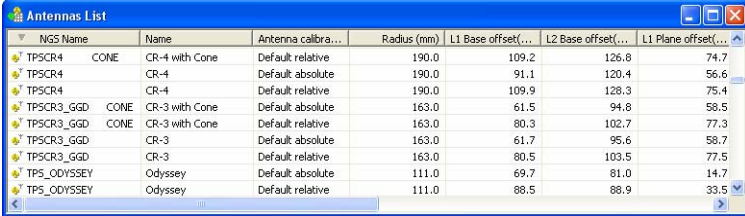
Pressing the **Save** button saves the datum with the new name and sets it as the current datum for the job.

## Antennas List

The *Antennas list* option allows the user to:

- view parameters of all antenna types available in Spectrum Survey Office
- create a new type of antenna (custom antenna) and save this type in the Spectrum Survey Office' antenna list
- import antenna calibration data from the file

Click **View ► Antennas List** to open the *Antennas List* dialog box (Figure 9-45):



NGS Name	Name	Antenna calibra...	Radius (mm)	L1 Base offset(...)	L2 Base offset(...)	L1 Plane offset(...)	
TP5CR4	CONE	CR-4 with Cone	Default relative	190.0	109.2	126.8	74.7
TP5CR4		CR-4	Default absolute	190.0	91.1	120.4	56.6
TP5CR4		CR-4	Default relative	190.0	109.9	128.3	75.4
TP5CR3_GGD	CONE	CR-3 with Cone	Default absolute	163.0	61.5	94.8	58.5
TP5CR3_GGD		CR-3 with Cone	Default relative	163.0	80.3	102.7	77.3
TP5CR3_GGD		CR-3	Default absolute	163.0	61.7	95.6	58.7
TP5CR3_GGD		CR-3	Default relative	163.0	80.5	103.5	77.5
TP5_ODYSSEY		Odyssey	Default absolute	111.0	69.7	81.0	14.7
TP5_ODYSSEY		Odyssey	Default relative	111.0	88.5	88.9	33.5

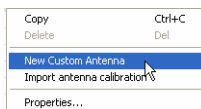
Figure 9-45. Antennas List Dialog Box

This *Antennas List* dialog box contains such antenna parameters as the standard NGS (National Geographic Society) antenna name, user's antenna name, radius, offsets, antenna manufacturer and some additional information for the antenna.

### Create a Custom Antenna

To create a new antenna type, do the following:

1. Right-click on any place in the *Antennas List* dialog box and select *New Custom Antenna* from the pop-up menu





- On the *General* tab, edit the *NGS Name*, *Name*, **Manufacturer**, and *Note* fields (Figure 9-46). Then click **Apply** to save the information.
- Click the *Parameters* tab and enter the *Radius*, *offsets*, and *Measured Height Method* for the antenna (Figure 9-46).

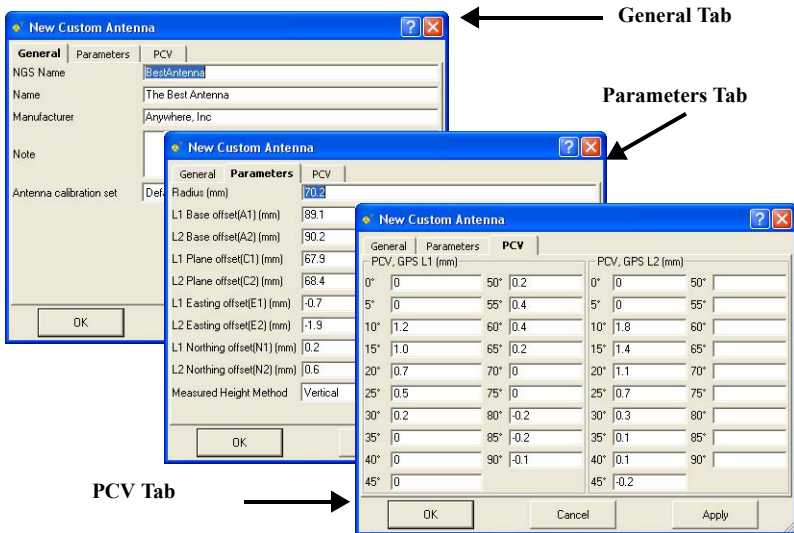
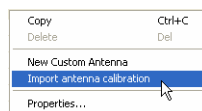


Figure 9-46. New Custom Antenna - General, Parameters and PCV Tabs

- Click the *PCV* tab and enter information on the antenna phase center variation (Figure 9-46).
- Click **OK** on the *New Custom Antenna* dialog box.

## Import Antenna Calibration Set

- To import antenna calibration from the file (such as NGS or Topcon XML), do one of the following:
  - Right-click on any place on the *Antennas List* dialog box and select *Import antenna calibration* from the pop-up menu



- Click **Job ▶ Job Configuration**, select *Equipment* and click the **Import antenna calibration** button in the left panel. The **Open** dialog box displays (Figure 9-47).

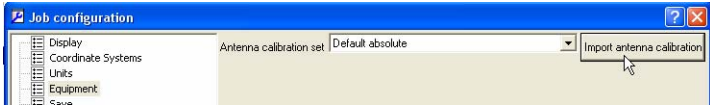


Figure 9-47. Import Antenna Calibration File

2. On the **Open** dialog box, navigate to the location of the antenna list, select the desired file format, select the type of antenna calibration (relative or absolute). From the drop-down list of the *Antenna calibration set* field, select one of the following:
  - **Default Relative** – a file containing the relative antenna calibrations, where all the antenna offsets and phase center variations are computed with respect to the AOAD/M\_T antenna.
  - **Default Absolute** – a file containing absolute antenna calibrations where all the relative antenna offsets and phase center variations that the National Geodetic Survey has computed are added to the absolute values for AOAD/M\_T antenna.
3. Click **Open** to add the new calibration set to the Spectrum Survey Office (Figure 9-48).

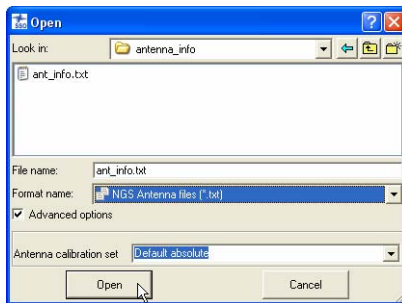


Figure 9-48. Select the Antenna Calibration File from the Antenna Calibration Set

The latest parameters of the antennas will display in the *Antennas List*.

# Computing the Position of the Camera's Perspective Center

Spectrum Survey Office can compute the position of the camera's perspective center in the moment of exposure. For this computation, Spectrum Survey Office uses the following parameters:

- Coordinates of the antenna phase center, obtained by processing the flight trajectory with the option '*Enable Continuous Kinematic*' in Spectrum Survey Office.
- Camera exposure time recorded in the \*.tps file.
- Offsets from the camera perspective center to the antenna phase center.

After processing the following occupation, the kinematic engine of Spectrum Survey Office calculates the coordinates of the aircraft GPS antenna at each epoch. As a general rule, the event exposure time does not coincide with the receiver measurement time ("epoch") (Figure 9-49).

- a static occupation collected by the receiver on a ground point
- a kinematic occupation collected by the receiver on the board of the aircraft

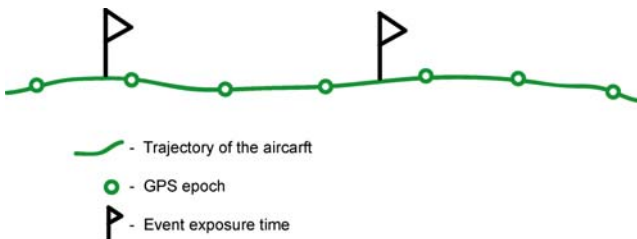
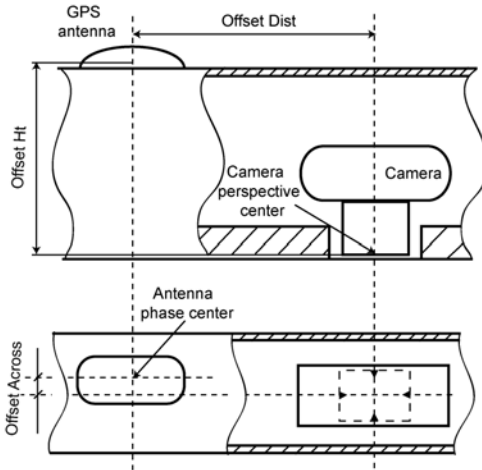


Figure 9-49. Events and GPS Epoch

For photogrammetry purposes, information about coordinates of the camera's perspective center is used. If the coordinates of the aircraft GPS antenna are known and the offsets (Offset Dist, Offset Ht, Offset Across) between the camera's center and the antenna phase center are measured, it is possible to calculate the coordinates of the camera's perspective center (Figure 9-50 on page 9-39).



**Figure 9-50. GPS Antenna and Photo Camera Mounted on an Aircraft**

Spectrum Survey Office first interpolates the coordinates of the antenna phase center to the event exposure times and then calculates, by reducing the position of the antenna to the position of the camera, the coordinates of the camera's perspective center at the time of exposure.

To synchronize the operation of GPS receiver and camera, the camera electric pulse (TTL level) is applied to the input of the receiver's external event detector. TPS receivers have two event detectors to receive event signals and "record" them into the current log file (\*.tps format). The first detector handles XA event signals and puts corresponding XA event records in the receiver's log file. The other event detector processes XB event signals exactly in the same manner. If at least one XA event record and/or one XB event record is found in the raw data file (\*.tps) imported to Spectrum Survey Office, the Points tab will display the points corresponding to the time of exposure (event points) (Figure 9-51 on page 9-40).

Icon	Name	Latitude	Longit...	Ell...	Code	Note
●	Aer0804a_PQTC 1334.352789000	60°51'...	77°38'...	235...		
●	Aer0804a_PQTC 1334.352790000	60°51'...	77°38'...	235...		
●	Aer0804a_PQTC 1334.352791000	60°51'...	77°38'...	235...		
●	Aer0804a_PQTC 1334.352792000	60°51'...	77°38'...	235...		
✕	Aer0804a_PQTC 04.08.2005 01:42:06.081551622				XA	1
✕	Aer0804a_PQTC 04.08.2005 01:42:15.109126863				XA	2
✕	Aer0804a_PQTC 04.08.2005 01:42:27.939646003				XA	3
✕	Aer0804a_PQTC 04.08.2005 01:42:42.007797108				XA	4

Figure 9-51. Point Tab Displays Event Points

The name of these points is created from the name of the kinematic occupation, the date and the time of exposure.

The *Code* column displays the name of the event detector that received this pulse (XA or XB). The *Note* column displays the event order.

As for the values of the offsets between the camera's center and the antenna phase center the user can enter them in the *Offset* tab of the *Properties Occupation* window (Figure 9-52).

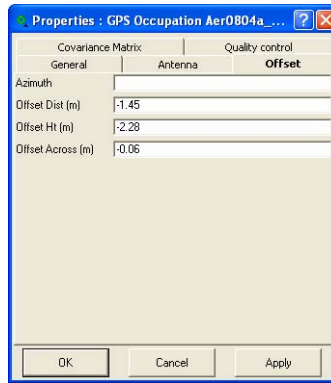
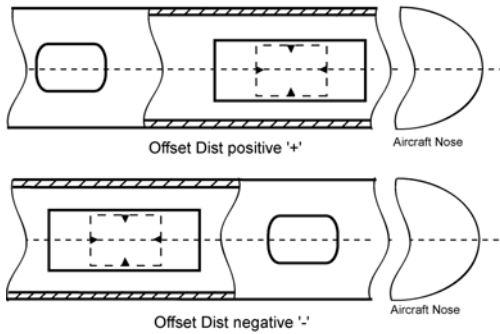


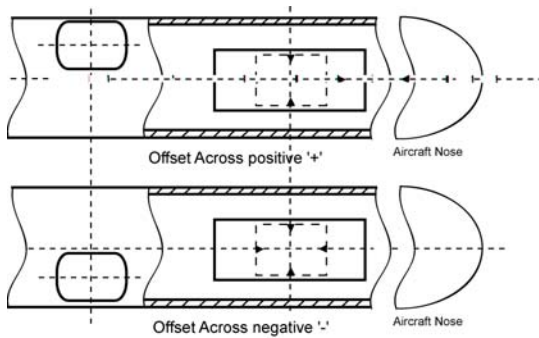
Figure 9-52. GPS Occupations Properties – Offset Tab

The *Offset Dist* is measured along the “building axis” of the aircraft from the antenna phase center to the camera's perspective center (Figure 9-53 on page 9-41).



**Figure 9-53. Signs of Offset Dist**

The *Offset Across* is measured across the “building axis” of the aircraft towards the aircraft’s wings from the antenna phase center to the camera’s perspective center (Figure 9-54).



**Figure 9-54. Signs of Offset Across**

The *Offset Ht* is measured along the vertical axis going through the top of the aircraft’s fuselage from the antenna phase center to the camera’s perspective center.

The coordinates of the camera’s perspective center are automatically calculated after processing the trajectory. The *Points* tab, *Map View* (Figure 9-55) and *CAD View* display these points (Figure 9-55 on page 9-42).

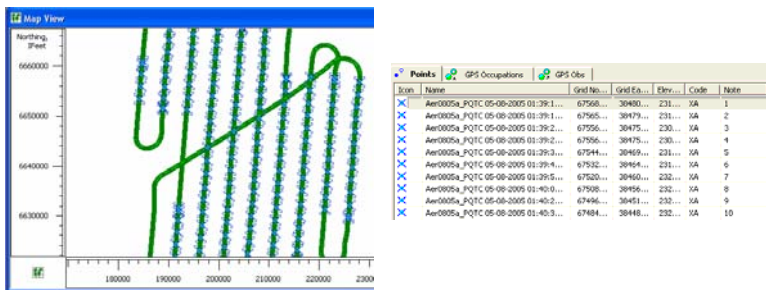


Figure 9-55. Map View and Points Tab Display Event Points

To create a report for these points, select the event points, right-click and select Report (Figure 9-56).

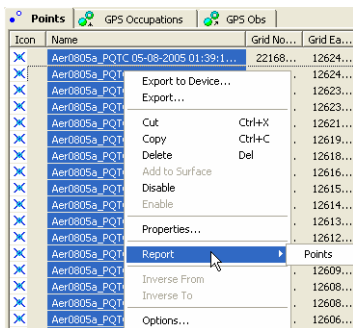


Figure 9-56. Creating Report for Event Points

## Advanced Module for Adjustment

If the Advanced module is activated, the *Process Properties* dialog box for the *Adjustment* process displays the following additional options (Figure 9-57 on page 9-43).

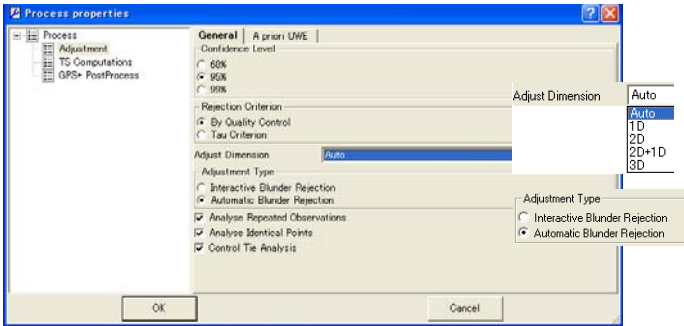
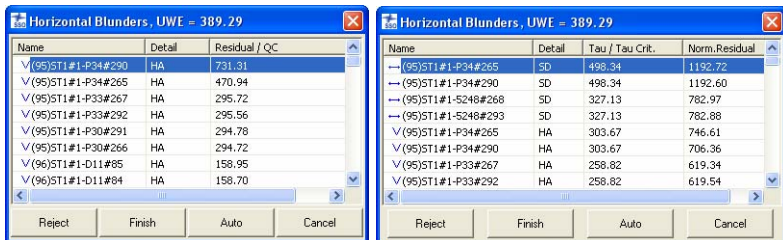


Figure 9-57. Process Properties Dialog Box – Adjustment

- selecting dimension for adjustment:
  - 1D: the adjustment is performed ONLY in the vertical plane.
  - 2D: the adjustment is performed ONLY in the horizontal plane.
  - 2D+1D: the adjustment is performed in the X, Y, and H planes.
  - 3D: the adjustment is performed in both the vertical and horizontal planes.
  - AUTO: the adjustment will run in 1D, 2D or 3D mode for each component depending on the presence of control points.
- selecting the adjustment type:
  - Automatic Blunder Rejection mode. This mode allows deleting the By Quality Control and Tay Criterion network components from the adjustment.
  - By Quality Control with residuals larger than the values set for the current job. By Tay Criterion with a Tau value larger than  $Tau_{critical}$ ).
  - This option is used by default in the adjustment without advanced mode.
  - Interactive Blunder Rejection mode. In this mode, if the network has blunders (observations that failed to pass the Quality Control or Tau Criterion tests), the network



adjustment process will be interrupted and the list of blunders will display.



Rejection 'By Quality Control'

Rejection by 'Tau Criterion'

The adjustment process can be stopped, continued, altered, or restarted after making changes to the data.

- Click **Cancel** to stop analyzing blunders and adjustment of the network
- Click **Finish** to continue the adjustment of the network without making any changes
- Select a component of the network and click **Reject** to delete from the adjustment process and restart the blunder analysis. Blunders rejected on the previous step are also displayed. To restore the deleted component, select this component and click **Unreject** (Figure 9-58)

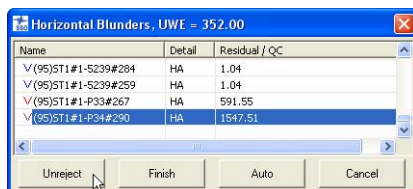


Figure 9-58. Unreject Blunders

- Click **Auto** to reject the component automatically with the maximum value of residual or Tau/Tau Crit from adjustment and restart the blunder analysis.

- To assign weights to control points, enter these values in the *Adjustment* tab of the **Properties** dialog box.

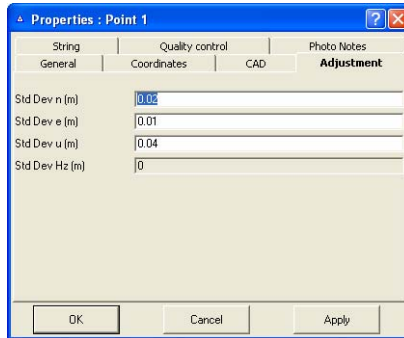


Figure 9-59. Properties Dialog Box – Adjustment Tab

Control points with non-zero weights will be adjusted as weighted, but their coordinates and Std Deviations are left unchanged.

## Advanced Module for Localization

If the *Advanced* module is activated, the *Localization* dialog box allows one to select the following method of plane localization:

- using only the stereographic projection on WGS-84 (for Localization when the *Advanced module* is not activated)
- using only the stereographic projection on any datum selected in the *Job Configuration* window of the current job
- using any projection selected in the *Job Configuration* window of the current job

If the user has information about type or/and datum used for creating local coordinate system, he can select this projection/ datum in the Localization window. In this case this projection/datum will be utilized in the calculation of localization parameters. Such approach to the calculation of localization parameters between two coordinate systems is a more rigorous method than using the stereographic projection for a unknown local projection. This method allows

increasing the distance between control points (used in localization) without the disadvantage of transformation precision.

If the *Advanced* module is activated, the **Localization** dialog box displays in the following way:

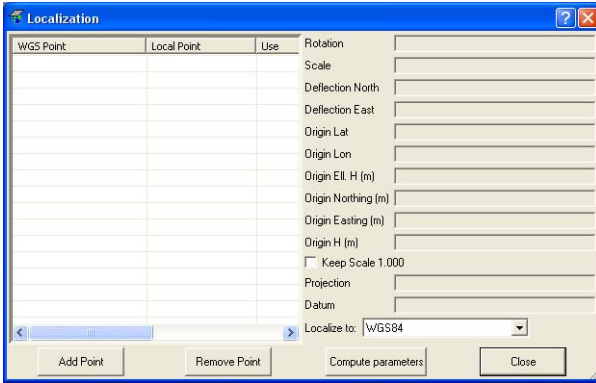


Figure 9-60. Localization window for Advanced module

This window has a ‘*Localize to*’ additional field, which contains the list of desired projection/datum for the given local system. The fields *Projection* and *Datum* display which projection datum were selected to calculate the above localization parameters.

**NOTICE** NOTICE

*The projection/datum for a local coordinate system must be selected in the Job Configuration window before running the Localization dialog box.*

1. If the user does not select any projection or datum, the *Localize to* list will contain only WGS-84 coordinate

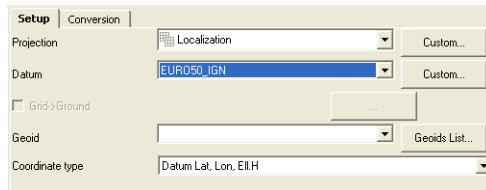


. This means that the plane

localization will use only the **stereographic** projection on WGS-84 datum.

2. If the user knows which datum is used for the local coordinate system, he can use this datum in localization. To do this:

- open the *Coordinate Systems* tab of the *Job Configuration* window (**Job ▶ Job Configuration ▶ Coordinate Systems**),
- select the desired datum in the *Datum* filed of the *Coordinate Systems* tab,
- set the *Datum Lat, Lon, Ell.H* in the *Coordinate type* field and click Ok:

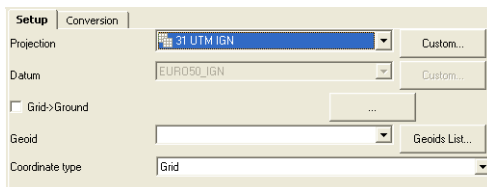


- after running **Localization (Process ▶ Localization)** the *Localize to* list will contain WGS-84 and selected

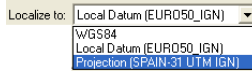
datums:

When the user selects the desired datum, it means that the plane localization will use the **stereographic** projection on the **datum** other a WGS-84.


3. If the user knows which a projection is used for the local coordinate system, he can use this projection in localization. To do this:
  - open the *Coordinate Systems* tab of the *Job Configuration* window (**Job ▶ Job Configuration ▶ Coordinate Systems**),
  - select the desired projection in the *Projection* filed of the *Coordinate Systems* tab,
  - set the *Grid* in the *Coordinate type* field and click Ok:



- after running Localization (**Process ▶ Localization**) the *Localization to* list will contain WGS-84 datum, datum for the selected projection and the projection itself:



If the user selects the desired projection, the plane localization will use this **projection on** the corresponding **datum**.

After selecting the desired projection/datum for the local system, add the pair points to *Localization* window and click  to calculate the localization parameters (see “Creating Localization in the job” on page 6-34).

# Installing the Global Geoid

Spectrum Survey Office comes with a set of commonly used geoids. Some geoid models come on the Spectrum Survey Office CD or are downloaded from the TPS web site. For other or local geoids, contact your local dealer.

To install the global geoid EGM96, which comes on the Spectrum Survey Office CD or can be downloaded from the TPS website, you must add the two required binary files to the geoid list.

With the Global Geoid installed, Spectrum Survey Office can slow down, especially on older computers.



TIP

Use Spectrum Link to convert the Global Geoid into a regional geoid. Remember to select the correct territory where occupations have been collected when creating the .gff file.

The global geoid EGM96 comes as two binary files: EGM96.glc and CORRCOEF.gla.

1. To install the global geoid, follow the steps described in “Add a Geoid” on page 2-19.

- On the **Open** dialog box, select the Global Geoid Files format and the EGM96.glc file (Figure A-1), then click **Open**.

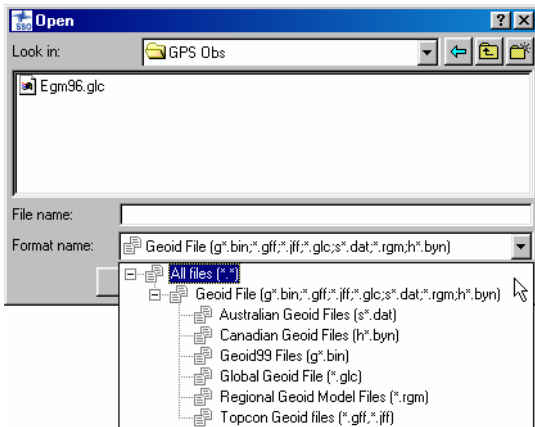


Figure A-1. Geoid File Format Selection

- Select the CORRCOEF.gla file and click **Open** (Figure A-2).

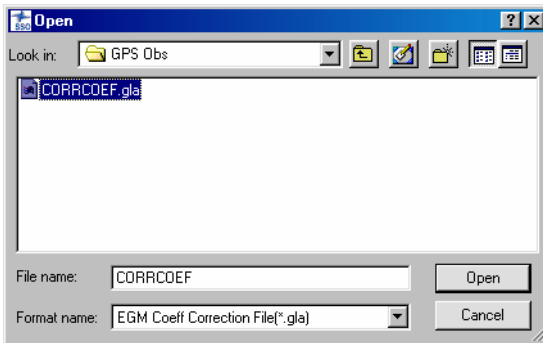
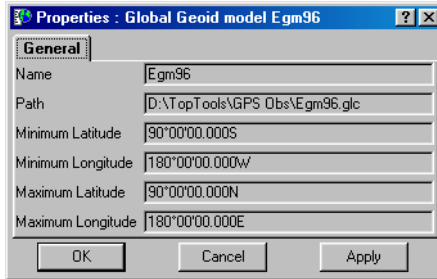


Figure A-2. Correction File Selection

4. To check the installation, right-click the global geoid on the **Geoids List** dialog box and click **Properties** on the pop-up menu. The **Properties** dialog box displays the selected geoid's information (Figure A-3).



**Figure A-3. Global Geoid Model Properties**



# About Quality Control Messages

This chapter discusses the various quality control messages received when points or observations fail a test or are outside the range of allowed precisions.

Quality control tests can be selected during job configuration. Click **Job ▶ Job Configuration**, then click **Quality Control**. On the *Automatic Tests* tab, select/de-select the tests to run during an adjustment (Figure B-1).

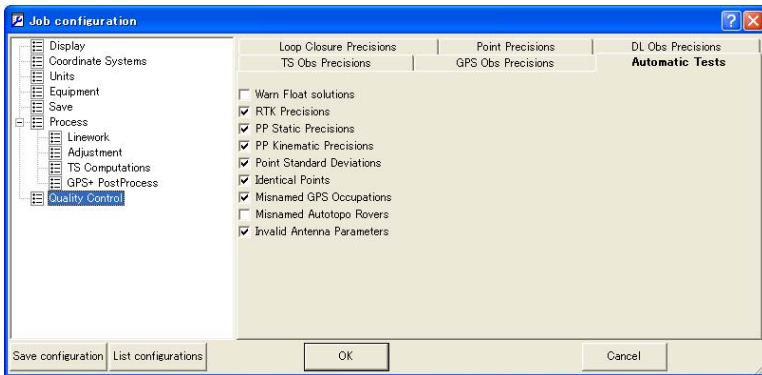


Figure B-1. Quality Control Tests

Points, occupations and observations that fail the test are marked in red on the Views and in Reports. To turn off the feature that marks failed objects red, select “Ignore QC” on the Properties dialog box for that object.

# Points Tab Quality Control Messages

Points that fail the quality control tests are marked in red on the Views and in Reports. To turn off the feature that marks failed objects red, select “Ignore QC” on the Properties dialog box for that object.

Quality control tests can be selected during job configuration. Click **Job ▶ Job Configuration**, then click **Quality Control**. On the *Automatic Tests* tab, select/de-select the tests to run during an adjustment.

To view quality control messages for points, open the *Properties* dialog box for that object. Quality control messages for the Points tab include the message for quality control in Table B-1.

**Table B-1. Quality Control Messages**

For this Message...	See...
This point is very close to point <point name>. They are probably identical.	“Point Failed Identical Points Test” on page B-2
Failed to match the desired precision.	“Point Failed Standard Deviation Test” on page B-4
Some GPS occupations’ autonomous positions are too far away from point. They are probably misnamed.	“Control Point Failed Misnamed GPS Occupations Test” on page B-6
Control point is not linked with network.	“Control Point Not Linked with the Network” on page B-7

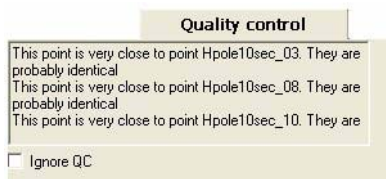
## Point Failed Identical Points Test

A point that fails the Identical Points Test is marked in red on the Views and in Reports.

This test determines which points are close together; that is, the distance between points is less than the distance entered into the Horizontal Precision/Vertical Precision fields. The test is performed in the background when opening a job, changing point coordinates, or creating/importing new points.

- Identical points (whether actually identical or too close together) can lead to a distortion of the network connectivity during adjustment.
- Using identical points when calculating transformation parameters by azimuth and distance during an adjustment can cause errors in the calculation.
- The job may require treating identical points as different points. For example, as an estimation of repeated measurements on the same point, but with different point names.

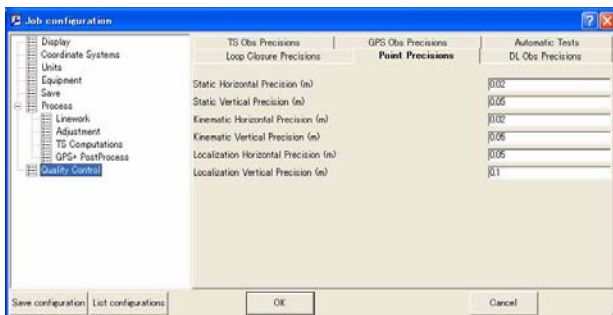
To view quality control properties for the point, select the point and click **Edit ▶ Properties**. Then click the *Quality Control* tab (Figure B-2).



**Figure B-2. Quality Control for Identical Points**

If needed, disable the setting for this test (Job ▶ Job configuration, Quality Control panel, Automatic Tests tab).

To change horizontal/vertical precision values, click **Job ▶ Job Configuration**, then click **Quality Control**. On the *Point Precisions* tab, edit the values in the corresponding fields (Figure B-3).



**Figure B-3. Edit Horizontal/Vertical Precisions**

## Point Failed Standard Deviation Test

A point that fails the Standard Deviation Test is marked in red on the Views and in Reports.

This test determines which points have horizontal/vertical precisions less than the values entered for the job (during job configuration). The precision values used depend on the selected job configuration. The test is performed during an adjustment and after importing a TopSURV job.



### NOTICE

*A large quantity of points failing this test indicates that the network has bad precision.*

To view quality control properties for the point, select the point and click **Edit ▶ Properties**. Then click the *Quality Control* tab (Figure B-4).

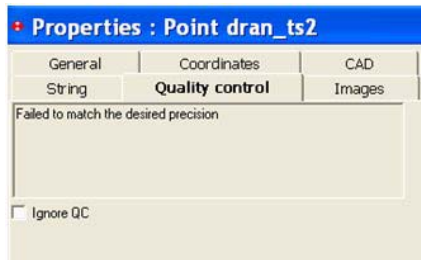


Figure B-4. Quality Control for Standard Deviation

Points with precision values dozens of times more than the setting indicate the following errors in the job:

- The network contains blunders.
- Points with the same name correspond to different measurements.
- TS and GPS measurements have the same name.
- Control points have been incorrectly fixed.
- Blunders were present during the measurement.
- Antenna height and/or reflector type settings are incorrect.

To find the source of the error(s), perform one or all of the following actions:

- View the Repeated Observation report.
- Include all information in the User report for analysis.
- Perform a Loop Closures test (Process ▶ Loop Closures) for GPS observations.
- Select blunder and analysis settings for processing points, and executing tests, during an adjustment (**Process ▶ Process Properties**) (Figure B-5).

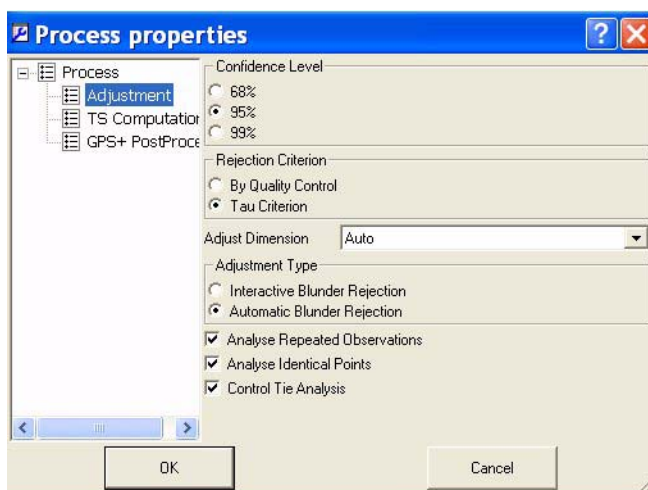


Figure B-5. Set Processing (Adjustment) Properties

If needed, disable the setting for this test (Job ▶ Job configuration, Quality Control panel, Automatic Tests tab).

To change horizontal/vertical precision values, click **Job ▶ Job Configuration**, then click **Quality Control**. In the Point Precisions tab, edit the values in the corresponding fields (Figure B-6 on page B-6).

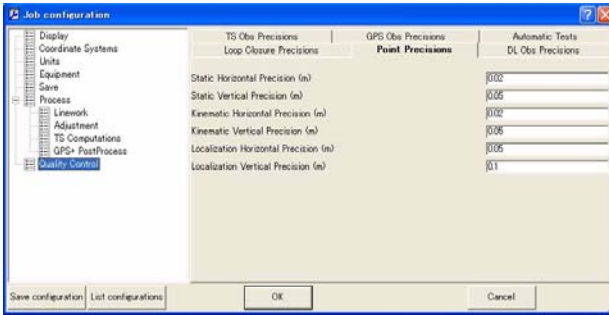


Figure B-6. Edit Horizontal/Vertical Precisions

## Control Point Failed Misnamed GPS Occupations Test

A point that fails the Misnamed GPS Occupations Test is marked in red on the Views and in Reports.

This test determines the differences between coordinates for those points that have several occupations where the difference between coordinates for the occupations is more than 30 meters. The test is performed in the background after changing a point’s coordinates.

- Points with occupations more than 30 meters apart can cause errors in the Adjustment.
- Misnamed occupations can lead to distortion of the network connectivity during an adjustment.

To view quality control properties for the point, select the point and click **Edit ▶ Properties**. Then click the *Quality Control* tab (Figure B-7 on page B-6).

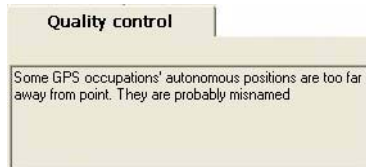


Figure B-7. Quality Control for Misnamed GPS Occupations

Points that are considered misnamed GPS occupations indicates the following possible errors in the job:

- Occupations are misnamed.  
Edit the site name for the suspect occupation.
- Data entry error occurred when entering point coordinates or parameters.

If needed, disable the setting for this test (Job ▶ Job configuration, Quality Control panel, Automatic Tests tab).

## Control Point Not Linked with the Network

A control point that is not linked with the network is marked in red on the Views and in Reports.

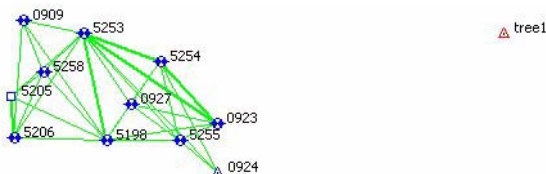


Figure B-8. Control Point (Tree1) Not Linked with Network

This test determines which points are not linked with the network. The test is performed in the background during an adjustment. Control points that are considered not linked with the network indicates the following possible errors in the job:

- The control point was incorrectly assigned.
- In some cases, no errors occur. For example, if the job has an excess of control points.

To view quality control properties for the point, select the point and click **Edit ▶ Properties**. Then click the *Quality Control* tab (Figure B-9).

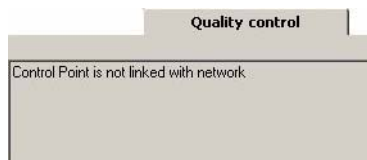


Figure B-9. Quality Control for Points Not Linked With Network

## GPS Occupations Tab Quality Control Messages

Occupations and corresponding points that fail the quality control tests are marked in red on the Views and in Reports. To turn off the feature that marks failed objects red, select “Ignore QC” on the Properties dialog box for that object.

Quality control tests can be selected during job configuration. Click **Job ▶ Job Configuration**, then click **Quality Control**. On the *Automatic Tests* tab, select/de-select the tests to run during an adjustment.

To view quality control messages for an occupation, open the **Properties** dialog box for that object. Quality control messages for the GPS Occupations tab include the following message in Table B-2.

**Table B-2. Quality Control Messages**

For this Message...	See...
Occupation’s autonomous positions is too far away from point. It is probably misnamed.	“Occupation Failed Misnamed GPS Occupations Test” on page B-8

### Occupation Failed Misnamed GPS Occupations Test

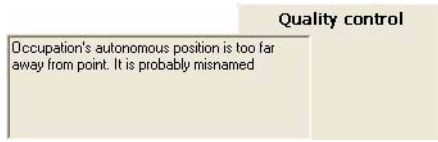
A static occupation that fails the Misnamed GPS Occupations Test is marked in red on the Views and in Reports.

This test determines that this occupation probably does not belong to the specified point because the coordinates between the occupation and point are more than 30 meters apart. The test is performed in the background after changing any occupation’s parameters.

- Points with occupations more than 30 meters apart can cause errors in the Adjustment.
- Misnamed occupations can lead to distortion of the network connectivity during an adjustment.



To view quality control properties for the point, select the point and click **Edit ▶ Properties**. Then click the *Quality Control* tab (Figure B-10).



**Figure B-10. Quality Control for Misnamed GPS Occupations**

To view the source of the error, generate a Misnamed GPS Occupations report (Figure B-11).

Misnamed GPS Occupations Report			
Original Name	Point Name	Start Time	Nav Distance from Point (m.)
9	9	26.10.2005 14:38:45	3,71
9	9	26.10.2005 14:39:55	70,75
9	9	26.10.2005 14:50:00	197,48

**Figure B-11. Misnamed GPS Occupations Report**

Points that are considered misnamed GPS occupations indicates the following possible errors in the job:

- Occupations are misnamed.  
Edit the site name for the suspect occupation.
- Data entry error occurred when entering occupation parameters.

If needed, disable the setting for this test (Job ▶ Job configuration, Quality Control panel, Automatic Tests tab).

# TS Obs Tab Quality Control Messages

Observations that fail the quality control tests are marked in red on the Views and in Reports. To turn off the feature that marks failed objects red, select “Ignore QC” on the *Properties* dialog box for that object.

Quality control tests can be selected during job configuration. Click **Job ▶ Job Configuration**, then click **Quality Control**. In the Automatic Tests tab, select/de-select the tests to run during an adjustment.

To view quality control messages for an observation, open the *Properties* dialog box for that object. Quality control messages for the TS Obs tab include the following messages in Table B-3:

**Table B-3. Quality Control Messages**

For this Message...	See...
Rejected by distance. Rejected by vertical angle. Reject by horizontal angle.	“TS Observation Rejected by Distance, Vertical Angle, or Horizontal Angle” on page B-11
Rejected by outlier distance. Rejected by outlier vertical angle. Reject by outlier horizontal angle.	“TS Observation with Outliers Rejected by Distance, Vertical Angle, or Horizontal Angle” on page B-12

## TS Observation Rejected by Distance, Vertical Angle, or Horizontal Angle

A total station observation that fails to satisfy precision values for distance, vertical angle, or horizontal angle is marked in red on the Views and in Reports (Figure B-12).

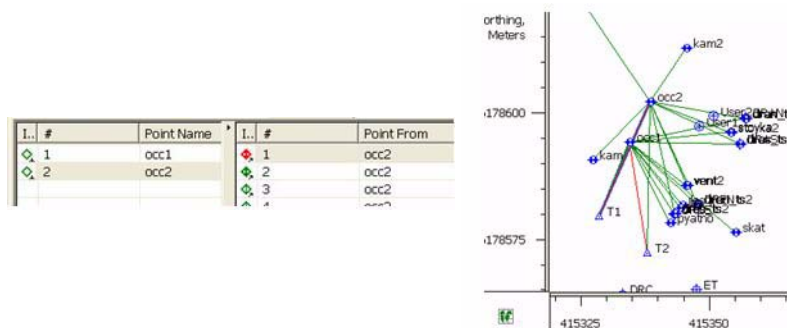


Figure B-12. Rejected TS Observation

This test determines which component of a TS observation has a precision worse than the value entered into the Horizontal Precision/ Vertical Precision fields. The test is performed when adjusting the net. After the test, the outlier (suspect) component of a TS observation will not be used when adjusting this net.

To view quality control properties for the observation, select the observation and click **Edit ► Properties**. Then click the *Quality Control* tab (Figure B-13).



Figure B-13. Quality Control for Rejected TS Observation

To change precision values, click **Job ▶ Job Configuration**, then click **Quality Control**. In the *TS Obs Precisions* tab, edit values in the corresponding fields.

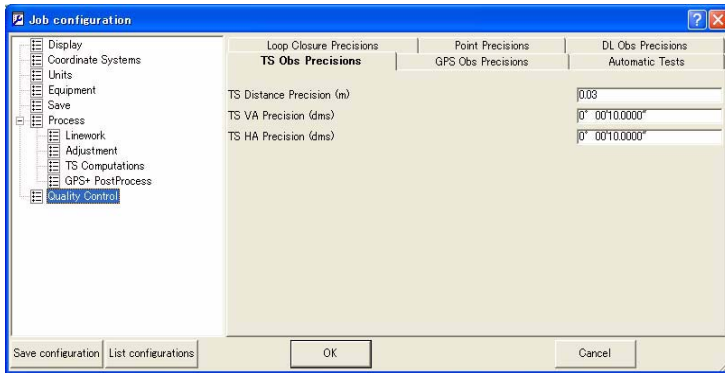


Figure B-14. Edit Distance, Horizontal Angle, Vertical Angle Precisions

## TS Observation with Outliers Rejected by Distance, Vertical Angle, or Horizontal Angle

A total station observation that has a suspect component (distance, vertical angle, or horizontal angle) is marked in red on the Views and in Reports.

This test determines which component of repeated (more than 2) observations is suspect. The suspect component has a value more than that entered for the job settings when compared with corresponding repeated vector components. This test is performed during net adjustment. The outlier (suspect) component will not be used in the adjustment of the net.

To view quality control properties for the observation, select the observation and click **Edit ▶ Properties**. Then click the *Quality Control* tab.



Figure B-15. Quality Control for Outlier TS Observation Component

To change precision values, click **Job ▶ Job Configuration**, then click **Quality Control**. In the TS Obs Precisions tab, edit values in the corresponding fields.

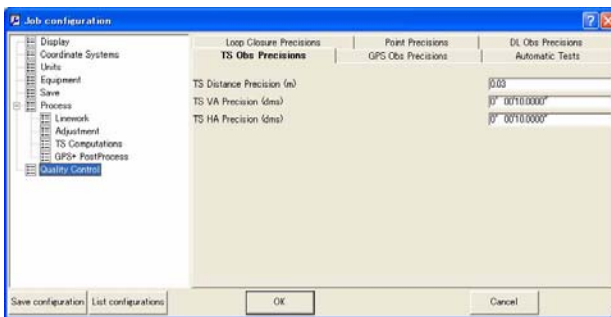


Figure B-16. Edit Distance, Horizontal Angle, Vertical Angle Precisions

## GPS Obs Tab Quality Control Messages

Observations that fail the quality control tests are marked in red on the Views and in Reports. To turn off the feature that marks failed objects red, select "Ignore QC" on the **Properties** dialog box for that object.

Quality control tests can be selected during job configuration. Click **Job ▶ Job Configuration** and click **Quality Control**. In the Automatic Tests tab, select/de-select the tests to run during an adjustment.

To view quality control messages for an observation, open the Properties dialog box for that object. Quality control messages for the GPS Obs tab include the following:

**Table B-4. Quality Control Messages**

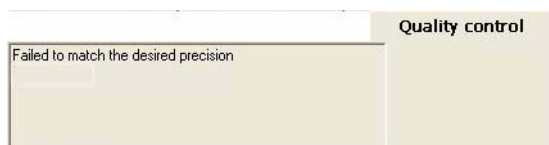
For this Message...	See...
Failed to match the desired precision.	“GPS Observation Failed to Match Desired Precision” on page B-14
Float solution.	“GPS Observation Has a “Float Solution”” on page B-15
Failed to process.	“GPS Observation Failed to Process” on page B-15
Rejected by Horz. Reject by Height.	“GPS Observation Rejected by Plane or by Height” on page B-16

## GPS Observation Failed to Match Desired Precision

A GPS observation that fails to match the desired precision is marked in red on the Views and in Reports.

This test determines which RTK and GPS post-processed observations have horizontal/vertical precisions worse than the value entered for the job settings. This test is performed after an adjustment.

To view quality control properties for the observation, select the observation and click **Edit ▶ Properties**. Then click the *Quality Control* tab (Figure B-17).



**Figure B-17. Quality Control for GPS Observation with Precision Error**

To change precision values, click **Job ▶ Job Configuration**, then click **Quality Control**. In the *GPS Obs Precisions* tab (Figure B-18),

edit the values for RTK, PP, and Kinematic horizontal/vertical precisions.

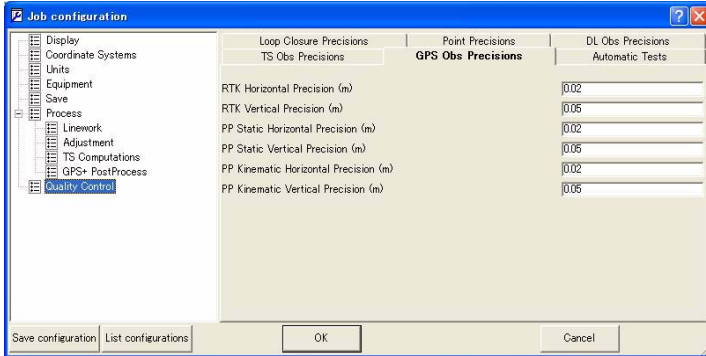


Figure B-18. Edit Distance, Horizontal Angle, Vertical Angle Precisions

## GPS Observation Has a “Float Solution”

This option allows to display in red on the Views and in Reports all observations which have float solution after processing.

This test is performed after an adjustment.

To view quality control properties for the observation, select the observation and click **Edit ► Properties**. Then click the Quality Control tab (Figure B-18 on page B-15).

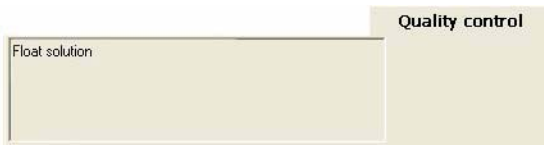


Figure B-19. Quality Control for GPS Observation with “Float Solution”

## GPS Observation Failed to Process

A GPS observation that fails to process is marked in red on the Views and in Reports.

This test determines which GPS observations were not processed because of lack of data. For example, the navigation data for corresponding observation data are absence and it is necessary to

download navigation data. The test is performed after post-processing.

To view quality control properties for the observation, select the observation and click **Edit ▶ Properties**. Then click the *Quality Control* tab (Figure B-19 on page B-15).

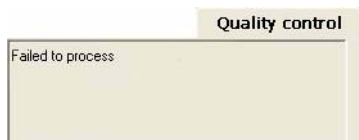


Figure B-20. Quality Control for GPS Observation that Failed to Process

## GPS Observation Rejected by Plane or by Height

A GPS observation that fails to satisfy total station observation precisions is marked in red on the Views and in Reports.

This test determines which component (plane or height) of a GPS observation has a precision worse than the value entered for the job settings. This test is performed during net adjustment. The outlier (suspect) component will not be used in the adjustment of the net.

To view quality control properties for the observation, select the observation and click **Edit ▶ Properties**. Then click the *Quality Control* tab (Figure B-21 on page B-16).



Figure B-21. Quality Control for GPS Observation that Fails TS Obs Precisions

To change precision values, click **Job ▶ Job Configuration**, then click **Quality Control** (Figure B-22). In the GPS Obs Precisions tab,



edit the values for RTK, PP, and Kinematic horizontal/vertical precisions.

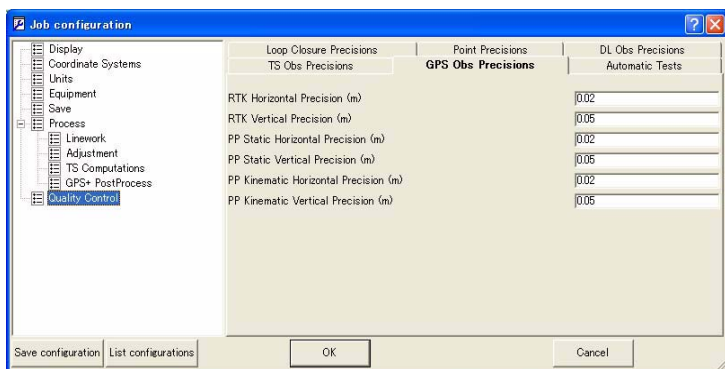


Figure B-22. Edit Distance, Horizontal Angle, Vertical Angle Precisions

## DL Obs Tab Quality Control Messages

Observations that fail the quality control tests are marked in red on the Views and in Reports. To turn off the feature that marks failed objects red, select “Ignore QC” on the Properties dialog box for that object.

Quality control tests can be selected during job configuration. Click Job ► Job Configuration and click Quality Control. In the Automatic Tests tab, select/de-select the tests to run during an adjustment.

To view quality control messages for an observation, open the Properties dialog box for that object. Quality control messages for the DL Obs tab include the following messages in Table B-5:

Table B-5. Quality Control Messages

For this Message...	See...
AutoRejected Rejected by Height	“DL Observation Failed to Match Desired Precision” on page B-18

## DL Observation Failed to Match Desired Precision

A DL observation that fails to match the desired precision is marked in red on the Views and in Reports.

This test determines which level measure has a precision worse than the value entered for the job settings, and thus has an erroneous elevation. This test is performed during an adjustment. The pair of points (BS and FS) for this observation will not be used in the adjustment of the net.

To view quality control properties for the observation, select the observation and click **Edit ▶ Properties**. Then click the *Quality Control* tab (Figure B-23 on page B-18).



Figure B-23. Quality Control for DL Observation with Precision Error

To change precision values, click **Job ▶ Job Configuration**, then click **Quality Control**. In the DL Obs Precisions tab, edit the value for vertical precisions (Figure B-24 on page B-18).

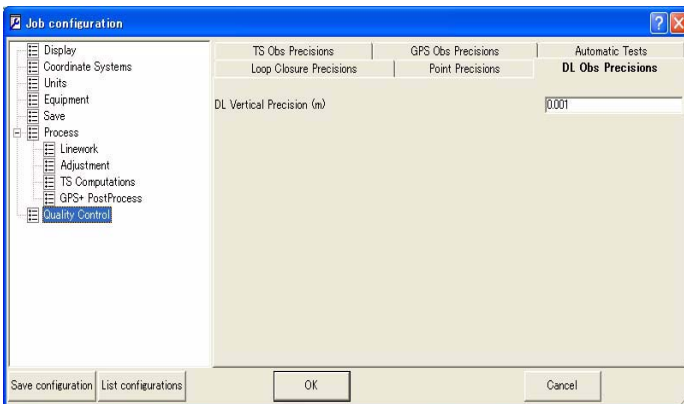


Figure B-24. Edit Vertical Precision

# Symbols Used in Tabs and on Views



## NOTICE

*Symbols are marked in red if the data did not pass the Quality Control test. To identify why the test failed for the data, click Properties on the pop-up menu and select the Quality Control tab.*

## Points Tab Symbols

Table C-1 contains symbols that Spectrum Survey Office uses to represent different information in the *Points* tab.

Symbols of points are marked red if the point did not pass Quality Control test. To identify why the test failed for the point, click Properties on the pop-up menu and select the Quality Control tab.

Table C-1. Points Tab Symbols









Symbols passed/not passed Quality Control test	Description
 / 	Manual point (the point added to the job with using the command <b>Edit ▶ Add ▶ Point</b> )
 / 	Unknown point (the non-control point imported to the job from a coordinate file)
 / 	Fixed Both Both coordinates point
 / 	Fixed Horizontal Horizontal control

Table C-1. Points Tab Symbols (Continued)
















Symbols passed/not passed Quality Control test	Description
	Fixed Vertical Vertical control
	Stakeout point
	Design point
	Point coordinates calculated by means of COGO
	Adjusted point
	TS station
	TS point
	TS BackSight point
	RTK base point
	Topo Point (the point collected during a static RTK measurement)
	Auto Topo Point (the point collected during a kinematic RTK measurement)
	GPS post-processing static point
	GPS post-processing static point in the stop&go measurements
	GPS post-processing kinematic point
	Tape Measurement point

Table C-1. Points Tab Symbols (Continued)









Symbols passed/not passed Quality Control test	Description
	GPS offset point
	PTL (point to line) offset point
	Traverse point (for digital level observation)
	Level point (for digital level observation)
	Unprocessed GPS PP points (static and kinematic)
	Scan point
	Event point
	Image measure point

Table C-2 contains messages in the *Quality Control (QC)* tab corresponding to the red symbols in the *Point* tab and a brief description for each message.

Table C-2. Messages in the Quality Control Tab for the Point Tab

Message in QC Tab	Description for a message
<b>‘Control Point is not linked with network’</b>	A control point not used in adjustment.(for example: control points used in calculation of the localization parameters and not used in adjustment)
<b>‘This point is very close to point ‘NAME’. They are probably identical’</b>	In this case the distance between these points is less than <i>Horizontal Precision /Vertical Precision</i> settings for the job ( <b>Job ▶ Job configuration ▶ Quality Control ▶ Point Precisions</b> tab). These several measurements probably belong to one point.





**Table C-2. Messages in the Quality Control Tab for the Point Tab (Continued)**

Message in QC Tab	Description for a message
<b>‘Failed to match the desired precision’</b>	In this case <i>Horizontal Precision / Vertical Precisions</i> for this point are worse than the value in the settings for the job ( <b>Job ▶ Job configuration ▶ Quality Control ▶ Point Precision</b> tab).
<b>‘Some GPS occupations’ autonomous positions are too far away from point. They are probably misnamed’</b>	There are several occupations for this point and the difference between the coordinates of the occupations is more than 30 meters. In this case the user has to change the site name for the suspect occupation.
<b>‘Control Tie Test failed’</b>	The differences between the fixed coordinates as Compare Both/Compare Horizontal/Compare Vertical and adjusted coordinates for a point are worse than the value in the settings for the job ( <b>Job ▶ Job configuration ▶ Quality Control ▶ Point Precision</b> tab).

## GPS Occupation Tab Symbols

Table C-3 contains symbols that Spectrum Survey Office uses to represent different information in the *GPS Occupations* tab.

**Table C-3. GPS Occupations Tab Symbols**

Symbols passed/not passed Quality Control test	Description
	RTK base station occupation
	Topo occupation (the static occupation in the RTK survey)
	Auto Topo Occupation (the kinematic occupation in the RTK survey)
	GPS post-processing base station occupation

**Table C-3. GPS Occupations Tab Symbols (Continued)**




Symbols passed/not passed Quality Control test	Description
 / 	GPS post-processing static occupation in the stop&go measurements
	GPS post-processing kinematic occupation

Table C-4 contains messages in the *Quality Control (QC)* tab corresponding to the red symbols in the GPS Occupations tab and a brief description for each message.

**Table C-4. Messages in the Quality Control Tab for the GPS Occupation Tab**

Message in QC Tab	Description for a message
<b>‘No ephemeris’</b>	There is only observation data for this GPS post-processing occupation (for RINEX data format). The user has to download the navigation data.
<b>‘Occupation's autonomous position is too far away from point. It is probably misnamed’</b>	This occupation does not belong to the specified point, because these coordinates are by more than 30 meters different from the coordinates of the other occupations corresponding to the point. In this case the user have to change the site name for the suspect occupation.

## TS Obs Tab Symbols

Table C-5 contains symbols that Spectrum Survey Office uses to represent different information in the *TS Obs* tab.

**Table C-5. TS Obs Tab Symbols**




Symbols passed/not passed Quality Control test	Description
	TS station
 / 	SideShot (SS) measurement

Table C-5. TS Obs Tab Symbols (Continued)









Symbols passed/not passed Quality Control test	Description
 / 	ForeSight(FS) measurement
 / 	BackSight (BS) measurement
 / 	BackSightBearing (BKB) point measurement
 / 	Horizontal Resection/Vertical Resection/Resection observation

Table C-6 contains messages in the *Quality Control (QC)* tab corresponding to the red symbols in the *TS Obs* tab and a brief description for each message.

Table C-6. Messages in the Quality Control Tab for the TS Obs Tab

Message in QC Tab	Description for a message
<p>‘Outlier by Horizontal Angle’</p> <p>‘Outlier by Vertical Angle’</p> <p>‘Outlier by Distance’</p>	<p>In the family of <b>repeated</b> (more than 2) TS observations a bad component (Horizontal/Vertical Angle or Distance) is found. The bad component is a component of TS observations, which is different from corresponding repeated vectors components by more than the value in the settings for the job (<b>Job ▶ Job configuration ▶ Quality Control ▶ TS Obs Precision</b> tab). This test is executed in the process of the net adjustment, and the outlier (bad) component of TS observation found will not be used in the adjustment of this net.</p>
<p>‘Rejected by Distance’</p> <p>‘Rejected by Vertical Angle’</p> <p>‘Rejected by Horizontal Angle’</p>	<p>After the net has been adjusted, a bad component is found (<i>Horizontal/Vertical Angle, Distance</i>). In this case, the bad component is a component of TS observations which has precision worse than the value in the settings for the job (<b>Job ▶ Job configuration ▶ Quality Control ▶ TS Obs Precision</b> tab). After testing, the outlier (bad) component of TS observation found will not be used in the adjustment of this net.</p>



# GPS Obs Tab Symbols

Table C-7 contains symbols that Spectrum Survey Office uses to represent different information in the *GPS Obs* tab.

**Table C-7. GPS Obs Tab Symbols**











Symbols passed/not passed Quality Control test	Description
 / 	RTK baseline from the base station to a Topo point
 / 	RTK baseline from the base station to an Auto Topo point
 / 	Processed GPS post-processing static vector
 / 	Processed GPS post-processing kinematic vector
	Unprocessed GPS post-processing static vector
	Unprocessed GPS post-processing kinematic vector

Table C-8 contains messages in the *Quality Control (QC)* tab corresponding to the red symbols in the *GPS Obs* tab and a brief description for each message.

**Table C-8. Messages in the Quality Control Tab for the GPS Obs Tab**

Message in QC Tab	Description for a message
<b>'Failed to match the desired precision'</b>	In this case <i>Horizontal Precision/Vertical Precision</i> for RTK and GPS post-processing vector are worse than the value in the settings for the job ( <b>Job ▶ Job configuration ▶ Quality Control ▶ GPS Obs Precision</b> tab).
<b>'Failed to process'</b>	The GPS post-processing vector could not be processed due to the absence of navigation data for corresponding observation data. The user have to download the navigation data

**Table C-8. Messages in the Quality Control Tab for the GPS Obs Tab**

Message in QC Tab	Description for a message
'Float solution'	The GPS post-processing vector is processed but integer biases are not fixed.
'Rejected by Plane' 'Rejected by Height'	After the net has been adjusted, a bad component is found ( <i>Plane or Height</i> ). In this case, the bad component is a component of GPS observation (vector) which has precision worse than the value in the settings for the job ( <b>Job ▶ Job configuration ▶ Quality Control ▶ GPS Obs Precision</b> tab). After testing, the outlier (bad) component of vector found will not be used in the adjustment of this net.

## DL Obs Tab Symbols

Table C-9 contains symbols that Spectrum Survey Office uses to represent different information in the *DL Obs* tab.

**Table C-9. TS Obs Tab Symbols**





Symbols passed/not passed Quality Control test	Description
	Leveling job
	BackSight level measurement
	ForeSight level measurement
	SideShot level measurement

Table C-10 contains messages in the *Adjustment Status* column corresponding to the red symbols in the *DL Obs* tab and a brief description for each message.













**Table C-10. Messages in the Quality Control Tab for the TS Obs Tab**

Message in QC Tab	Description for a message
<b>'Rejected by Height'</b>	After the net has been adjusted, a level measure with bad elevation is found. In this case, the level measure has precision worse than the value in the settings for the job ( <b>Job ▶ Job configuration ▶ Quality Control ▶ TS Obs Precision</b> tab). After testing, the pair of the points (BS and FS) of DL observation found will not be used in the adjustment of this net.
















## Map View Symbols

Table C-11 contains point's symbols that Spectrum Survey Office uses to represent different information in the Map View.

**Table C-11. Map View Symbols**

Point's symbols passed/not passed Quality Control test	Description
 / 	Manual point (the point added to the job with using the command <b>Edit ▶ Add ▶ Point</b> )
 / 	Unknown point (the non-control point imported to the job from a coordinate file)
 / 	Fixed Both/Compare Both coordinates point
 / 	Fixed Horizontal/Compare Horizontal control
 / 	Fixed Vertical/Compare Vertical control
 / 	Stakeout point

**Table C-11. Map View Symbols (Continued)**

Point's symbols passed/not passed Quality Control test	Description
	Design point
	Point coordinates calculated by means of COGO
	Adjusted point
	TS occupation
	TS Sideshot point
	TS BackSight point
	RTK base point
	Topo Point (the point collected during a static RTK measurement)
	Auto Topo Point (the point collected during a kinematic RTK measurement)
	GPS post-processing static point
	GPS post-processing static point in the stop&go measurements
	GPS post-processing kinematic point
	Tape Measurement point
	GPS offset point
	PTL (point to line) offset point

**Table C-11. Map View Symbols (Continued)**















Point's symbols passed/not passed Quality Control test	Description
 / 	Turning point (for digital level measurements)
 / 	Level point (for digital level measurements)

Table C-12 contains line's symbols that Spectrum Survey Office uses to represent different information in the Map View.

**Table C-12. Map View Symbols**

Line's symbols passed/not passed Quality Control test	Description
 / 	TS measurement (measurement line from the station to the point)
 / 	RTK baseline from the base station to a Topo point
 / 	Processed GPS post-processing baseline from the base station to a static point
	Unprocessed GPS post-processing baseline from the base station to a static point
	Tape measurement
	Kinematic trajectory for RTK Autotopo points and for post - processing kinematic points
	Multiple Observation (for repeated measurements)

# Hot Keys

The following table lists hot keys, also known as keyboard shortcuts, used in Spectrum Survey Office.

**Table D-1. Spectrum Survey Office Hot Keys**

Press This...	To Perform This...	Press This...	To Perform This...
Ctrl+C	Copy	Ctrl+F	Filters
Ctrl+V	Paste	Ctrl+T	Tabular View
Ctrl+X	Cut	Ctrl+M	Map View
Ctrl+Y	Redo	Ctrl+U	Occupation View
Ctrl+Z	Undo	Ctrl+L	Loop closures
Ctrl+N	New File (Job)	Ctrl+1	Adjustment report
Ctrl+O	Open File (Job)	Ctrl+2	GPS Observations report
Ctrl+P	Print	Ctrl+3	Localization report
Ctrl+S	Save File (Job)	Ctrl+4	Points report
Ctrl+A	Select All (in active window)	Ctrl+5	QC report
Del	Delete	Ctrl+6	TS Observations report
Ctrl+Backspace	Zoom back	Ctrl+Alt+M	Map View options
=	Restore all (zoom to extents of job)	Ctrl+Alt+U	Occupation View options
Shift+Del	Cut	Ctrl+Alt+T	Tabular View options
Ctrl+Insert	Copy	Ctrl+Alt+P	Process Properties
Shift+Insert	Paste	F2	Edit current cell (in table)
Ctrl+E	Enable	Ctrl+D	Disable
Ctrl+Enter	Properties	F4	Export
Ctrl+F2	Job Configuration	Shift+F3	Import From Device

**Table D-1. Spectrum Survey Office Hot Keys (Continued)**

<b>Press This...</b>	<b>To Perform This...</b>	<b>Press This...</b>	<b>To Perform This...</b>
Shift + F4	Export To Device	F3	Import
F8	Adjustment	F7	GPS+ PostProcessing
F9	Report Configuration	Shift+F8	Localization
Ctrl+Shift+N	Select none (deselect current selection)	F12	Customize toolbar
Ctrl+Shift+P	Select points	Ctrl+Shift+I	Insert selection
Ctrl+Shift+G	Select GPS Occupations	Ctrl+Shift+T	Select TS Occupations
Ctrl+Shift+O	Select GPS Obs	Ctrl+Shift+M	Select TS Obs
Left/Right arrows	Pan graphical view left/right	Home	Move graphical view to the far left
Up/Down arrows	Pan graphical view up/down	End	Move graphical view to the far right
Page Up/Page Down	Pan graphical view up/down by page	+/-	Zoom in/out

# Connectors

## Serial C-RS232C Connector

This cable is used to connect the TPS receiver (ports A and D) with a computer. Figure E-1 shows the receiver's connector.



Figure E-1. C-RS232C Receiver Connector

Table E-1 gives specifications for this connector.

Table E-1. RS232 Connector Specifications

Number	Signal Name	Dir	Details
1	Power_OUT	P	Power Output ( $I < 0.2$ A)
2	GND	-	Signal ground
3	CTS	I	Clear to send
4	RTS	O	Request to send
5	RXD	I	Receive data
6	TXD	O	Transmit data
7	-	-	Not used



Connector types are SEALED RECEPTACLE, 7- pin W.W. FISCHER, INC, p/n DBEU 102 A056. Table E-2 gives the pin equivalents for the connectors.

**Table E-2. Connector Pin Equivalents**

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

## Receiver COM Port Status

The following RS232C interface options (Table E-3) are default communication settings for the receiver application program.

**Table E-3. Default Receiver COM Port Settings**

Communication Option	Default Setting
Port input mode	CMD for GRIL or Command for PC-CDU; the port is in command mode. In this mode, the port recognizes the commands sent by the user.
Hardware handshaking	OFF
Serial port baud rate	115200 baud
Stop bits	1
Parity	N (no parity)
Data bits	8

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Ver.7.5

1st ed. 01-0910

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